Social Inclusion
2026 • Volume 14 • Article 11685
https://doi.org/10.17645/si.11685

cogitatio

ARTICLE

Open Access Journal

The Response by Co-Working Spaces to Digital Transformation in Singapore

Anastasia Sinitsyna [1] and **Luca Alfieri** [2,3]

[1] Asia Centre, University of Tartu, Estonia
[2] Department of Architecture and Urban Studies, Politecnico di Milano, Italy
[3] School of Economics and Business Administration, University of Tartu, Estonia

Correspondence: Luca Alfieri (luca.alfieri@polimi.it)

Submitted: 30 October 2025 **Accepted:** 1 April 2026 **Published:** 28 April 2026

Issue: This article is part of the issue "Digital Transition and New Forms of Spatial Inequality" edited by Tiit Tammaru (University of Tartu), Kadi Kalm (University of Tartu), and Rūta Ubarevičienė (Lithuanian Centre for Social Sciences), fully open access at https://doi.org/10.17645/si.i468

Abstract

This article examines how the digitalisation process has reshaped the evolution of co-working (CW) spaces in Singapore and has contributed to the emergence of hybrid work ecosystems. Drawing on qualitative data from semi-structured interviews with managers of CW spaces in Singapore, the findings suggest that digitalisation did not create entirely new client segments but instead reinforced the existing ICT-dominated customer base by stabilising hybrid and remote working practices. At the same time, digitalisation made possible the institutionalisation of virtual CW practices, supported by platforms which serve to integrate video conferencing, collaborative software, and digital community tools. These virtual extensions enhance flexibility, inclusivity, and cross-border collaboration whilst remaining complementary to physical CW spaces. Within the Singapore context—one which is characterised by strong digital infrastructure and its role as a regional headquarters and innovation hub—CW spaces are evolving towards structurally-embedded hybrid models. This study contributes to the available literature by conceptualising CW spaces as digitally-enabled socio-spatial infrastructures which operate within hybrid work ecosystems rather than as purely physical shared offices.

Keywords

co-working space; digitalisation; hybrid work ecosystem; Singapore

1. Introduction

Over the past two decades, the rapid advance of digital forms of technology has reshaped work organisation, the structure of labour markets (Acemoglu & Restrepo, 2020; Charles et al., 2022), and the physical spaces in

which work is carried out (Alfieri et al., 2025; Shifrin & Michel, 2022). The process of digitalisation is understood within this study as one through which digital forms of technology, which include cloud computing, artificial intelligence, digital communications platforms, and data analytics (Brynjolfsson & McAfee, 2014; Charles et al., 2022), are adopted and integrated into economic activities, organisational structures, and everyday work practices (Vial, 2021). This process has not only expanded employment levels in the information and communications technology sector (ICT) but has also profoundly transformed traditional sectors through the application of increased automation (Acemoglu & Restrepo, 2019), increased numbers of digital platforms (Martindale & Lehdonvirta, 2023), and new forms of connectivity (Frey & Osborne, 2017). These transformations, which were accelerated during the Covid-19 pandemic, have fostered across a wide range of sectors the normalisation of remote work practices, work which partially is carried out outside the default place of work (International Labour Organization, 2021), along with increasing hybrid work arrangements which are defined as a blended mode of in-office and out-of-office work (Manzini Ceinar & Mariotti, 2021; OECD, 2023; Sostero et al., 2020).

Despite the gradually growing degree of implementation in terms of digital solutions, the persistent demand for collaborative and professional interaction simultaneously has given rise to co-working (CW) spaces (Pernice et al., 2025; Spinuzzi et al., 2019). A CW space is a shared space which is used by individuals who pay for access on a flexible, membership-based model, and who therefore are bound by community norms rather than a common employer (Gandini, 2015; Spinuzzi, 2012). In this sense, CW spaces offer not only physical space but also social space for communities and networks which foster collaboration, innovation, and knowledge exchange (Capdevila, 2015; Merkel, 2015).

Digitalisation has, on the one hand, prepared the ground for the emergence of CW spaces as a phenomenon, while, on the other hand, the process of digital transformation is continuously reshaping the way in which they operate. This study aims to shed some light on how and to what extent digital transformation serves to change the traditional CW model. In order to address this overarching question, we seek to answer the following questions: How is digitalisation understood and to which degree is it accepted within the context of CW spaces? Which new elements or transformations does digitalisation introduce into the core components of the CW business model, including practices, values, and customer structure? How do digital and physical spaces interact within the CW model? This article seeks to address these questions by investigating the perspectives of CW managers in Singapore in terms of the relationship between digitalisation and CW. As decision-makers who are responsible for implementing digital tools, redesigning physical infrastructure, and adapting service portfolios, managers provide an aggregated and strategic perspective on digital transformation processes and ecosystem-level change.

Empirically, this study is based on the Singapore context. As a global financial hub and one of the world's most digitally advanced economies, this city-state has actively promoted its "Smart Nation" agenda, embedding digitalisation into economic policy, public services, and urban planning (Woo, 2018; Yeo, 2024). At the same time, Singapore's limited physical space, high real estate costs, and its role as a regional headquarters location for multinational corporations has created distinctive pressures upon and opportunities for CW spaces. The clustering of innovation ecosystems around major universities such as the National University of Singapore and Nanyang Technological University (Das & Kwek, 2024), combined with the cross-border mobility of professionals who are commuting from neighbouring countries, further diversifies the CW landscape.

By combining insights which have been received from managers with broader literature on digitalisation and CW, this article provides two contributions. Firstly, it examines the emergence of new extensions of CW spaces and assesses their temporal character, calculating whether they constitute temporary adaptations or enduring structural transformations. Secondly, it sheds some light on the interplay between physical and digital spaces, evaluating whether they operate as complementary, substitutive, or coexisting dimensions of the CW ecosystem. Together, these findings contribute to ongoing scholarly debate on the digital transformation of work and the evolution of CW space models within the context of a small city-state economy.

