What Kind of City is the Fab City?

3

Some Theoretical Groundings and Intellectual Predecessors of the *Fab City* Project

Sonja Buxbaum-Conradi

3.1 Introduction

> "Cities are, above all, physical spaces which produce surprising things, reacting like a catalyst for the unexpected." (Antoine Picon[1])

Very little attempts have been made so far to theorize the suggestions made by the Fab City project in terms of the kind of urban functioning and trace back its intellectual predecessors and conceptual underpinnings. Exceptions can be mainly found in Rumpala (2018, 2023) as well as Diez (2016, 2021), with the latter being one of the founders of the Global Fab City Initiative. Yet it remains unclear, what kind of city the Fab City actually is and in how far it challenges the meaning of cities in old or new ways.

Looking back in history, all moments of expansion or decay of economic systems – with their inherent function of creating and distributing value in society – are linked to the importance of cities rather than nation states or kingdoms. This does not change in the information age. Cities are the central sites for the generation of value and the material basis of power, cultural production and social selection (Hall, 1998). Living in a networked society, the global processes of urbanisation taking place in the early twenty-first century are marked by a profound spatial transformation as a fundamental dimension of this new social structure. Global processes of urbanisation have established new global networks con-

[1] VINCI Group (2018).

S. Buxbaum-Conradi (✉)
Helmut Schmidt University/University of the Federal Armed Forces Hamburg, Hamburg, Germany
E-Mail: buxbaums@hsu-hh.de

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necting metropolitan areas and their radius of influence (Castells, 2010a). This interconnectedness becomes particularly visible in the economic system and its dependency on global production networks as part of the globalisation, diversification and specialization of value chains that are spread across the planet. The development has fostered global integration, but at the same time established strong interdependencies and unequal developmental outcomes with massive ecological consequences that become particularly visible in the realm of cities.

Until now, cities relied predominantly on linear production models based on massive energy consumption and lacking waste recovery. Since urbanization is growing rapidly assuming that 68% of the world's population will live in cities by 2050 (UN Development Report on World Urbanization, 2018) policy makers and city dwellers, are seeking for strategies that enable circularity of material flows and a stronger overall resilience and self-reliance of cities when it comes to productive models and related consumption patterns.

This is where the **Fab City project** enters the debate. It can be best described as a collective experiment seeking solutions to the above outlined challenges articulated by a globally connected urban social movement of designers, academics, engineers, architects and makers that have evolved from the Fab Lab Movement initiated by MIT roughly 20 years ago. The Fab City project reminds us that cities are not only major spaces for economic activity (i.e., production) but also central places of collective or shared consumption. This addresses recent criticism in terms of which economy and urban analysis have historically established a disjunction between production and consumption. What tends to distinguish the strategies carried out with the Fab City project from other currently dominating strategies for urban transformation can be summarized in four aspects that are recaptured and rearranged: the organization of flows, the availability of resources and technological capacities for urban functioning in the urban fabric, the involvement of citizens in productive activities and the type of productive system that is suggested by the project's proponents (i.e., relocalized, distributed, self-sufficient) (Rumpala, 2018).

However, the so-called *Fabrication City* thus far belongs partly to the imagination (or rather the imagination of stakeholders that are carrying it forward). It appears as a set of images and practices associated with the possibility for cities to become self-sufficient, reaching a new balance between environment and economic development, between quality of life and efficient use of resources through the access to and widespread use of information, communication and digital fabrication technologies.

So, the question at hand is: what kind of city is the Fab City? What kind of space- and place-based images are defining and what kind of model for urban functioning is suggested? The aim of this contribution is to ground the ideology behind the Fab City project in prior theoretical work and related imaginations of cities in the field of urban anthropology and urban transformation. This is necessary to provide a more consistent and scientifically profound integrative framework to which future research from different disciplines can relate serving as a common ground of what can be understood as a *Fab City.* Based on document analysis of material provided by the project and the author's experi-

ences resulting from the engagement with the Fab City community throughout two publicly funded research and development projects, the rationale behind it is reconstructed and discussed.

