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From smart cities to smart social urbanism: A framework for shaping the socio-technological ecosystems in cities

Tali Hatuka[a,*], Hadas Zur[b]

[a] Head, Laboratory for Contemporary Urban Design (LCUD), Department of Geography and Human Environment Tel Aviv University, POB 39040, Tel Aviv 69978, Israel

[b] Laboratory for Contemporary Urban Design (LCUD), Department of Geography and Human Environment Tel Aviv University, POB 39040, Tel Aviv 69978, Israel

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ABSTRACT

Advocated mostly by technology companies, the smart city concept promises participation, democratization and innovative urbanism. Tracking these promises and ideas, this paper explores "smart urbanism" in ten cities from all over Israel. Based on interviews with leading figures in municipalities, smart city consultants and key figures in technological companies (n = 40), the aims of this paper are to assess the efforts of cities to become smart by responding to the following questions: 1. What is guiding the decision-making process in developing technological initiatives? 2. Does context play a role in implementing technological initiatives? 3. How are the residents perceived, and what tools are being used to address residents' digital differences? The key argument of this paper is threefold: first, in the process of becoming a smart city, the roles of public and private actors are blurred, influencing the process of decision making. Second, despite contextual differences, cities adopt similar digital initiatives. Third, technological initiatives that focus on social needs and address inequality in the digital age are still at the margins. The final discussion suggests that most municipalities are still at an early stage of digitization implementation and have the ability to shape and form a vision for the cities as socio-technological ecosystems in a way that will serve their publics as a whole. The paper ends with a call for shifting the focus from the city to society in developing digital initiatives and cultivating smart social urbanism.

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Cities today are influenced by the digital revolution. Context, funding and regulations play a key role in this dynamic process, which results in variations between cities. As a global uneven process, the key question is not whether digitization is penetrating cities, but what are the new types of socio-technological ecosystems being created? What are the departure points in implementing digitization projects in cities? Who is taking the lead in this formation process? Is there still a possibility to shape this process with an aim of creating an ecosystem that would serve the public good? This paper addresses these questions, under the premise that most municipalities are still at an early stage of digitization implementation and have the ability to shape and form a vision for the cities as socio-technological ecosystems in a way that will serve their publics as a whole.

Digitization implementation and projects in cities are often entitled and branded as "smart city" projects. The "smart city" concept became common in the first decade of the twenty-first century. However, there is no consensus about what the term "smart city" means, despite its importance and its contribution to urban development (Albino et al., 2015; Angelidou, 2014; Nam and Pardo,

* Corresponding author.
E-mail address: hatuka@tauex.tau.ac.il (T. Hatuka).

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2011; Neirotti et al., 2014). There are many interpretations of the concept, and three main approaches can be identified. The first, the technological approach, focuses on aspects of digitization, technology and communication systems as the foundation of urban infrastructure (Lee et al., 2014). The second, the economic-pragmatic approach, focuses on the smart city as a business-friendly city that fosters and nurtures the high-tech industry and the creative sector. This approach connects residents digitally to the urban infrastructure, thereby providing better and more equitable urban services from both the environmental and the social perspective (Caragliu and Del Bo, 2015). The third, the political-governance approach, focuses on the relationship between residents and the authorities and promotes the idea of participatory governance by investing in human and social capital and modern information communication technologies (ICTs) (Anthopoulos, 2017a; Anthopoulos and Reddick, 2016; Ho, 2016). These three approaches – the technological, the economic-pragmatic and the political-governance – can be seen as a spectrum: the narrowest definition refers to the technological aspects as a goal, and, conversely, the more expansive approaches consider technology only as a means to promote other goals – social, cultural and political. The common aspect of all the approaches is the view that smart city ideas can enhance urban-economic growth. This view has accelerated the development of digital initiatives by cities around the world.

With the implementation of digital initiatives in cities, a reflexive and critical discourse on the smart city emerged (Buck and While, 2015; Bunders and Varró, 2019; Calzada and Cobo, 2015; Greenfield, 2013; Hollands, 2008; Kitchin, 2015; Klauser et al., 2014; Martinez-Balleste et al., 2013; Shelton et al., 2015; Vanolo, 2013). One approach in this critical discourse suggests focusing on the idea of smart urbanism (Luque-Ayala and Marvin, 2015), an idea that calls for moving away from “a field of policy analysis towards a more complex understanding of how technology, capitalism and urbanization enmesh in producing Smart City approaches and their impacts on contemporary urban life” (Verrest and Pfeffer, 2018: 1342). Another, less explored venue is to examine the working processes between technological companies and municipalities in developing smart city strategies. This paper aims at linking both paths by analyzing the lead and role of private companies in shaping smartness, and by suggesting the concept of smart social urbanism.