2. Theoretical Background

Rapid digitalisation has significantly reshaped and restructured global labour markets, contributing through task replacement, task creation, and the transformation of work arrangements to labour market segmentation which can be characterised as the division of the labour market into distinct segments which are characterised by different wages, working conditions, and career opportunities (Autor & Dorn, 2013; Charles et al., 2022; Goos et al., 2014; Piore, 1983). As a result of the processes of digitalisation, globalisation, polarisation, and economic restructuring, two segments of the labour market have grown quite extensively: the low-skilled service sector and highly-skilled knowledge workers—employees or freelancers whose primary tasks involve the creation, processing, analysis, or communication of information and knowledge (Autor & Dorn, 2013; Drucker, 1999; Merkel, 2015). Therefore, it can be seen that ICT and creative professionals and, more broadly, mobile employees who can work outside their primary workplace, became the main customer pool for the rise of CW spaces (Bednář et al., 2023; Merkel, 2015; Spinuzzi, 2012). Their preferences, and their ability to adopt hybrid work models which combine office and remote work, further contributed to the growth of CW spaces (Bloom et al., 2022; Migliore et al., 2021). Such spaces became multilayered spatial environments (Yang et al., 2019), integrating designed, well-equipped physical spaces with a strong community-building dimension (Gandini, 2015), and functioning as micro-clusters which are co-located with creative and knowledge-intensive industrial hubs and districts within urban spatial ecosystems (Capdevila, 2015; Clifton, 2022; Coll-Martínez & Méndez-Ortega, 2023).

Relative to traditional office and home-based work, CW practices provide a wider range of physical and psychosocial environmental factors which shape user outcomes, including ergonomic design, noise management, and opportunities for collaboration (Kinsman et al., 2024), thereby improving concentration, productivity, and well-being (Lukeš et al., 2026; Robelski et al., 2019) and reducing isolation (Ciccarelli, 2023). In addition, CW spaces help to reduce long-distance daily commuting to central offices, generating both private financial savings and broader public benefits, including reduced traffic congestion, lower carbon emissions, and more sustainable urban mobility patterns (Curtis et al., 2025; Fai et al., 2025; Lejoux et al., 2019).

Although the model of CW spaces is considered to be sustainable, it has evolved significantly. Being the driver for the rise of CW spaces, digitalisation at the same time began transforming the CW model itself (Sinitsyna et al., 2022). The Covid-19 pandemic forced a reconsideration of the role of physical space and physical events, meetings, and social interactions, which were the core elements behind the value of CW spaces (Kraus et al., 2022). In response, CW spaces shifted some activities into the digital space in the form of virtual CW spaces, with these being ICT-mediated environments which replicate the social proximity, motivation,

and knowledge-sharing functions of any physical CW space (Hofeditz et al., 2020). CW spaces therefore no longer remained exclusively physical workspaces (Hirschmann et al., 2026; Sinitsyna et al., 2022).

Virtual CW spaces are a relatively new concept and practice. Although their advantages are recognised in terms of flexibility in time and space, 24-hour access, and access to global knowledge networks, so also is recognised their socio-technical constraints such as participation fatigue and difficulties in sustaining informal communication (Dell'Aversana & Miglioretti, 2025; Hopkins & Bardoel, 2023). However, the depth of knowledge regarding the sustainability of this model remains imbalanced. While some scholars emphasise the temporary nature of the virtual space due to participation fatigue (Di Marino et al., 2023; Sinitsyna et al., 2022), others consider virtual CW to be a promising hybrid work environment (Hofeditz et al., 2020; Mao, 2025).

Both CW spaces and virtual CW spaces serve an economically-significant yet limited segment of the labour market (Di Marino et al., 2023; Mariotti et al., 2019). This may raise broader questions of urban social justice. A well-functioning and innovative labour market depends not only upon digitally-connected professionals but also on essential service workers whose livelihoods rely on affordable housing, accessible transportation, and robust social security systems (Florida, 2017; Harvey, 2012). As cities tend to position themselves as innovation hubs, the expansion of CW infrastructures may inadvertently contribute towards the imposition of spatial inequalities (Vogl et al., 2024), gentrification pressures, and the exclusion of lower-wage workers from central urban areas (Zukin, 2012), potentially forcing and reinforcing existing socio-economic stratification and unequal access to opportunities (Fainstein, 2014; Mariotti et al., 2023). On the other hand, CW spaces often co-locate with start-ups and creative hubs, thereby benefiting from the clustering and knowledge-sharing environments these spaces provide and, therefore, contributing to urban variety by activating underused or abandoned buildings, stimulating local service economies, and attracting complementary businesses into surrounding neighbourhoods (Mariotti et al., 2021; Merkel, 2015).

3. Digitalisation and the Rise of CW Spaces in Singapore

A recent market report estimates that the CW industry in Singapore, which was valued at USD 88.2 million in 2023, will surpass a figure of USD 407 million by 2030, with an annual growth rate of 24.3% during 2024–2030 (Next Move Strategy Consulting, 2025). This rapid expansion did not occur randomly. Rather, it is a consequence both of global shifts in the future of work towards digitalisation, Singapore's transformation into a financial and corporate hub for the Indo-Pacific region, and the city-state's specific economic and spatial planning policies (Nunnington et al., 2017).

Firstly, the digitalisation of Singapore's labour market and its adoption of digital solutions across sectors have both served as a strategic driver for its growth. Singapore has actively promoted itself as a "Smart Nation," adopting at a state level wide-ranging digital solutions across industries, public services, and education (Das & Kwek, 2024). This transformation has not only expanded the ICT sector but has also reshaped work practices across all segments of the economy (OECD, 2023). As businesses digitalise their operations, the requirement has diminished for employees to be physically co-located on a daily basis, whilst remote and hybrid work practices have become mainstream (Ei et al., 2021; Sostero et al., 2020). This is the niche for CW spaces: offering a technologically equipped office which can flexibly be accessed (Dell'Aversana & Miglioretti, 2025).

A second structural driver lies in Singapore's role as a regional headquarters hub. Establishing a headquarters in Singapore carries symbolic weight, a move which signals prestige, stability, and access to South-East Asian markets (Barr, 2016; Yue, 2001). Yet not all companies can maintain a physical office in Singapore due to its high property prices (Han, 2005; K. W. Wong & Bunnell, 2006). Some of these companies choose to retain a prestigious Singapore address but outsource or downsize their physical office requirements (Van Meeteren & Bassens, 2016). For such firms, CW spaces offer a digital registration address and some limited services (such as postal handling and reception services).

Thirdly, Singapore's broader planning strategy to decentralise economic activity (P. K. Wong et al., 2010) resulted in the emergence of knowledge-intensive hubs outside the city's central business district (CBD). This created a spatial niche for CW spaces. The presence of world-class universities such as the National University of Singapore and Nanyang Technological University has fostered the emergence of suburban innovation clusters (P. K. Wong et al., 2011). Both universities host technology parks and start-up incubators, thereby attracting ICT entrepreneurs, researchers, and spin-off ventures (Oswin & Yeoh, 2010). CW spaces have capitalised on these concentrations, situating facilities close to campus areas in order to capture the demand.