The first part of the chapter gives a brief introduction and overview on how cities have been conceptualized and theorized (i.e., imagined) in prior work in the field of urban studies. It is argued throughout this section that a lot of the intellectual predecessors and ideas that the Fab City Vision is based on relate to the social theorist Manuel Castells' work. What makes this particularly valuable is that he has linked observations of social movements and community-based approaches to urban transformation to the role that information and communication technologies play in creating a new industrial space that is able to link multiple scales. The second part of the chapter specifically analyzes the core principles of the Fab City approach and its conceptual underpinnings in the work of Castells (and related findings) and identifies those aspects that are not yet considered (or at least not considered together) in prior theoretical conceptualizations. The final section integrates the findings from the analysis into a coherent picture and concludes with an outlook for future research especially in the field of social science.

3.2 Central Imaginations of Cities and Urban Transformation in the Post-Modern Age

"Theorizing the city is a necessary part of understanding the changing post-industrial, advanced capitalist, postmodern moment which we live in." (Low, 1996, p. 387) – There exists a broad range of ideas, concepts and frameworks used to analyze, write and communicate about an often elusive and discursively complex subject.

The first question that arises here is the question of how cities have been imagined and conceptualized in terms of **urban functioning**. What are essential urban functions and how can cities be described and analyzed? Urban analysis usually links perspectives from various fields such as architecture, geography, urban planning, sociology, economics and history. Different approaches in different disciplines take different access points to the analysis of cities from the social organization of space to the organization of flows, the meanings of knowledge, group and power as well as the intricacies of commodity, exchange and political economy (Low, 1996). The **value of an anthropological perspective** here is to frame a common imagination of cities and urban functioning that helps to link experiences to structure (i.e., abstract models) (Low, 1996, p. 384). This is also necessary to maintain a critical relationship with normative proposals and to consider collective dynamics. Those can be reconstructed by studying the discourses produced and the practical extensions given to them by the actors concerned (Rumpala, 2018).

To begin with, one important distinction in the conceptualization of cities is the difference between space and place. In geography as well as anthropology, space and place are different yet related concepts. "Space" refers to a dimension in which matter is located, an objective three-dimensional extension of reality (Low, 2017). It can be, to some degree,

displayed mathematically (e.g., coordinate systems, size). Contrary, "place" is what gives a space meaning. It is linked to human experiences and the culturally ascribed meaning given to a space. "It is the 'vibe' that you get from a certain space, and it exists for a reason." (Fink, 2019) That reason is to create common identity and cultural meaning, to create a sense of belonging. Neither space nor place is static. Space moves in time and the meaning of places is subject to change. Different communities can ascribe different meanings to the same space. Although place-based struggles and conflict lines might be the same throughout younger history, the common conceptualization of space and the distinction between place and space as well as the matter that traditionally constitutes cities has been challenged with the further elaboration and diffusion of digital technologies (Picon, 2018, p. 272).

It was especially the work of Manuell Castells on the *Informational City* and the *Networked Society* that has promoted the conceptualization of the urban space as a network (e.g., the networked metropolis) providing the infrastructure for what he has termed the "space of flows" (Castells, 1991a). More than three decades ago, Castells wrote: "We are moving from a materially-constructed, historical space to a technologically deconstructed space based upon the ability to constantly reprogram according to the interests of the different interactive elements in the process of flows" (Castells, 1991a, p. 14). In 1996, the architect and urban designer William J. Mitchell predicted in his famous book *City of Bits: Space, Place and the Infobahn* that the diffusion of digital technology would ultimately lead to a decrease of physical circulation (i.e., circulation of material flows) in cities (Mitchell, 1996). Apparently, he has been proven wrong, at least until now. The imagination of the city and its economic system as a space of (informational) flows is certainly a manifestation of the *zeitgeist* in the early 1990s being associated with the emergence of the "New Digital Economy" and the "relational turn" of conceptualizations of space in geography and cultural sciences (Boggs & Rantisi, 2003). It had a profound impact on many contemporary images of futuristic cities.