Following this, the paper focuses on three key questions: 1. What is guiding the decision-making process in developing technological initiatives? 2. Does the urban context play a role in implementing technological initiatives? 3. Do social contexts and differences play roles in this process? These questions are explored through the study of cities all over Israel. Known as “start-up nation” (Senor and Singer, 2011), Israel has the highest number of start-ups per capita in the world and a dense high-tech ecosystem (Fraiberg, 2017). This culture of technology has created a reliant dynamic between cities and companies. Cities aim at absorbing and cultivating a high-tech ecosystem into their juridical boundaries, and companies that aim at experimenting and improving their products, look for local collaborations with cities in Israel as their beta-sites. This dependent relationship enhances the transactions between the two and influences the implementation of digital models.

To be sure, Israel is not unique in the race to become smart. Cities all over the world are facing similar challenges and dilemmas. Differences in implementation result from the political and juridical systems. Yet, the case of Israel is different in terms of its scale and hi-tech culture density. Furthermore, the country's scale (i.e., small), the dominance of hi-tech companies, the presence of the “start-up nation” narrative in the public discourse, and the centrality of the government in managing many realms of the city (i.e., transport, health, and more), all enhance processes of digitization, defining Israel as a living laboratory in studying the smart city.

Using the case of Israel, the key arguments of this paper is threefold: first, in becoming smart, the roles of public and private actors are blurred, influencing the process of decision-making. This condition poses a major challenge for the public sector and has ramifications for the life of residents, the services they receive, their privacy and the responsibility for and ownership of information that is carried by these services. Second, despite contextual differences, cities adopt similar digital initiatives. Third, technological initiatives that focus on social needs and address inequality in the digital age are still at the margins.

In exploring these arguments, the study focuses on 10 cities in Israel. Methodologically, the analysis is qualitative and based on in-depth interviews with leading figures in 10 municipalities, smart city consultants and key figures in technological companies ($n = 40$). The interviews focus on policy and development strategies for digital processes. The findings show that although they are different socially, spatially and politically, cities adopt the same basic digital initiatives. This dynamic is, in part, a result of the smart city model itself, which is based on the idea that “one size fits all” (Paskaleva et al., 2018), and 'the acceleration in cross-border policies' codified as 'best practices' (Peck and Theodore, 2015), all rooted in the smart city industry (i.e., global conferences, communities of practice, entrepreneurs, consultants) (Joss et al., 2019). Yet, the power relationship between the cities and companies are still in a process of formation. This power relationship, which differs from one context to another, has a tremendous influence on the values that guide development and the urban global future as a whole. In a world where smart cities are becoming a global praxis (Joss et al., 2019) and technology dominance is inevitable, this process could be better guided by the municipalities.

The paper includes four parts. The first part introduces the way that digitization processes and initiatives penetrate cities and alter them. The second introduces the research methodology and the empirical field. The third presents the empirical analysis and focuses on three key issues: the decision-making process, the urban context and social needs. The paper ends with a call to address and develop digital visions that shift the focus from the city to society and emphasize smart social urbanism.

1. The evolving relationships between digital companies and municipalities

Over the last decade, the smart city model was perceived as a means of strengthening the civic and public participation of residents (Berntzen and Johannessen, 2016; Cardullo and Kitchin, 2019; Effing and Groot, 2016; Simonofski et al., 2017). According to this approach, the digital component is expected to supply citizens or residents with quick, direct, up-to-date information and to support transparency and the local community’s awareness of its environs (Spinak and Casalegno, 2012). In general, the smart city model is based on four (contested) foundations:

Data accessibility and use. Democratic regimes can allow more citizens to participate in the civil-technological development process. Adopting the smart city model reduces the existing barriers to entering the market, with municipal authorities allowing private companies, nonprofit organizations and private–public partnerships to test new technologies related to public service. However, researchers argue that participation and use are not equal and deepen social divides (Hatuka and Zur, 2019).

Public participation. The development of technologies for civic participation facilitates and promotes a broad, democratic foundation of collaboration (Berntzen and Johannessen, 2016; Effing and Groot, 2016; Pereira et al., 2017). The idea is that citizens can benefit from participatory governance (Effing and Groot, 2016), be more active and involved in a city's life and cultivate the democratic process as a whole (Simonofski et al., 2017). However, researchers claim that when involvement requires the use of technology, it does not necessarily promote democratic participation and sometimes even blurs the boundary between participation in public life and consumerism (Cardullo and Kitchin, 2019; Shkabatur, 2011).

Optimal administration. The prevailing but covert starting assumption is that access to big data will allow decision makers to make better decisions (Batty, 2013; Baud et al., 2014). Similarly, it is assumed that having information about residents' behavior makes it possible to improve services. These assumptions are based on the vision of the utopian smart administration promoted by private companies and consultants. However, critical scholars warn against a neutral attitude towards processes of gathering data, algorithmic governance and reconfiguring urban governmentality (Kitchin, 2014; Klauser et al., 2014; Luque-Ayala and Marvin, 2015; Pasquale, 2015; Sadowski and Pasquale, 2015; Shelton et al., 2015; Vanolo, 2013).