Finally, regional labour mobility and commuting practices serve to shape demand for a flexible workspace. The high cost of living in Singapore means that many professionals who are employed by Singapore-based firms do not permanently reside in the city. Instead, they are based in neighbouring countries such as Malaysia or Indonesia, commuting periodically to Singapore for meetings, negotiations, or project work (Hui, 1997; Yeoh & Chang, 2001). These cross-border professionals often maintain a home office in their country of residence but rely on temporary workspaces when in Singapore. For them, CW spaces provide flexible access to professional environments for a few days or weeks, avoiding the need for long-term rental contracts. The rise of such commuting professionals highlights the broader regional integration of Singapore's labour market and underscores the functional role of CW spaces as bridges between home-based work abroad and formal corporate environments.

Taken together, these four factors reinforce one another. Digitalisation enables remote work, but remote work creates demand for flexible offices; multinational firms desire a Singapore base, but spatial constraints push them towards shared facilities; universities attract ICT entrepreneurs, and CW captures this trend; regional professionals circulate between Singapore and neighbouring states, and CW provides their temporary anchor.

4. Method

4.1. Study Participants

The study targeted the managers of CW spaces which are located in Singapore. The selection of CW spaces was guided by several criteria in accordance with the definition of CW space which has been applied in this study. Firstly, a CW space should have a headquarters which is located in Singapore. Secondly, it should operate as a private, profit-oriented business with independent ownership. Thirdly, each maintains a physical workspace and provides flexible desk membership. For this reason, fully online-based virtual spaces were excluded. Public libraries and semi-private social spaces were also excluded from the sample. In addition, we excluded micro-providers of CW spaces, temporary pop-up spaces, and closed corporate

spaces which usually are accessible only to corporate employees. Additional exclusion criteria were used to ensure transparency. To qualify for inclusion, the CW space should have an updated website with publicly available contact details, in English, and managers should be available for the interview, also in English. However, during the desk research and recruitment phase, no invitations were declined due to language-related reasons. We did not intentionally focus on CW spaces which specialised in a particular sector (such as creative industries or ICT), as our aim was to observe the impact of digitalisation across differing sectoral contexts. As a result, a list was compiled of 12 CW spaces. Seven were randomly approached for face-to-face interviews. Based on manager availability, readiness, and willingness to participate, 3 of the 12 were visited for pilot interviews during the first phase of data collection. In the second stage of data collection, two additional CW spaces agreed to participate. In total, we contacted 5 out of 12 CW spaces across different districts in Singapore, including both the CBD and suburban innovation and creative hubs close to university clusters (Supplementary File, Table 1).

Established between 2012 and the early 2020s, these spaces range from small student-oriented work environments (CW space B) to internationally-connected hubs which are embedded in the CBD (CW spaces C and E). Membership profiles vary from freelancers and creative entrepreneurs to large multinational corporations, reflecting diversified demand patterns within Singapore's knowledge economy. In terms of scale, some CW spaces maintain single-site facilities (CW space B), while others operate as multi-location networks across Singapore (CW spaces A, C, D, and E). The provision of services also differs substantially: While some spaces emphasise community-building, creative production facilities, and flexible desk arrangements (CW spaces A and D), others focus on premium business lounges, premium office services, and corporate-oriented meeting infrastructures (CW space C). Pricing strategies range from highly flexible, short-term memberships for students to higher-cost dedicated team offices, indicating differentiated market positioning.

Overall, the spatial distribution of the 12 CW spaces (Figure 1) is characterised by strong clustering around business hubs and innovation centres across Singapore's various districts rather than displaying any uniform distribution. This pattern reflects the result of Singapore's spatial planning policy, which, on the one hand, aims to decentralise economic activities beyond the CBD and, on the other hand, to develop creative and business hubs, thereby encouraging CW spaces to co-locate in close proximity to these hubs as they provide a pool of potential customers. CW spaces tend to cluster either (a) in the main business and financial district, where demand is highest from startups, finance, consulting, and international companies, or (b) along and in major transport corridors and hubs.

The five selected CW spaces (the red dots in Figure 1) which were included in this study's interview process are distributed across various districts in Singapore. Two of them (CWs C and E) are situated within the central downtown area, Singapore's primary CBD, which is characterised by its office towers, multinational corporations, and high financial density. Their positioning embeds these CW spaces within the formal corporate ecosystem, facilitating interaction with multinational firms and professional service networks. In contrast, CW space A is located in a historical neighbourhood which bears a strong concentration of art and creative industries. This setting reflects a more community-oriented and entrepreneurial positioning. Meanwhile, CW spaces B and D are located in the urban fringe and light-industrial areas which are characterised by a mix of commercial-residential and industrial buildings. These locations offer comparatively lower rental costs and greater spatial flexibility, often attracting startups, small and medium-sized enterprises (SMEs), and production-oriented activities.

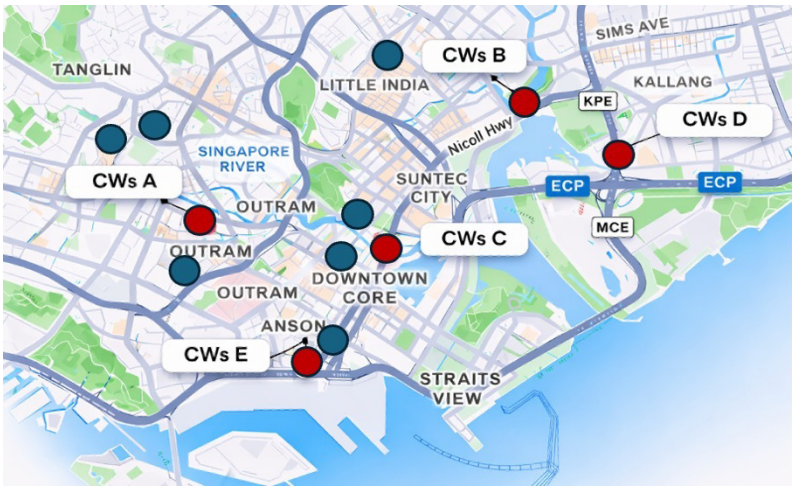

Figure 1. The spatial distribution of case study CW spaces in central Singapore. Notes: blue and red dots indicate the approximate locations of the 12 selected co-working spaces after the first stage of sampling; red dots indicate the final set of five co-working spaces which were included in interviews. Source: compiled by the authors based on the Urban Redevelopment Authority (2019).