In this very prominent imagination, the city is conceptually more or less detached from its actual natural environment. The focus is on the technical space (in terms of urban functioning) rather than the city as a place linked to human experiences and interaction with their (natural) environment. Material and informational exchanges (i.e., flows) resulting from human production and consumption activities are rarely considered in an integrative manner. The city is viewed through the prism of machine metaphors inspired by neocybernetic imaginations of idealized spaces of flows that can be designed or "reprogramed according to the interests of the different interactive elements in the process of flows" (Castells, 1991a, p. 14). This image is still fundamental to more recent advances in conceptualizing what is termed a smart or algorithmic city understood as a network of algorithmically mediated social relations.

The initial conceptualizations and powerful metaphors developed throughout and after the 1980s seem to be coming up against their limits due to the increasing impact of environmental constraints and a growing criticism on the logics of cognitive capitalism and the global distribution systems that it has created (Picon, 2018). It is still unknown though

how humans and non-humans (i.e., machines, computing devices, digital infrastructures, ecological systems) can be linked within a city that might become 'smart' in a much more literal sense than is often imagined today (Picon, 2015).

It is one thing to imagine urban functioning and the city as an abstract space of flows. The consequence of such a perspective is that it has very little in common with how people are actually experiencing spatial practices and the city in their daily lives, how they make use of and create flows and how they engage in economic activity and consume resources (Low, 2017). Consequently, the subsequent question here is how to imagine the **city as a place**, how do people ascribe meaning to it and how is this meaning changing? How can we imagine the city as something other than a neo-cybernetic machine that organizes flows according to the logics of capital growth models?

When it comes to strategies of urban transformation and **the analysis of urban social movements,** the focus of researchers is, indeed, rather on the city as a place than the city as a space. In this regard, once again, Manuel Castells has provided valuable insights and his definition of urban social movements might be more topical than ever in combining struggles over collective consumption with those for community culture and self-determination (Miller, 2006; Mayer, 2006). According to his famous writings in the *The City and the Grassroots* that synthesized a decade of his (ethnographic) field work and a broad spectrum of cross-national texts on urban mobilizations, he came to the conclusion that, while being unable to transform society, urban-oriented mobilizations do transform urban meanings through undermining societal hierarchies that usually structure urban life. Instead, they create "a city organized on the basis of use values, autonomous local cultures and decentralized participatory democracy" (Castells, 1983, pp. 319–320).

Of course, urban movements have transformed their goals, strategies and organizational structure since the 1960s and 1970s (the time of his fieldwork). Meanwhile, urban elites and policy makers have identified and integrated the activation potential of local civil society groups (Mayer, 2006). Integrative programs nowadays directly involve social movement organizations as stakeholders in public-private-partnership constellations, and urban planners (at least in the EU and the US) are increasingly employing participatory models. In doing so, they are able to make use of the "territorial identity" and the "capacity-building" competence of local movement groups, even if they follow and implement their own visions of sustainable neighborhoods and social economy. However, as also concluded by Castells (2010b) in *The Rise of the Network Society*, in today's globalized 'space of flows' places no longer serve as the ultimate basis for social power, thus, local movements can be easily outmanoeuvred by larger developmental forces. Local movements can connect each other into global networks Consequently, one question remains: how do specific incidences, forms, relations, and effects of these cosmo-local mobilizations challenge the meaning of cities in old or new ways (Mayer, 2006, p. 205)?