Service orientation. Another aspect of e-governance relates to the tension between participation and consumerism. ICTs can supply the following aids: smart electric and water meters, thermostats, interior and exterior lighting, traffic signals, parking meters, toll collection, monitoring of public transportation lanes, navigation systems, data entry, cellular devices, fitness trackers, etc. (Elmaghraby and Losavio, 2014; Martinez-Balleste et al., 2013; Steenbruggen et al., 2015). Indeed, these technologies contribute to upgrading services and municipal management that improve daily lives. However, citizens pay an intangible price for access to these technologies and sacrifice privacy, information security and freedom of choice.

Two central forces support and promote the implementation of this agenda in a city: large technology companies that strive to enter the municipal market and profit and politicians and city decision makers who wish to advance their cities' economy and growth (Calzada and Cobo, 2015; Greenfield, 2013; Hollands, 2008; McNeill, 2015; Sadowski and Bendor, 2019; Wiig, 2016, 2015). Both the technology companies and the local authorities act on the basis of a competitive economic agenda to maintain their position in the global neoliberal economy. These interests and aims define new work processes and power relations between private companies and municipalities (Datta, 2015; Greenfield, 2013; Hatuka et al., 2018), and result in the modification of the socio-technological ecosystem in the city. Indeed, this process is inevitable, but could be better guided by the municipalities

In further explaining this claim, it is necessary to become familiar with the technology market. Based on the context of Israel, four key prototypes of technological companies are identified:

Type 1: Infrastructure-hardware companies are technology companies that create the infrastructure for ICTs. The work process with the municipality varies; a project can be either a long-term project for deploying several types of infrastructure or a short-term localized project.

Type 2: Integration companies offer end-to-end solutions for digitization in a city, including infrastructure and hardware that they did not necessarily develop. The work process with the municipality varies; it can be either project-based or long-term. When it involves both establishing and operating the system, it will be a long-term relationship, since the company becomes a supplier/vendor of software and support.

Type 3: Software companies are technology companies that provide an overall solution for applications. The work process with the municipality tends to be a long-term contract. When a municipality adopts software, it creates an ongoing, dependent relationship for support, so the company becomes a permanent supplier of services.

Type 4: Start-up-product companies are technology companies that develop a specific product, service or application. The work process with the municipality varies. Many companies seek collaboration with cities as beta sites to test their products.

As detailed in Table 1, each prototype develops a particular work process with municipalities, nurtures different power relationships and offers diverse interventions. Clearly, the difference between these prototypes is not merely technical but also creates different work processes and relationships with the municipality.

This dynamic should be placed in a wider historical and economic context (Fig. 1). In the past, municipalities supplied critical urban infrastructure that included responding to needs by supplying the services, facilities and structures required for the existence of a functional society (transportation, communications, water, electricity, sewer, gas) (Steele et al., 2017). In contemporary neoliberal urbanism (Brenner and Theodore, 2002), public services have been privatized (Hayward, 1997). In that respect, neoliberalism marks a shift "from vertical, often government-controlled integration, to environments involving a mix of multiple public, private and quasi private entities that manage and govern urban infrastructural systems" (Barns et al. 2017:20). New forms of entrepreneurship arise in

Table 1
Key prototypes of technology companies and their work processes with municipalities.

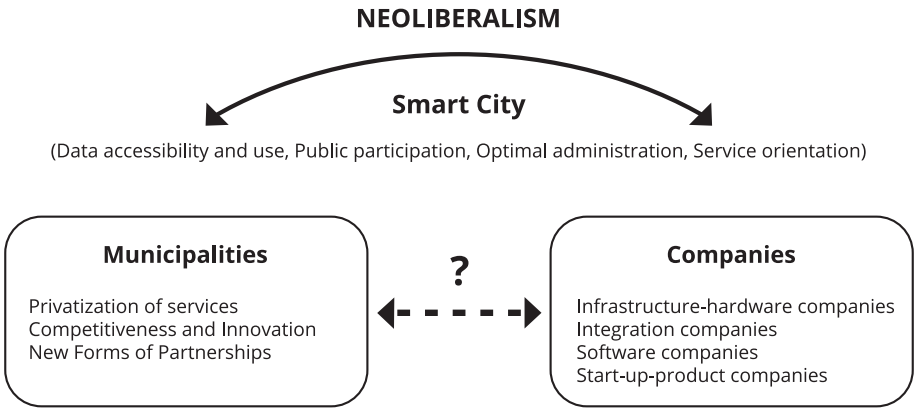

Fig. 1. Placing the smart city model in an economic and power relations context.

developing cities' infrastructure, creating new relationships with state's power, such as extrastatecraft, that is, "undisclosed activities outside of, in addition to, and sometimes even in partnership with statecraft" (Easterling, 2016).