Participation in the study was voluntary, and all respondents provided their informed consent prior to data collection. To be able to protect confidentiality, pseudonyms were assigned both to CW spaces and managers, and identifying details were removed from the transcripts. Data were stored on password-protected servers which were accessible only to the research team. The research followed established ethical guidelines for social science research, ensuring respect for participant autonomy, privacy, and the voluntary nature of participation. Informed consent was obtained from all participants while they were assured of confidentiality and were informed of their right to withdraw at any stage from the study.

4.2. Data Collection and Analysis

Data collection proceeded in two stages. Firstly, three semi-structured pilot interviews were conducted over a one-week period in April 2024 during a fieldwork trip to Singapore. Each interview lasted between one and three hours. The fieldwork in total included approximately 10 hours of observations and face-to-face interviews with managers. These interviews were held offline and included guided tours of the CW spaces, followed by semi-structured in-depth discussions with the managers. This stage was particularly important as it provided the opportunity to observe digitalisation practices in situ, engage informally with managers, and gain familiarity with the CW physical space. During observations, conversations extended beyond the formal interview questions, allowing managers to reflect on their broader perspectives on digitalisation and how digital transformation had changed their daily routines.

The first stage interview questions were developed by basing them on a review of the available scientific literature. However, the pilot interviews revealed additional topics as managers offered their own reflections on how digitalisation has reshaped and impacted the future of CW spaces. Consequently, in the second stage of data collection, the original set of interview questions was expanded to explore new insights on structural changes which can take place during digitalisation. Examples of interview questions, together with their respective theoretical foundations, are presented in Table 1.

Table 1. Examples of questions for semi-structured interviews with CW managers.

Research question	Examples of interview questions	Theoretical base
How do CW managers interpret and conceptualise digitalisation?	How do managers define digitalisation within the context of CW? Do they see it as opportunity, pressure, necessity, or transformation? Where do they perceive its strongest impact to lie?	Clifton et al. (2022); Mátyus (2021); Orel (2019).
In which ways does digitalisation restructure demand patterns and shift CW user preferences, and how do CW spaces adjust?	How has digitalisation changed customer expectations? Has the profile of members shifted? Describe how. How does digitalisation increase or decrease community engagement?	Bednář et al. (2023); Wright et al. (2022).
How are digital and physical spaces integrated within the CW space model?	How do managers see the evolution of (a) physical-only CW, (b) online extension (especially after the pandemic period), and (c) the integrated hybrid ecosystem? How do digital and physical spaces relate to each other? What is the future of digital space?	Hofeditz et al. (2020); Vial (2021); Yang et al. (2019).

In the second stage (September–November 2025), two more CW spaces were approached and interviewed using the finalised interview guide. Given the fact that data collection spanned a period of more than six months, previously-interviewed managers were re-contacted and asked to update their responses. Two previously-contacted CW managers agreed to participate in additional online interviews, which allowed us to capture recent developments in digitalisation practices and CW space adaptation. One previously-contacted manager provided written responses to the interview questions due to time constraints. New CW managers were also interviewed online. All interviews which were conducted during the second stage were held via video conferencing and lasted between 25 and 45 minutes. A total of five CW spaces were studied between April 2024 and November 2025.

All interviews were recorded, transcribed, and analysed using a qualitative content analysis approach in order to systematically examine the interview material, identify recurring themes, and develop categories which reflect both predefined analytical concepts and themes which may have emerged from the data. Some of the code examples are presented in Table 2.

The coding procedure was conducted using NVivo software and was then manually checked. The analysis process began with open coding of the interview data, followed by the identification of recurring patterns across respondents. Codes were then synthesised into higher-level topics which aligned with the study's research questions and were reflected in pilot interviews.

Table 2. Examples of codes used in the content analysis of semi-structured interviews with CW managers.

Topic	Code	Interview quotation	Focus and notes
Interpretation of digitalisation	Ddef	For us digitalisation is a long-term shift toward a more connected and data-driven workspace (CW space B manager, April 2024, Singapore).	Interpretive dimension of digitalisation. Conceptual framing. Digitalisation as a permanent trend.
Digital practices	DPben	We manage bookings, payments, and community engagement entirely through our digital platform….It just makes everything smoother (CW space D manager, September 2025, online interview).	Utility of digitalisation. Concrete implementation. Changes in internal management processes.
Impact on user profiles	DLpro	Well, our community now includes more remote employees from multinational firms. They are very flexible, more internationally mobile (CW space E manager, November 2025, online interview).	Increased diversity as a demand-side transformation. Transformation of the user profile beyond the physical space.
Digital-physical space	DPScom	I would say that the digital platforms we use, they are supporters for us and our members….And these offline/online interactions, if I may say so, are now fully interconnected (CW space A manager, April 2024, Singapore).	Complementary coexistence of digital and physical spaces.

Notes: Ddef = definitions of digitalisation; DPben = benefits of new digital practices; DLpro = digitalisation and labour market, changes in profile; DPScom = digital and physical space, complementary.

5. Findings and Discussion

5.1. Digitalisation as an Indirect Driver of CW Demand

In addressing our first research question—how digitalisation is understood and interpreted amongst CW managers—those managers framed digitalisation as an essential part of their professional routines rather than as an external or temporal shock to the sector. As one respondent noted, "Most of us already work in highly digital environments. For us, online things are just part of our everyday life" (CW space A manager, April 2024, Singapore).

Managers emphasised the fact that digital transformation is most visible in communication practices rather than in the other dimensions of CW. "In terms of productivity tools, our members are extremely advanced. AI, automation, cloud collaboration…that's nothing surprising for them," explained one manager (CW space C manager, April 2024, Singapore). The social component of CW was described as being less impacted by digitalisation. "Digital tools help coordination, but the community still needs physical presence," observed another respondent (CW space D manager, September 2025, online interview). The other manager also commented: "We know that after Covid people don't like to communicate too much. They like to control communications. So we offered our members special channels…they can simply switch it off when they want" (CW space A manager, April 2024, Singapore).