So, in order to promote the transformation of meaning of the city, place-based actors have been increasingly integrated in **strategies of urban transformation** to make use of their territorial identity- and capacity-building competence. Currently, there are three dominating strategies for urban transformation: circular, smart, and resilient cities. Faced

with multiple challenges, cities have been promoted to take advantage of the latest technological advances in information and communication technologies, to become what is imaged as being "smart". Since the mid-2000s, the still rising issue of "smart cities" has allowed communities of actors from various backgrounds (municipalities, private sector service providers, experts, engineers) to reintegrate urban infrastructure and governance into an optimized and highly technicalized management of flows. Nowadays, the three concepts have evolved into a rather multi-objective and participatory strategy that aims at tackling environmental deterioration and other external shocks while trying to foster sustainability through circular approaches (Ascione et al., 2021), inclusion and building social capital (Bibri & Krogstie, 2017; Cañavera-Herrera et al., 2022).

After this brief introduction into some major fundaments of theorizing the city in the post-modern age and summarizing recent strategies for urban transformation, the questions are now: what is behind the Fab City project? How does it relate to existing theoretic explanations? What kind of model for urban functioning does it suggest? And on what type of space- and place-based images does it rely?

3.3 What Is Behind Fab Cities?

Proponents of the Fab City approach aim to radically transform how cities meet their needs and produce necessities themselves (Diez, 2021). According to them, Fab Cities bear the potential to support "the development of localized circular economies that can transform the waste system and waste paradigm" (Ramos et al., 2021, p. 15). This is estimated to support "cities and regions in becoming auto-productive, to form complex cosmo-local value chains for greater resilience' and keep 'production within planetary boundaries' (Ramos et al., 2021, pp. 15–16).

The idea of a Fab City is said to have originated around 2010/2011 and has been further institutionalized as a concrete strategy for urban transformation in 2014 during FAB10, the 10th global annual reunion of the Fab Labs network issued by IAAC, MIT's Centre for Bits and Atoms, the Fab Foundation and the Barcelona City Council around prominent protagonists of urban planning, architecture and urban transformation such as Vincente Guallart and Antoni Vives (Rumpala, 2018). Given its origins in the field of engineering (and urban planning), it is marked by a strong techno-optimism, while it follows, at the same time, a community- and human-centered approach. During the last eight years it evolved into a global association that has gathered 44 cities and regions as well as the first so-called Fab Nation (i.e., Bhutan) under the common vision of becoming 'auto-productive' by 2054. It is pushed forward through local communities within the participating cities, which are connected globally and meet face-to-face at a week-long global summit every year. In 2018, exactly 20 years after Neil Gershenfield's class on "How to make almost anything" the publication of *Fab City: Mass distribution of (almost) everything* has been launched, presenting best practices from the existing network including digital technologies such as blockchain and artificial intelligence (Diez, 2018). The project is embedded

in the widely disseminated imagination of a "new industrial revolution". During the development of the project, its promoters were able to make it appear as an alternative to the smart city model, while retaining some of the latter's attractions, particularly those related to new digital technologies (Rumpala, 2018). These technologies are still considered a driver for change, though in such a way that the population can appropriate them more. Emerging as a sort of counter-narrative in response to top-down smart urbanization efforts, Fab City favors open and loosely coupled coordination systems associated with the empowerment of people to 'democratize' production and gaining back power over local production and consumption practices.

In the following section I will discuss three major foundations of the Fab City approach against existing (theoretical) findings: the re-appropriation of a city's productive function through its citizens, the reorganization of material and informational flows, and the relation between production and consumption in the suggested model.