Thus, it is suggested that the evolving relationships between digital companies and municipalities should be placed in the context of the transition from monolithic public goods to a model of complex ownership and involvement in critical infrastructure. This transition raises critical questions about risk, responsibility and resilience (Steele et al., 2017). Risk is associated with the increase in digital infrastructures, software and services that have obtained various amounts of data and have ramifications for privacy, data ownership, cybersecurity and vulnerability (Birnhack, 2020). Furthermore, under the ethos of innovation and the race to 'become a smart city', the technology companies that hold the necessary technical knowledge impose a vision based on their solutions. Contextual and social urban needs are pushed aside for the sake of a standardized technological vision (Fernandez-Anez et al., 2018). Fig. 1 illustrates the analytical framework for exploring the evolving relationships between digital companies and municipalities in Israel.

2. Context and methodology: Israel, cities and digitization

The focus of this study is on Israeli cities. This section will briefly address (1) the geographical context of the cities examined, (2) the smart city industry in Israel, and (3) the research methodology.

Geographical context of cities. From a geographical point of view, Israel includes four metropolitan areas: the largest is the Gush Dan metropolitan area (3,918,800), with Tel Aviv as its central city, located along the Mediterranean coastline. The Jerusalem metropolitan area (1,284,800) has approximately 50% Jewish residents and 50% Palestinian residents. The Haifa metropolitan area (936,800) is in the north, and the Be'er Sheva metropolitan area (384,900) is in the south (Israel Central Bureau of Statistic, 2018). Ten cities were studied: the four central cities of the metropolitan areas, Tel Aviv, Jerusalem, Haifa, and Be'er Sheve, as well as five cities in Gush Dan, two in the middle ring (Herzliya and Rishon LeZiyyon), and three in the outer ring (Netanya, Ashdod and Modi'in-Makkabim–Re'ut). The geographical proximity of the cities in Gush Dan to Tel Aviv increases their competition for financial and human resources; thus, aiming to improve their position in this competitive environment, they are trying to implement smart city concepts (Hatuka et al., 2018). Last, Eilat is the southernmost city in Israel, outside the metropolitan areas.

The smart city industry in Israel. The industry of digitization and start-up companies in the field of urban solutions should be viewed as a national project. This industry enjoys governmental support including grants, financial incentives, public relations, international governmental collaborations and infrastructure building with an aim of nurturing this ecosystem. A project run by GovTech, Creators and CityZoom[1] mapped the 124 Israeli smart city start-ups (Fig. 2). In addition, the Israeli central government initiated 'Digital Israel', a national project led by the Ministry of Social Equality which aims at: 1. assisting and encouraging municipalities with digital processes and 2. supporting the smart city private sector and acting as an intermediary between the two sectors. This climate has exposed municipalities in Israel to the smart city idea since 2012–2013. Thus, for example, Tel Aviv-Yaffo launched its first project (Digi-Tel) in 2013 and won first prize at the Smart City Expo World Congress in Barcelona in 2014 (Hatuka and Zur, 2019). This climate has further accelerated the race in the 'smart city' field, which is mostly lead by consultants and technology companies. As a result of the government support, the actions of the municipalities and the interests of the private sector have contributed to a cohesive technological ecosystem.

Methodologically, this study is based on a wide-reaching qualitative and quantitative study conducted in Israel in 2015–2017. The purpose of the study was to map the implementation of digitization in Israeli cities, identify the obstacles and challenges, and learn about the diverse strategies and concepts of local authorities, the national government, private sector technology companies and

[1] CityZoom Urban Innovation Community is an NGO, founded by the Ministry of the Economy, the Ministry of the Interior, Digital Israel, and in partnership with Tel Aviv University and Atidim Hi-tech Park, Peres Center of Peace and Innovation. According to CityZoom they are currently working on an updated map that will include 500 startups in the field of Smart City.

Fig. 2. Israel's Smart City Map 2019, created by a joint initiative of Creators' GovTech Innovation Lab and CityZoom, March 2019.

consultants working in the field. The research was based on multiple primary (i.e., interviews (n = 40) and survey (n = 490), field study) and secondary resources (i.e., statistical data, maps). This paper is primarily based on interviews with 40 key actors in the field as detailed below.

A. Senior officials in ten cities in Israel;[2] national government officials: The Privacy Protection Authority (1), Ministry of Energy (1), Ministry for Social Equality (2), Digital Israel (3);
B. Senior officials in technology companies: Cisco (1), Microsoft (2), HP (1), Taldor (2)
C. Consultants: Deloitte (2) and private consultants (5) involved in smart city development.