Managers nevertheless did not interpret digitalisation as a direct driver of increased demand for CW membership. "We didn't suddenly get digital workers because of digitalisation. They were already our core audience," stated one manager (CW space B manager, April 2024, Singapore). Instead, they emphasised their initial customer base as already having predominantly been composed of ICT professionals whose work had long been carried out in the digital space. Managers framed it less as a disruptive force which was generating new markets and more as an enabling environment which sustains and stabilises established user profiles. "Digitalisation didn't change who our members are, it changed how they work," summarised one respondent (CW space E manager, September 2025, online interview). Digital transformation therefore operates as an instrument of vertical expansion rather than a horizontal one, underpinning CW practices rather than being a primary causal factor in membership growth.

5.2. Digitalisation and the Rise of Virtual CW Practices

Our second research question addresses how CW spaces have adjusted in response to digitalisation. That response to the digital transformation saw CW spaces developing and implementing virtual CW spaces, understood as being digital spaces which are designed to replicate some of the functional and social dimensions of physical CW through the supply of online platforms (Hofeditz et al., 2020; Sinitsyna et al., 2022). As one manager explained, "The virtual room creates accountability. People log in, switch on their cameras, and work together even if they're in different countries" (CW space D manager, September 2025, online interview). Platforms such as Zoom, Microsoft Teams, and Google Meet were consistently cited as essential tools which supported this synchronous interaction.

At the same time, managers differentiated between activities which were suitable for the digital space and those which required a physical co-presence. Informational sessions, briefings, and certain networking events were increasingly conducted online, thereby saving commuting time and increasing efficiency. As one manager explained, "Workshops and briefings can easily be moved online. It saves everyone time" (CW space B manager, April 2024, Singapore). In contrast, events which were aimed at deeper network formation, trust-building, and community integration—particularly for newcomers—were deliberately maintained in physical settings. "You can introduce yourself online, but real connections still happen over coffee," noted a respondent (CW space A manager, April 2024, Singapore). This selective digitalisation of services created additional value for CW operators who were able to strategically integrate digital solutions. Moreover, virtual CW was perceived as reducing unnecessary commuting, aligning with broader discussions on mobility and efficiency.

Unlike assumptions reached by previous studies (Di Marino et al., 2023; Trapanese & Mariotti, 2023), virtual CW was not framed merely as a temporary response to pandemic-related restrictions but rather as a structural adaptation to the digitalisation of work. As one manager noted, "We initially moved online because of Covid, but now virtual access is simply part of how we operate" (CW space C manager, April 2024, Singapore). Managers emphasised the fact that digital platforms made it possible for multi-location teams to maintain collaboration, thereby expanding CW beyond its physical space. In this sense, digitalisation restructured CW demand from locally-embedded freelancers towards more internationally mobile and hybrid corporate users. As a respondent explained, "Our members are no longer just freelancers from one neighbourhood. Many of them have not seen each other face-to-face…they simply log in from different countries" (CW space E manager, November 2025, online interview).

Virtual CW spaces were also described as an opportunity for inclusivity and flexibility over space and time, rather than the necessity to be online (Mao, 2025). As managers explained, digital access broadened participation from different geographical backgrounds, which is particularly important for international professionals and remote workers who are operating across multiple time zones. One manager observed, "Digital access allows people who are not physically in Singapore [still to] feel part of our community" (CW space A manager, April 2024, Singapore). Flexibility in scheduling was frequently cited as a benefit, contributing to improved work–life balance and accommodating the needs of globally-distributed teams. As another respondent stated, "Some members prefer to join events online because it fits better with their schedule and family commitments" (CW space D manager, September 2025, online interview). The findings therefore confirm that virtual CW provides substantial advantages in terms of accessing global knowledge networks by means of linking members across geographical boundaries. Digitalisation therefore not only restructures internal demand patterns but also more deeply integrates CW spaces into transnational business ecosystems.

5.3. The Emergence of Hybrid Work Ecosystems as an Interaction Between Digital and Physical Spaces

Our third research question examined how digital and physical spaces relate to one another within CW models: Do they function as substitutes or complements, or as an integrated system? CW initially emerged purely as a physical phenomenon (Gandini, 2015; Moriset, 2013), which was centred on shared office infrastructures. During the Covid-19 pandemic (Di Marino et al., 2023), CW spaces had to expand into the digital space, and virtual CW practices became dominant due to mobility restrictions and the rapid expansion of remote work (Dell'Aversana & Miglioretti, 2025). However, the post-pandemic period does not reflect a simple return to the pre-digital model. Digital and physical spaces instead now operate in complementary, permanent, and mutually-reinforcing ways, giving rise to what can be conceptualised as a hybrid work ecosystem.

Digital expansion has reshaped expectations when it comes to physical infrastructure. Managers observed that, as members increasingly participate in virtual meetings and hybrid workflows, physical spaces must accordingly adapt. "Our members expect proper soundproof rooms and video pods, not just desks," explained one respondent (CW space A manager, April 2024, Singapore). This has led to spatial redesigns, including the addition of sound-isolated booths, advanced conferencing facilities, and multifunctional areas which are optimised for hybrid interaction. Therefore, physical CW spaces are not being diminished in terms of their relevance. Instead, they are being redesigned to adjust to digital transformation.

Additionally, within the Singapore context, the adoption of virtual CW was not driven solely by internal demand but also by the broader institutional environment. Managers referred to the strong governmental support for digital transformation and Singapore's positioning as a "digital nation." As one respondent reflected, "In Singapore there is an expectation that you are digitally advanced. It's part of the business culture" (CW space B manager, April 2024, Singapore). Whilst this environment facilitated technological adoption, some managers reported that they felt under pressure to maintain a digital space: "Even if not everyone uses the virtual platform daily, we feel we must offer it," explained a respondent (CW space C manager, April 2024, Singapore).

This ecosystem operates across multiple interconnected layers. At the physical layer, CW spaces provide desks, meeting rooms, event venues, and increasingly specialised soundproof or conferencing facilities.

At the digital layer, booking applications, communication platforms (such as Slack or similar systems), CRM tools, and digital access control make it possible to ensure remote coordination and hybrid participation. At the social layer, community managers facilitate networking events and peer interaction across both online and offline environments. Finally, at the organisational layer, flexible contracts, hybrid membership models, and platform governance structures allow for temporal and spatial adaptability. Altogether, this integration is supported, promoted, and sometimes enforced by national government bodies.