3.4 Reorganizing the Space of Flows: A Cosmo-Local Approach to Urban Industrial Spaces

Fab City expands the model of fab labs that constitute the basis of an alternative model of urban functioning (Rumpala, 2018, 2023). Therein, production is "returned" to the city level, close to its inhabitants, with the promise to being able to provide some basic needs, notably through open manufacturing workshops or small-scale production sites located in the neighborhoods, which put relatively advanced digital machines at the disposal of local communities. Proponents of the Fab City approach promote a city in which citizens (once again) become manufacturers and take possession of their own needs, reclaiming technologies collaboratively and contributing to the control and coordination of various flows (i.e., material, energy, information) which determine urban ecological situations. Thus, in the production system outlined, production is approached from an angle that favors territorial proximity bringing it back to the inhabitants of neighborhoods and adapt it to local consumption and demands. Tomas Diez associates the image of local production as it was present in medieval times with this model – but in a renewed version, jointly connected to global networks of knowledge and immaterial exchanges (Diez, 2017). Fab City suggests the resurrection of the productive function that constitutes a city, but in a form that the population is able to re-appropriate. In doing so, it tends to detach new opportunities linked to digital technologies from their economic and commercial dimension, instead focusing more on the capacities given to its inhabitants. Hence, instead of considering market mechanisms as a main vehicle for economic activity, it stresses the qualities attributed to fab labs (i.e., creativity, incentives to share, productive capacity, open spaces for knowledge exchange etc.) and aims to transpose them to the scale of the city and its territory (Rumpala, 2018).

Consequently, the Fab City approach aims at a fundamental transformation of a city's metabolism through a reconfiguration of exchanges and a reconfiguration of the socio-

technical framework that organizes collective life on an urban scale. In this internal logic, the reorganization of flows is mainly enabled by making resources for urban functioning (e.g., technological capabilities) available in the urban fabric. Citizens are involved in a way that they can contribute to the production of what they consume in a relocalized, decentralized, distributed and self-sufficient productive system. The suggested productive system is mainly based on the principles of "design global, manufacture local (DGML)":

> "DGML describes the processes through which design is developed, shared and improved as a global digital commons, whereas the actual manufacturing takes place locally through shared infrastructures with local biophysical conditions in mind." (P2P Foundation, n.d.)

The main ideology and vision behind cosmo-localist approaches to value creation (and, more particularly, manufacturing) is the reduction of global circulation and movement of material goods (i.e., atoms) by simultaneously enabling or facilitating the international circulation and transfer of designs, ideas and knowledge (i.e., bits) on the local realization and production of these ideas – as reflected in the PITO-to-DIDO (product in, trash out vs. data in, data out) model suggested by the Fab City project (Diez, 2016). Hence, in the core of this approach lies the conjunction of open source, open design and production logics at the global scale with local-network production capabilities at a regional scale (Kostakis et al., 2015). In other words, in this conception, material production, controlled locally, remains in the city, and imports as well as exports subsist mainly in informational form (exchanges are then constituted of bits rather than atoms, as summarized in the image also popularized by Neil Gershenfield).

The **image of an auto-productive cosmo-local city** suggested here, reflects a very strong orientation of (re)apprehending the city through its flows as in former conceptualizations of Castells' Informational City developed a couple of decades ago (Castells, 1991b). However, the integration of other (especially environmental) considerations has contributed to a further evolution of the perspective, combining it with that of a self-sufficient city (March & Ribera-Fumaz, 2016). Here, the city is rather imagined as a (biological) organism, an eco-system that has neither clear boundaries nor is it being deterministic, instead it evolves through the interaction with its (natural) environment, stressing the necessity for the circularity of flows.

The reorganization of flows in the cosmo-local productive system considers both incoming and outgoing flows almost as if all activities could be broken down and monitored through that which is put in circulation. Rumpala (2018) has already problematized this simplification of flows because it places the entire urban functioning in the framework of a "circular economy" to escape the negative consequences caused by linear models that rely on imported goods (hence, evading local control), ending up in waste that is costly to manage and without utility. This attention to **material flows** engages in combined reflections on the infrastructures and practices that are associated with them. In this perspective, the city becomes more of a "reservoir of reusable material resources", instead of being condemned to become a giant scrapyard. Waste is considered a valuable resource, as becomes evident in the wide diffusion of circular design approaches in the Fab City movement.