The interview questions followed six themes: 1. Defining the smart city (vision and aims), 2. The project (motivation and services), 3. Political and social implications, 4. Cybersecurity and privacy, 5. Funding and resources, and 6. Working with the private sector (only for the municipal and national government officials).

3. Findings: Assessing the race of Israeli cities to become smart

This section assess the race of cities to become smart by considering three fundamental issues: the decision-making process, the urban context and social needs in developing technological initiatives.

3.1. Decision-making processes in developing technological initiatives

The work process between the private sector and municipalities is complex. It is influenced by the interest of companies in selling

[2] Metropolitan cities: Tel Aviv-Yaffo (3 interviewees), Jerusalem (2 interviewees), Haifa (1 interviewees), Be'er Sheva (1 interviewee). Second-tier cities: Herzliya (2 interviewees), Netanya (3 interviewees), Rishon LeZion (1 interviewee), Ashdod (2 interviewees), Modiin-Maccabim-Reut (1 interviewee), and Eilat (4 interviewees). The number of interviews in each city depended on the organizational structure of the smart city initiative in each municipality. The director general in each city directed us to the senior executives who run the project (i.e., strategic planning, chief of knowledge, chief officer for IT, etc.).

their products to cities, an interest that is expressed through intensified pressure on municipalities that aims to enhance growth and development (Anthopoulos, 2017b; Greenfield, 2013; Wiig, 2015). This dynamic and at times colliding interests influence the work process, which can lead to conflict and complex issues. Below, several characteristics of the work dynamics between the private sector and local authorities are outlined.

Deep involvement of private companies in the city's vision. Private companies and independent consultants seek to gain trust and pave their way to the decision-making table. Some of them even ask to be involved in developing the municipal strategic vision. The involvement of a private company in its vision is a new work model for a city that has previously defined its vision independently by working with professional planners and consultants who examine the public interest rather than through private companies that have commercial interests. However, the desire for involvement and leadership is evident in statements made by representatives of private companies, as in the following examples.

Senior Manager, Business Development, Cisco-Israel[3]:

> You don't go and suggest a solution but rather partnership in a digital journey – you work together with the client in order to know how to best create the most beneficial impact for the client, which will serve the interests of the client and where he wants to go with our know-how, technology and interest. Here is, I think, one of the most important lessons I learned: building trust is indeed the most important thing.

ATU (Attitude Toward Using) Government Lead, Microsoft[4]:

> There is the physical infrastructure, there is the conceptual infrastructure, there are our applications, there are services. It is always connected to many things. Thus, I think that very often our conversation is first and foremost about truly listening to their vision of where they want to be and what their priorities are. That is where the conversation needs to begin.

Moreover, technology companies are not interested in intermediaries – consultants with expertise in digitization who advise city governments. Intermediaries further delay and complicate the work process. The technology companies prefer to lead the project and work directly with the municipality. Intermediaries who are employed by the municipality gain the trust of government officials, while private companies are perceived as vendors about whom there is more suspicion. These factors contribute to private companies' hesitancy about intermediaries. Thus, for example, a Senior Manager at Cisco-Israel: explains:

> I think that there are consultants because the mayors are hesitant; they do not know what this is, but the consultants do the work for them, write the plan and submit it to them. I think this is a mistake, I think that it is necessary to do this together. The mayors and heads of local authorities need to go through the process themselves; this needs to be their own. It is possible to help them and lead them through the process but not to have it delegated to someone else for them to do it.

It is important to note that the smart city consulting field is relatively new; like the technology companies, such companies have recognized the potential profitability of the public sector (Wiig, 2015). The consultants justify their importance as protectors of the municipal public interest against the infiltration of private companies, as experts in leading municipalities to the digital age and as enhancers of a more business-oriented model. A Senior Manager at Deloitte[5] consulting company notes:

> There are significant gaps between municipalities in the quality of the planning processes. The planning needs to begin with strategic thinking about a smart city and connect to the needs and "business" goals of the city itself and determine how digital technology can serve them and not the other way around. For this purpose, it is very important for senior decision makers in the city to also be involved, not only the managers of the information system.

Use of the city as a beta site. The concept of 'the city as a perpetual beta' enhances the technological logic of open-source and the 'unfinished concept' of city making. City makers, citizens, and all users of the city are seen as co-developers of the city (Lange and de Waal, 2019:71). Companies offer a collaboration in which they provide the technology and fund the costs of the project in order to further develop and test their product. The municipalities, on the other hand, enjoy the prestige of the companies and/or the academic institutes they collaborate with, advancing their public image as innovative, advanced and creative. The involvement of the city in leading or selecting such an initiative depends largely on the personnel who accompany it and whether the initiative is part of a comprehensive municipal agenda. Frequently, the companies have an interest in leaving "loose ends" and allowing both the city and the company the possibility of leaving the initiative at any given moment. However, the temporary nature of these projects creates significant vulnerability, primarily for the local authority. Furthermore, financing and maintaining the project after the pilot ended is problematic due to limited resources and municipal priorities. Hence, using a city as a beta site is advantageous primarily for the companies and is much less so for municipalities and residents.