6. Conclusion

This study explored how digitalisation has shaped and reshaped the evolution of CW spaces, a form of workspace in which the physical component remains an integral part of its core value alongside community building. This study draws on evidence from Singapore, a city-state which is characterised by a high level of digitalisation and development, and an active spatial planning policy which aims at reducing spatial inequality and decentralising economic activity beyond traditional CBDs. Within this context, CW spaces play a dual spatial role. Firstly, they tend to co-locate in close proximity to business and creative hubs in order to position themselves near their core customer base. Secondly, they complement and extend the spatial landscape of neighbourhoods by providing an alternative workplace for remote workers. This allows those remote workers to avoid some of the negative externalities which can be associated with working from home, while at the same time reducing the need to commute to the CBD.

Our findings revealed that digitalisation in Singapore has primarily served as an indirect enabler of CW growth rather than a direct driver of customer pool expansion. Whilst CW managers do not see digital transformation as generating new demand beyond ICT professionals, they acknowledge that digitalisation is crucial in sustaining and enhancing CW practices, particularly through the emergence of virtual CW spaces. Supported by digital solutions which enable video conferencing, collaborative software, and digital community tools, virtual CW spaces, as part of the business model, have made it possible for CW spaces to be able to maintain engagement and continuity even beyond physical offices. These virtual extensions enhance flexibility, inclusivity, and cross-border collaboration, positioning CW as an adaptive physical infrastructure for the digital economy. However, virtual CW practices are not a substitute for physical space but rather serve to extend and complement that physical space, therefore suggesting that CW spaces are evolving towards hybrid work ecosystems in which digital and physical layers dynamically interact rather than compete.

Overall, CW spaces in Singapore exemplify a broader transformation toward hybrid work ecosystems, suggesting that such spaces are not shifting from physical to digital environments, but rather that both are being integrated into a multilayered ecosystem. Whilst certain functions have transitioned into the digital space, the physical space remains important and is becoming more multifunctional, increasingly technologically-equipped, and certainly flexibly designed. The hybrid work ecosystem therefore represents a reconfiguration rather than the dominance of either physical or digital spaces, and is bound by routine practices while being supported by state policy.

The future trajectory of CW in Singapore will likely follow a hybrid model, and this hybridisation appears structural rather than temporary. Therefore, the future of work is not placeless. Rather than making location irrelevant, digitalisation is reshaping the importance of location, and CW spaces are one of the key spatial forms through which this transformation becomes visible.

Although this study has attempted to advance the understanding of digital and physical space interaction through the case of CW spaces in Singapore, several gaps remain relevant here. Firstly, the analysis was limited to managerial perspectives, whereas future research could incorporate the viewpoints of CW members in order to better understand user-level experiences of hybrid work ecosystems. Secondly, comparative studies across different institutional contexts would allow for an assessment of whether the hybrid work ecosystem which has been observed in Singapore represents a global mode of work or is one which has been shaped by Singapore's specific institutional and digital environment. Thirdly, longitudinal research could examine how hybrid work ecosystems evolve over time, particularly as digital tools and artificial intelligence applications continue to develop.

Acknowledgments

The authors would like to thank Dr. Ilaria Mariotti and Dr. Elo Süld for their valuable advice and support, and their helpful recommendations.

Funding

This research was supported by the Estonian Research Council under the research grant Living Segregated Lives: Exploring Changes in Spatial Inequalities in Digitally Transforming Societies (PRG1996). The authors also acknowledge the project MOBI-TWIN – Twin Transition and Changing Patterns of Spatial Mobility: A Regional Approach (Grant Agreement ID: 101094402), funded by the European Union's Horizon Europe Research and Innovation Programme. The fieldwork for the study was supported by the research grant China's and India's Foreign Policy and Sustainable Development in the New Geopolitical Context (SHVUS23369), funded by the Ministry of Foreign Affairs of Estonia.

Conflict of Interests

The authors declare no conflict of interests.

Data availability

The data associated with this article are available upon request from the authors.

LLMs disclosure

The authors used ChatGPT (OpenAI) solely for language editing and improvement. No AI tools were used for data analysis, interpretation, or the generation of scientific conclusions. The manuscript was subsequently professionally proofread. The authors reviewed and approved the final version of the manuscript and take full responsibility for its content.

Supplementary material

Supplementary material for this article is available online in the format provided by the authors (unedited).

References

Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives*, *33*(2), 3–30.

Acemoglu, D., & Restrepo, P. (2020). Robots and jobs: Evidence from US labor markets. *Journal of Political Economy*, *128*(6), 2188–2244.

Alfieri, L., Mariotti, I., & Rossi, F. (2025). The twin transition and flexible work arrangements: A systematic literature review. *Journal of Environmental Management*, *395*, Article 127988.

Autor, D. H., & Dorn, D. (2013). The growth of low-skill service jobs and the polarization of the US labor market. *American Economic Review*, *103*(5), 1553–1597.

Barr, M. D. (2016). Ordinary Singapore: The decline of Singapore exceptionalism. *Journal of Contemporary Asia*, *46*(1), 1–17.

Bednář, P., Danko, L., & Smékalová, L. (2023). Coworking spaces and creative communities: Making resilient coworking spaces through knowledge sharing and collective learning. *European Planning Studies*, *31*(3), 490–507.

Bloom, N., Han, R., & Liang, J. (2022). *How hybrid working from home works out* (Working Paper No. 30292). National Bureau of Economic Research.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work progress and prosperity in a time of brilliant technologies*. WW Norton & Company.

Capdevila, I. (2015). Coworking spaces and the localised dynamics of innovation in Barcelona. *International Journal of Innovation Management*, *19*(3), Article 1540004.

Charles, L., Xia, S., & Coutts, A. P. (2022). *Digitalization and employment: A review*. International Labour Organization. https://www.ilo.org/publications/digitalization-and-employment-review

Ciccarelli, F. C. (2023). Exploring the potential of coworking spaces for quality of working life and wellbeing: A systematic review of academic literature. *Cidades. Comunidades e Territórios*, *46*. http://journals.openedition.org/cidades/7155

Clifton, N. (2022). Coworking spaces, proximity, innovation and the fourth space. *Proceedings*, *81*(1), Article 153.

Clifton, N., Füzi, A., & Loudon, G. (2022). Coworking in the digital economy: Context, motivations, and outcomes. *Futures*, *135*, Article 102439.

Coll-Martínez, E., & Méndez-Ortega, C. (2023). Agglomeration and coagglomeration of co-working spaces and creative industries in the city. *European Planning Studies*, *31*(3), 445–466.