On the other hand, informational flows are not further problematized as long as they can flow freely and contribute to the transfer and creation of "new" knowledge. The main principle for reorganizing informational flows relies on the vision behind what Loveluck (2015) has termed "informational liberalism", which will be introduced and discussed in the subsequent section.

3.5 Informational Liberalism, Knowledge Commoning and Collective Consumption

The reorganization of informational flows suggested here, relies predominantly on the imagination of a knowledge society and a rather knowledge-based economy, with the manipulation of symbols, ideas and knowledge becoming the core of the economy (Castells, 1991a). Two aspects are particularly relevant for understanding the rationale behind the productive system suggested by the Fab City project. First, an open-source principle relating to the free flow of knowledge and information; second, the principle of self-organized heterarchies. To understand how they have found their way into conceptualizing the Fab City vision, we need to take a closer look at the history of the Internet and the Free Software movement which have influenced contemporary social hacker cultures. Their core values can be also found in the Fab City manifesto.

Since its early cybernetic beginnings, the Internet has come along with the promise of facilitating the free flow of information, hailed as a tool for democratizing access to information and promoting freedom of expression (Flichy, 2008; Castells, 2002). Due to the specific properties of computer networks that enable alternative forms of power distribution and the coordination of activities by enabling uncoordinated action for coordinated effects (Benkler, 2006). Hence, network computing has been associated with the ability to promote the emergence of **self-organization**. This property is still prominently stressed in recent discourses on "the collaborative economy" and the mobilization of smart crowds related to collective intelligence and collective solutionism. According to Benkler, this central feature is also key to the emergence of what he has termed commons-based peer production, a new modality of organizing production and value creation that relies on the collective sharing, management, and production of resources (Benkler, 2006; Rifkin, 2014).

However, the digitization of information and its circulation via networks have introduced a new dimension of exchanges while concurrently creating a paradox that is still unresolved and present in many current debates on freedom/control problems related to intellectual property regimes (Araya, 2015; Loveluck, 2015). On the one hand, information and data (and even interaction with systems) are increasingly recognized as having a significant economic and political value, as they can be used to generate revenue, influence public opinion, and shape policy decisions. On the other hand, information can be shared and replicated instantly at essentially zero marginal costs regardless of whether it is protected by property rights or copyright laws. In this sense, knowledge is purely non-rivalrous

(Stiglitz, 1999) – meaning that one person's use does not preclude the use by another. Thus, it functions different from other commodities.

Starting with the "New Digital Economy" of the 1990s, for the established laws of economics to remain relevant, legal frameworks were set up trying to protect property rights in the intellectual domain (expansion of patents, licenses, trademarks, etc.). This creation of an artificial scarcity of knowledge and information was perceived to be necessary to ensure the further application of conventional laws of supply and demand to "the goods of the mind" (Loveluck, 2015, p. 9). As a sort of counter movement to prevent knowledge from enclosure, the hacker movement has made valuable contributions to what might be termed "informational liberalism".

One of the most significant achievements of the free software movement founded in the 1980s was the introduction of the legal concept of *copyleft,* turning the existing intellectual property rationale on its head: instead of giving ownership rights to the producer of codes (software), it focuses on usage rights given to consumers/users, including the right to run the software, access its source code, modify the code, and redistribute copies of it, thus building the basis for an informational commons (Weber, 2005) or a commons of the mind (Hess & Ostrom, 2006). This institutional innovation has also inspired many other fields and has most recently been transferred to the production of physical goods (e.g., in concepts such as Open Design and Open Source Hardware). Thus, the key to a linked productive system is that resources within networks are held as common goods (Benkler, 2006; Rifkin, 2014). That is to say, they are collectively shared, managed and produced. This type of productive function obviously demands a sophisticated digital infrastructure for the coordination of flows, engagement of citizens, tracking of material flows, and involvement of micro-contributions from a large cosmo-local network of people. The development of such a (prototypical) digital infrastructure for the productive function of Fab Cities has been recently started in an EU-funded project called "Interfacer". It relies on a federated network/system architecture (i.e., enabling self-organizing heterarchies) and integrates distributed ledger technologies as well as an open-source tool chain that aims to provide functionalities along the entire value flow. Hence, in the image of the cosmo-local city suggested by the Fab City project, the Internet of Things and related advances in digital technologies tend to be seen as another determining, even structuring, factor for the possibilities of exchange and collaboration at a distance and on a large scale (Rumpala, 2018).