The Head of the Strategic Planning Department in Haifa[6] presents the situation as follows:

> Large companies have approached us and offered their services. They claim that they know how to provide technological solutions for every problem that we raise in discussion with them. The issue is that in most cases, beyond the pilot that they are willing to do in one neighborhood or a specific area, in order to implement and assimilate it in the entire city, an extremely large municipal

[3] Interview with Senior Manager, Business Development, Cisco-Israel, December 12, 2016.
[4] Interview with ATU (Attitude Toward Using) Government Lead, Microsoft, November 7, 2016.
[5] Interview with Smart City Manager, Deloitte Consulting, December 25, 2016.
[6] Interview with Head of Strategic Planning Dept., Haifa, October 30, 2016.

budget is necessary. So, unfortunately, we are often unable to realize these things.… And sometimes they propose solutions that are not necessarily the ones that are appropriate for our problems.

Lack of a digital strategic plan. The lack of a structured framework for implementing digital projects in cities is a crucial factor that influences the work process between the varied actors. Moreover, a lack of readiness for the digital age is evident in all of the cities studied. In many cases, the initiatives come from private companies, and the people leading the initiatives are mayors, chief information officers (CIOs) and the relevant division heads. As a policy maker in the field told us anonymously:

> There is a work process that I do not think is the most impressive in the world because it is not well organized, and it is managed primarily on the basis of opportunities. That means that a few ideas are flung about and advanced. If someone wakes up in the morning with a subject that is sufficiently dramatic from his perspective, if he is willing to mount the barricades for it and it is sufficiently important for him, then it can be assumed that it will happen.

Very few authorities have established dedicated teams for a crosswise, holistic examination of digital initiatives that includes professionals who are able to evaluate the influence of these initiatives on the city from the economic, planning and social perspectives.

3.2. Urban context significance in digital processes

The central question for cities today is not whether to invest in digital initiatives but rather how and where. When smart city initiatives are compared, despite the variations in geography, size, socioeconomic variables, demography and culture, the differences between cities are minor. This could be explained by the fact that the basket of digital services offered by technology companies is limited (Paskaleva et al., 2018). The rhetoric and vision of technology companies disregarded history, culture or identity (Greenfield, 2013), which are important components that shape the political structure, human capital, cultural sensitivity, traditions and customs. Besides the human aspects, economic and geographical components are not taken into account.

In addition, as stated earlier, cities do not develop an organized strategic plan based on their specific urban needs and challenges in residential and industrial areas, both on the local and regional levels. Thus, cities miss the opportunity to help bridge economic gaps and solve real-time problems. From the comparative study, four types of digital initiatives are identified:

- Upgrading management systems by improving online services and establishing control centers.
- Connecting with residents by providing apps or resident cards that provide information, benefits and services.
- Encouraging businesses by promoting initiatives with the high-tech industry and entrepreneurship through incubators and accelerators.[7]
- Developing urban infrastructure, mainly in the field of transportation and sanitation.

When we look beyond the metropolitan areas in Israel, it seems that other cities are adopting the same basic digital initiatives. However, it is evident that the smaller cities are making an effort to set themselves apart from the central cities and find a focal idea that will strengthen and differentiate them. Affordability and limited resources are other parameters that push smaller cities to anticipate a more creative, modest and sustainable agenda.

Tables 2 and 3 map the technological applications in Israeli cities. The information in the tables is based on interviews conducted with twenty senior officials of ten local authorities during 2016–2017. It is likely that there have been developments and changes since then. Except for Tel Aviv-Yaffo, no city published a smart city strategic plan; hence, information was gathered from different sources and informally (i.e., municipal websites, press releases, newspaper articles) as well as from oral sources.

3.3. Urban society and advanced digitization

The social context of Israeli cities is complex; as in most cities in the world, inequality, gaps and differences exist. The most urgent gaps lie between ethnic groups (Jews and Palestinian Arabs), religious groups (ultra-Orthodox), and immigrants, alongside socioeconomic gaps. In recent years, the uneven effect of smart cities and digitization processes on different residents in the cities has become clearer and more evident (Hatuka and Zur 2019; Hatuka et al. 2020; Edge et al. 2020; Robinson et al. 2018).