Curtis, C., Olaru, D., Smith, B., Reed, T. W., Knight, C., & Biermann, S. (2025). Sustainable urban mobility transitions through working from home (WFH). *Travel Behaviour and Society*, *39*, Article 100953.

Das, D., & Kwek, B. (2024). AI and data-driven urbanism: The Singapore experience. *Digital Geography and Society*, *7*, Article 100104.

Dell'Aversana, G., & Miglioretti, M. (2025). Coworking spaces for remote workers: An inclusive solution? Advantages and challenges from affiliated workers' perspectives. *Review of Managerial Science*, *19*(4), 1131–1160.

Di Marino, M., Tabrizi, H. A., Chavoshi, S. H., & Sinitsyna, A. (2023). Hybrid cities and new working spaces—The case of Oslo. *Progress in Planning*, *170*, Article 100712.

Drucker, P. F. (1999). Knowledge-worker productivity: The biggest challenge. *California Management Review*, *41*(2), 79–94.

Ei, C. H., Soon, C., & Tan, D. (2021). *State of digital inclusion in Singapore: A landscape review*. NUS Centre for Trusted Internet and Community. https://ctic.nus.edu.sg/resources/CTIC-WP-02(2021).pdf

Fai, F. M., Tomlinson, P. R., & Barzotto, M. (2025). Coworking spaces and regional development: A role for policy. *Regional Studies*, *59*(1), Article 2399282.

Fainstein, S. S. (2014). The just city. *International Journal of Urban Sciences*, *18*(1), 1–18.

Florida, R. (2017). *The new urban crisis: Gentrification, housing bubbles, growing inequality, and what we can do about it*. Simon and Schuster.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, *114*, 254–280.

Gandini, A. (2015). The rise of coworking spaces: A literature review. *Ephemera*, *15*(1), 193–205.

Goos, M., Manning, A., & Salomons, A. (2014). Explaining job polarization: Routine-biased technological change and offshoring. *American Economic Review*, *104*(8), 2509–2526.

Han, S. S. (2005). Global city making in Singapore: A real estate perspective. *Progress in Planning*, *64*(2), 69–175.

Harvey, D. (2012). *Rebel cities: From the right to the city to the urban revolution*. Verso Books.

Hirschmann, F., Neumayr, T., Schönböck, J., Kovacs, C., & Augstein, M. (2026). Concept, challenges, and requirements of hybrid collaboration spaces: A systematic literature review. *International Journal of Human–Computer Interaction*, *42*(5), 3570–3614.

Hofeditz, L., Mirbabaie, M., & Stieglitz, S. (2020). *Virtually extended coworking spaces?—The reinforcement of social proximity, motivation and knowledge sharing through ICT*. arXiv. https://doi.org/10.48550/arXiv.2012.09538

Hopkins, J., & Bardoel, A. (2023). The future is hybrid: How organisations are designing and supporting sustainable hybrid work models in post-pandemic Australia. *Sustainability*, *15*(4), Article 3086.

Hui, W. T. (1997). Regionalization, economic restructuring and labour migration in Singapore. *International Migration*, *35*(1), 109–130.

International Labour Organization. (2021). *Teleworking arrangements during the Covid-19 crises and beyond*. https://www.ilo.org/publications/teleworking-arrangements-during-covid-19-crisis-and-beyond

Kinsman, N., Marris, N., & Oakman, J. (2024). The impact of coworking spaces on workers' performance, mental and physical health: A scoping review. *Work*, *77*(1), 61–75.

Kraus, S., Bouncken, R. B., Görmar, L., González-Serrano, M. H., & Calabuig, F. (2022). Coworking spaces and makerspaces: Mapping the state of research. *Journal of Innovation & Knowledge*, *7*(1), Article 100161.

Lejoux, P., Flipo, A., Ortar, N., Ovtracht, N., Souche-Lecorvec, S., & Stanica, R. (2019). Coworking, a way to achieve sustainable mobility? Designing an interdisciplinary research project. *Sustainability*, *11*(24), Article 7161.

Lukeš, M., Zouhar, J., & Bennis, W. M. (2026). The influence of coworking on well-being and performance: An Experience Sampling Method study. *Ergonomics*, *69*(4), 591–604.

Manzini Ceinar, I., & Mariotti, I. (2021). The effects of Covid-19 on coworking spaces: Patterns and future trends. In I. Mariotti, S. Di Vita, & M. Akhavan (Eds.), *New workplaces—Location patterns, urban effects and development trajectories: A worldwide investigation* (pp. 277–297). Springer.

Mao, Y. (2025). Habituating urbanity: The (re)production of socio-spatial configurations on/offline through coworking. *Applied Geography*, *178*, Article 103593.

Mariotti, I., Pacchi, C., & Di Vita, S. (2019). Co-working spaces in Milan: Location patterns and urban effects. In S. Armondi, & S. Di Vita (Eds.), *New urban geographies of the creative and knowledge economies* (pp. 47–66). Routledge.

Mariotti, I., Akhavan, M., & Di Matteo, D. (2021). The geography of coworking spaces and the effects on the urban context: Are pole areas gaining? In I. Mariotti, S. Di Vita, & M. Akhavan (Eds.), *New workplaces—Location patterns, urban effects and development trajectories: A worldwide investigation* (pp. 169–194). Springer.

Mariotti, I., Akhavan, M., & Rossi, F. (2023). The preferred location of coworking spaces in Italy: An empirical investigation in urban and peripheral areas. *European Planning Studies*, *31*(3), 467–489.

Martindale, N., & Lehdonvirta, V. (2023). Labour market digitalization and social class: Evidence of mobility and reproduction from a European survey of online platform workers. *Socio-Economic Review*, *21*(4), 1945–1965.

Mátyus, E. (2021). Digitalization of coworking space services. *Proceedings of the International Conference on Business Excellence*, *15*(1), 1060–1068.

Merkel, J. (2015). Coworking in the city. *Ephemera*, *15*(1), 121–139.

Migliore, A., Manzini Ceinar, I., & Tagliaro, C. (2021). Beyond coworking: From flexible to hybrid spaces. In M. Orel, V. Ratten, & O. Dvouletý (Eds.), *The flexible workplace: Coworking and other modern workplace transformations* (pp. 3–24). Springer.

Moriset, B. (2013, January 23-25). *Building new places of the creative economy. The rise of coworking spaces*. [Paper presentation]. 2nd Geography of Innovation International Conference, Utrecht, The Netherlands.