In summary, we can observe two different strategies in dealing with the opportunities given by network computing and digitization, or in other words, to organize informational and knowledge flows in a productive urban system. The first one seeks to sustain the classic understanding of market mechanisms and, thus, commodifies information through mechanisms of enclosure. The second – which is the relevant one for the Fab City Project – leverages the specificities of the digital environment to introduce an alternative which, though not necessarily incompatible with the market, thoroughly redefines its boundaries (Loveluck, 2015, p. 13).

As different and partly contradictory as these approaches might be, they all emphasize a liberating force and positive determism that is associated with advances in information and communication technology.

Indeed, the growth of peer-to-peer (P2P) networks leveraging next generation communication, data sharing, and value creation have opened up a broad array of new opportunities for bottom-up civic engagement (Araya, 2015). As Castells (2009) observes, the rise of socially mediated ICTs has sparked new social movements with the capacity to build multi-scale networks across a broad spectrum of socio-political mobilizations This is also reflected in the mobilizations created by the Fab City project resulting in the emergence of a global network of actors disseminating the Fab City vision in very different localities.

Besides considering knowledge as a commons and social good as well as defending the free flow of information on the one hand, while restricting material flows to take place in local cycles on the other; the question that is yet unanswered in detail by the Fab City project is the relation between (knowledge) production and **collective consumption** on an urban scale. The project claims, in order to foster self-sufficiency of cities, "cities need to produce (almost) everything that they consume". In this image "the city" is personified in a way that it is able to produce and consume. Yet, what kind of specific services, goods, and information are collectively consumed in a Fab City? So far, there have been only very few explanations and debates on what exactly should be held in commons (besides knowledge). A lot of emphasis has been put on the actual realization of productive processes and the reorganization of flows or, in other words, on how things come into being and what an alternative urban productive model can look like.

Consumption appears as a rather elusive concept. Following Castells (1978), Dunleavy (2019, p. 1) defines 'consumption' as "the final appropriation of products by people." Indeed, one of Castells' major contributions to urban theory emphasizes the unique status of collectively consumed services (and some goods) often provided by public actors, such as public housing, education, health care, basic infrastructure (from energy, to waste management, streets and water). Collective consumption involves people consuming or using services and other goods of general interest which are particularly subject to the influence of public actors, since their costs are partly or entirely socialized through government subsidies; or their provision is specially regulated to foster social equality; or government agencies organize service provision (Dunleavy, 2019).

Indeed, collective consumption services remain centrally important to urban politics. Social and political polarization around collective consumption (versus private consumption) plays a key role in defining 'the urban' in modern societies, especially in the scope of urban politics (Dunleavy, 2019). The rise of corporately mediated "shared consumption" through platforms such as Google, Uber, Airbnb and the like poses fundamental challenges to the provision of public services. These platforms provide "free" goods and commoditize social interaction itself. Hence, the public sector in cities might become marginalized, if it does not cope with this development integrating it in strategies on urban transformation (Dunleavy, 2019). Though, not only what but also how services are developed and delivered in a city has a significant impact on the quality of life of its inhabitants

(especially for manual workers and poorer households apart from intellectual elites). In the context of the Fab City project, this is an important aspect, since all the projects and initiatives evolved under the umbrella of a "Fab City" rely on public funding, and municipal authorities form a central group of stakeholders. So, who should be the final provider of services? And, besides knowledge, what should be held in common? Is it the digital and physical infrastructure (e.g., production means provided in open manufacturing sites) that enables the productive model? What will the process of co-creation emphasized by the movement look like? Those are central questions yet to be answered.