Social challenges are addressed at two levels: national and local. The Israeli government is concerned that the digital divide between cities deepens inequality and the existing gaps. Hence, a national project, 'Digital Israel', established by the Ministry of Social Equality, supports weaker cities in their transition to the digital era. At the local government level, digitization and the smart city are constructed around technology, management, rescue utility and communication, while social gaps, the digital divide or other social challenges are still at the margins of smart city policies.

Based on the empirical study, only 5 of 10 cities had initiated projects with social impact (welfare, financial, disabilities and inequality). Although these initiatives are at the margins of the cities' race to become smart, they are indicative of future potential dilemmas of society in the digital age.

Dealing with diversity and digital illiteracy. The process of digitalizing services confronts the authorities with digital gaps and divides

[7] An accelerator is a program that nurtures start-ups for a limited period of time.

Table 2
Smart city initiatives in Israeli metropolitan cities.

Table 3
Smart city initiatives in second-tier Israeli cities.

of which they were not aware. As the CIO and smart city director of Rishon LeZion[8] explains: "We decided to have only an online registration for kindergarten, and we ran into problems in one specific neighborhood." The majority of residents in the neighborhood are immigrants from Ethiopia, and city officials learned that this population suffers from low access to the Internet alongside matters of trust in technology. He describes the parents' concern and suspicion of a system without a human element: "They have less trust in technology. Many parents [think] that if they don't come here and see the person complete the registration forms before their eyes, how can their child go to kindergarten?" To meet these residents' needs and gain their trust, the city enabled in-person registration. However, this process emphasized the digital divide within the city, which may lead to further exclusion of this group.

In supporting populations that do not use online services for diverse reasons – literacy, lack of trust, religious constraints, age and more – most cities maintain human services that provide in-person responses. Some cities offer digital literacy training or guidance or even go to the homes of residents who require assistance. Furthermore, the chief officer for IT and innovation of Be'er Sheva[9] asserts the need to develop a wide range of services and platforms to suit the diverse society of the city:

> The city needs to remember that there are many different types of population in the city and many different types of users. We need to provide the service for everyone – there are senior citizens, there are new immigrants, there are children, there are elderly people, there are people with disabilities. We need to see how we can make each of our solutions as well suited as possible for everyone, because not everyone has a smart phone. We have a very interesting project with the university on the digital literacy of senior citizens.

Cultural adaptation is a concern for policy makers in Jerusalem, which is home to a large ultra-Orthodox population that requires specific technological adaptations. For example, garbage sensors were opposed by the ultra-Orthodox because they broadcast on Shabbat.[10] Only through dialogue with the community was a solution found. Any implementation of technological tools in ultra-orthodox neighborhoods must go through a negotiation process with the community in order to be approved by local leaders. City officials explain that understanding the culture, hierarchy and discourse of the community is crucial.

At the margins: Using technology to promote equal opportunity and support disadvantaged populations. Some cities harness technological change and smart city initiatives to advance disadvantaged groups. Each city chooses a different strategy; some focus on core social problems that can benefit individual financial and welfare status, while others promote the more equal distribution of benefits and open opportunities for all. Be'er Sheva, with the highest number in Israel of residents registered to welfare services (180.7 per 1000 people) (Israel Central Bureau of Statistics 2014), decided to improve the welfare system. By digitizing and synchronizing knowledge and services from various welfare providers, it hopes to achieve broader utilization of rights. As the chief officer for IT and innovation of Be'er Sheva explains:

> The question is how to use digital means to improve the welfare situation in the city. This is very complex – the largest gaps lie there. Let's take two challenges. First, there are many agencies that provide welfare services: the municipality, the Ministry of Welfare, and the National Insurance Institute (NII), and there are many types of nonprofit organizations. Too many different people, and there is no synchronization. Second is the utilization of rights. (…) These are two of the challenges, and there are many more.… If only we could solve them using technological means, we would have done something big.

The city of Eilat is also focusing on trying to improve individual financial status. The city helps households move to solar energy systems that save electricity costs. In a city where many households have limited means, this strategy delivers financial assistance and

[8] Interview with CIO, City of Rishon LeZion, LeZion, September 8, 2016.
[9] Interview with Chief Officer for IT and Innovation, City of Be'er Sheva, September 15, 2016.
[10] Shabbat is the holy day in Judaism. Shabbat observance entails refraining from work activities, commercial transportation and any activity using electricity in order to engage in restful activities to honor the day.

promotes sustainability to all of the city's residents[11].