Next Move Strategy Consulting. (2025). *Singapore co-working space market*. https://www.nextmsc.com/report/singapore-co-working-space-market

Nunnington, N., Wright, J., & Tan, E. (2017). Co-working in action: JustCo Singapore. In B. Haynes, N. Nunnington, & T. Eccles (Eds.), *Corporate real estate asset management—Strategy and implementation* (2nd ed., pp. 410–423). Routledge.

OECD. (2023). *Skills for the digital transition: Assessing Recent trends using Big Data*. OECD Publishing. https://www.oecd.org/en/publications/skills-for-the-digital-transition_38c36777-en.html

Orel, M. (2019). Coworking environments and digital nomadism: Balancing work and leisure whilst on the move. *World Leisure Journal*, *61*(3), 215–227.

Oswin, N., & Yeoh, B. S. (2010). Introduction: Mobile city Singapore. *Mobilities*, *5*(2), 167–175.

Pernice, G. F. A., Orso, V., & Gamberini, L. (2025). Redefining coworking for sustainable communities: Insights from small cities amid Covid-19. *Sustainability*, *17*(4), Article 1547.

Piore, M. J. (1983). Labor market segmentation: To what paradigm does it belong? *The American Economic Review*, *73*(2), 249–253.

Robelski, S., Keller, H., Harth, V., & Mache, S. (2019). Coworking spaces: The better home office? A psychosocial and health-related perspective on an emerging work environment. *International Journal of Environmental Research and Public Health*, *16*(13), Article 2379.

Shifrin, N. V., & Michel, J. S. (2022). Flexible work arrangements and employee health: A meta-analytic review. *Work & Stress*, *36*(1), 60–85.

Sinitsyna, A., Di Marino, M., & Paas, T. (2022). Virtual coworking and remote working: Lessons and perspectives on the Covid-19 pandemic from Estonia and Norway. In I. Mariotti, M. Di Marino, & P. Bednář (Eds.), *The Covid-19 pandemic and the future of working spaces* (pp. 153–164). Routledge.

Sostero, M., Milasi, S., Hurley, J., Fernandez-Macías, E., & Bisello, M. (2020). *Teleworkability and the Covid-19 crisis: A new digital divide?* (JRC Working Papers Series on Labour, Education and Technology No. JRC121193). European Commission.

Spinuzzi, C. (2012). Working alone together: Coworking as emergent collaborative activity. *Journal of Business and Technical Communication*, *26*(4), 399–441.

Spinuzzi, C., Bodrožić, Z., Scaratti, G., & Ivaldi, S. (2019). "Coworking is about community": But what is "community" in coworking? *Journal of Business and Technical Communication*, *33*(2), 112–140.

Trapanese, B., & Mariotti, I. (2023). Socio-cultural hybrid spaces in Milan coping with the Covid19 pandemic. *Romanian Journal of Regional Science*, *16*(2), 39–59.

Urban Redevelopment Authority. (2019). *Master plan 2019 planning area boundary (no sea)*. https://data.gov.sg/datasets/d_4765db0e87b9c86336792efe8a1f7a66/view

Van Meeteren, M., & Bassens, D. (2016). World cities and the uneven geographies of financialization: Unveiling stratification and hierarchy in the world city archipelago. *International Journal of Urban and Regional Research*, *40*(1), 62–81.

Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144.

Vogl, T., Sinitsyna, A., & Micek, G. (2024). Systematic literature review of location factors of coworking spaces in non-urban areas. In I. Mariotti, E. Tomaz, G. Micek, & C. Méndez-Ortega (eds.), *Evolution of new working spaces: Changing nature and geographies* (pp. 83–94). Springer.

Wong, K. W., & Bunnell, T. (2006). 'New economy' discourse and spaces in Singapore: A case study of one-north. *Environment and Planning A: Economy and Space*, *38*(1), 69–83.

Wong, P. K., Ho, Y. P., & Singh, A. (2010). Industrial cluster development and innovation in Singapore. In M. Tsuji & A. Kuchiki (Eds.), *From agglomeration to innovation: Upgrading industrial clusters in emerging economies* (pp. 50–116). Springer.

Wong, P. K., Ho, Y. P., & Singh, A. (2011). Towards a 'global knowledge enterprise': The entrepreneurial university model of the National University of Singapore. In P. K. Wong (Ed.), *Building technology transfer within research universities—An entrepreneurial approach* (pp. 281–306). Cambridge University Press.

Woo, J. J. (2018). *The evolution of the Asian developmental state: Hong Kong and Singapore*. Routledge.

Wright, A., Marsh, D., & Wibberley, G. (2022). Favours within the tribe: Social support in coworking spaces. *New Technology, Work and Employment*, *37*(1), 59–78.

Yang, E., Bisson, C., & Sanborn, B. E. (2019). Coworking space as a third-fourth place: Changing models of a hybrid space in corporate real estate. *Journal of Corporate Real Estate*, *21*(4), 324–345.

Yeo, S. J. I. (2024). Negotiating digital urban futures: The limits and possibilities of future-making in Singapore. *Transactions of the Institute of British Geographers*, *49*(2), Article e12632.

Yeoh, B. S., & Chang, T. C. (2001). Globalising Singapore: Debating transnational flows in the city. *Urban Studies*, *38*(7), 1025–1044.

Yue, C. S. (2001). Singapore: Towards a knowledge-based economy. In S. Masuyama, D. Vandenbrink, & C. S. Yue (Eds.), *Industrial restructuring in East Asia: Towards the 21st century* (pp. 169–198). ISEAS.

Zukin, S. (2012). The social production of urban cultural heritage: Identity and ecosystem on an Amsterdam shopping street. *City, Culture and Society*, *3*(4), 281–291.

About the Authors

Anastasia Sinitsyna (PhD) is a research fellow in Asian studies, focusing on topics related to the sustainable and green energy transition, the twin transition, and the economic rationale behind this. She is a visiting lecturer at the Prague University of Economics and Business, and was an exchange researcher at the Norwegian University of Life Sciences and Kiel University. She has authored several publications on various topics and in multiple contexts related to geo-economics and climate change.

Luca Alfieri (PhD) is a lecturer in econometrics at the University of Tartu and a postdoctoral researcher at Politecnico di Milano. His main area of research is macroeconomic applications using big data and machine learning methods. He is also interested in international trade, monetary economics, Asian economics, the future of work, digitalisation, and workplaces. He was a visiting researcher at the Bank of Estonia and the Vienna Institute for International Economic Studies.