In summary, the principles of informational liberalism (openness and self-organizing heterarchies), outlined at the beginning of the section are closely linked to collective consumption, as both emphasize the importance of collective decision-making and the empowerment of individuals in shaping public goods.

3.6 Conclusion and Outlook

Central to these imaginations of a Fab City are four core attributes that relate to aspects of reorganizing informational and material flows, making resources and technologies for productive activities available in the urban fabric and transforming the type of productive system. The **image of an auto-productive cosmo-local city** suggested by the Fab City project reflects a very strong influence of spatial conceptualizations of Castells' Informational City. However, the integration of other (especially environmental) considerations has contributed to a further evolution of the perspective, combining it with that of a self-sufficient city. The city is, hence, rather imagined as an organism, an eco-system that has neither clear boundaries nor is it being deterministic, instead, it evolves through the interaction with its (natural) environment, stressing the necessity for the circularity of material flows. This also leads to the imagination of the city as a reservoir of reusable material resources.

The Fab City model suggests the **re-appropriation of a city's productive function through its citizens**, the co-creative reorganization of material and informational flows integrating the relation between collaborative production and collective consumption practices in a quite original way. In doing so, it tends to detach the new opportunities linked to digital technologies from their economic and commercial dimension, focusing more on the capacities given to its inhabitants. Instead of considering market mechanisms as a main vehicle for economic activity, it stresses the qualities attributed to fab labs (i.e., creativity, knowledge commoning, shared productive means and capacity, etc.) and aims to transpose them to the scale of the city and its territory. Consequently, the Fab City approach aims at a **fundamental transformation of a city's metabolism** through a reconfiguration of exchanges and of the socio-technical framework that organizes collective life on an urban scale.

The prior analysis has shown that the Fab City project emerged into a strategy that aims to redistribute the power of monitoring and control over a territory 'by democratizing advanced technology and enabling networking of users in a digital space.' As a result, it has

grown into an initiative that aims to redefine common grounds for citizenships enabled by technology (Rigobello & Gaudillière, 2019, p. 2). Not limited to technological issues, the project is thus at the junction of themes that have taken an increasing place on urban agendas: resilience (i.e., via becoming auto-productive), reasonable use of resources and the limitation of ecological nuisances (i.e., via reorganizing material flows in productive systems) as well as the appropriation of digital technologies (i.e., via making use of digital technologies for urban and economic governance) creating a new promising framework for self-sufficient cities in the digital age.

However, even if a broad understanding of the discursive content around conceptualizations and imaginations of a Fab City helps us link it to reflections and practices developed by the actors that promote it, many of the proposals and arguments spawned here are linked to broader socio-political objectives and strategies pursued in often constrained spaces and idiosyncratic socio-political contexts that might "translate" the suggested model differently. These place-making practices and this place-based struggle for meaning and local solutions will be of particular interest for any future research on Fab Cities in the field of social sciences. Another focus should be on non-human intelligence with its rapidly growing capacities for reasoning and decision-making. In this sense, AI is part of its own self-fulfilling narratives which are now beginning to be felt and experienced in our daily lives. As Picon argues, the imagination of the city as a space of flows and the "monopoly held on urbanistic thinking" regarding urban networks and the flows they produce is beginning to weaken (Picon, 2018, p. 272). Instead, he suggests to imagine the future smart city rather as a city of "occurences and events" as the primary material of the process of reading and rationalizing the urban environment. It is occurrences and events as the actual manifestation of flows in a specific point in time and space that are the basis for human experiences. And after all, it is still people that *make* the city.

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