In contrast, Tel Aviv-Yaffo separates its smart city agenda and equity policy. Officials are well aware of the inequality and gaps between the northern part of the city and the southern neighborhoods. However, as the Deputy Mayor[12] explains, the municipal policy for closing these gaps does not rely on technological tools and is not included in the smart city projects. He notes that there are several areas in which the DigiTel resident's card, the flagship of "Smart City Tel Aviv" project, can help reduce gaps. However, equity is not one of its main purposes. As he explains: "Today, we have more participants in the DigiTel processes in the southern part of the city than before DigiTel. Many more. Enough? Definitely not. Will this generate the largest change; do I base the need for rectifying the social gaps in Tel Aviv Jaffa on the DigiTel systems? Definitely not." However, the city does use DigiTel's ability to segment the population and direct messages to specific target populations, which allows it to offer weaker neighborhoods a first chance to take advantage of free opportunities (i.e., theater tickets, public events).

Investing in digital infrastructure. In aiming to reduce the digital divide in terms of physical access, municipalities encounter a dilemma: whether to invest in connecting individual homes or in public infrastructures. The CIOs of Rishon LeZion and Eilat raise similar concerns. After they tried to supply Internet connections or even private computers to households with limited access, this strategy was revealed as a failure. The significant cost of installing and maintaining WiFi networks and computers for private homes did not meet the budget goals. Hence, the success of the program depended on the hardware available at residents' homes. Therefore, they decided to focus on connecting all schools in the city to fast Internet services. The city deployed optical fiber cable throughout the city and is now connecting all educational institutions and city agencies to fast Internet, which will facilitate maximal usage of the computerized communication infrastructures that the city installed in schools as part of the "Smart Classroom" program. Focusing on digital infrastructure for public institutions instead of for end users ensures that, at least in school, every child in the city will be able to benefit from computerized systems and fast Internet. Investing in the educational system, where children from all levels of society meet, is investing in public goods.

Another issue concerning the digital infrastructure is the uneven development of different areas in the city. Jerusalem's socio-spatial divide between the east Palestine and west Jewish neighborhoods means that implementation encounters many difficulties. Smart city and digitization projects cannot avoid these differences and divides. The Head of the Operations Administration in Jerusalem[13] claim that investing in digital infrastructures is the key to the city's development: "If we could create more communications infrastructures, the sky would be the limit….". Fiber-optic infrastructures are necessary for every aspect of a digital city – schools, intersections, security, parking management and garbage collection. Nevertheless, implementation in the city is affected by large gaps and difficulties in terms of existing infrastructures. For example, in East Jerusalem[14], where the Palestinian population is concentrated, there is almost no infrastructure. Therefore, smart waste management based on buried trash containers with sensors was found to be impossible in neighborhoods where the drainage, water and electrical infrastructures are not orderly or mapped. As city officials admit, communication infrastructures are a key element for equal development, but digital infrastructure is another layer that adds to and depends on former gaps: physical, institutional, political and spatial. This highlights the other side of the coin: uneven investment in digital infrastructure extends the existing divides and gaps.

Table 4 maps initiatives with social impact in five cities in Israel and assesses their conception of equity, social needs and technology.

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Fig. 3 summarizes the key points that emerged from the three issues examined: the decision-making process, the urban context and social needs. Based on the 10 cities examined, the roles of public and private actors are blurred; despite contextual differences, cities adopt similar digital initiatives; and technological initiatives that focus on social needs and address inequality are still at the margins. Thus, the challenge is to alter both focus and conduct in the implementation of technological initiatives.

4. From the city to society: Focusing on smart social urbanism

"Smart city" is an abstract, generic name for digitization initiatives and processes in contemporary cities, and it is often used as a branding tool (Valdez et al., 2018). Private entities seized the opportunity to work with the public municipal sector, viewed as a new market and as an opportunity to penetrate the growing market of urban innovation (Greenfield, 2013; McNeill, 2015; Wiig, 2015). For the urban public sector, dealing with increasing competitiveness and demand for better up-to-date services alongside economic constrains, even austerity, (Peck, 2012), generates new power relations with the hi-tech industry. This dynamic develops a new socio-technological ecosystem.

This evolving ecosystem contributes to the following dynamics:

1. **"Similarism"**, the flow of ideas from one city to another and the role of consultants and tech companies as transmitters of 'smart city' packages, leading to the eventual outcome of rather similar smart city initiatives.

2. **Techno-utility orientation**, the development of smart cities focuses on economic and utility factors and thus smart cities are often developed at the expense of human capital, social needs and spatial characteristics (Cowley et al., 2018; Datta, 2015;

[11] Interview with Head Organization, Methodology and Information Systems Division, City of Eilat, November 23, 2016.

[12] Interview with Deputy Mayor, City of Tel Aviv-Jaffa, I August 7, 2016.

[13] Interview with Head, Operations Administration, City of Jerusalem, March 19, 2017.

[14] The eastern part of Jerusalem was occupied by Jordan during the 1948 Arab–Israeli War. Since the 1967 Arab–Israeli War, East Jerusalem, along with the rest of the West Bank, has been occupied by Israel.

Table 4
Social initiatives by cities in Israel.

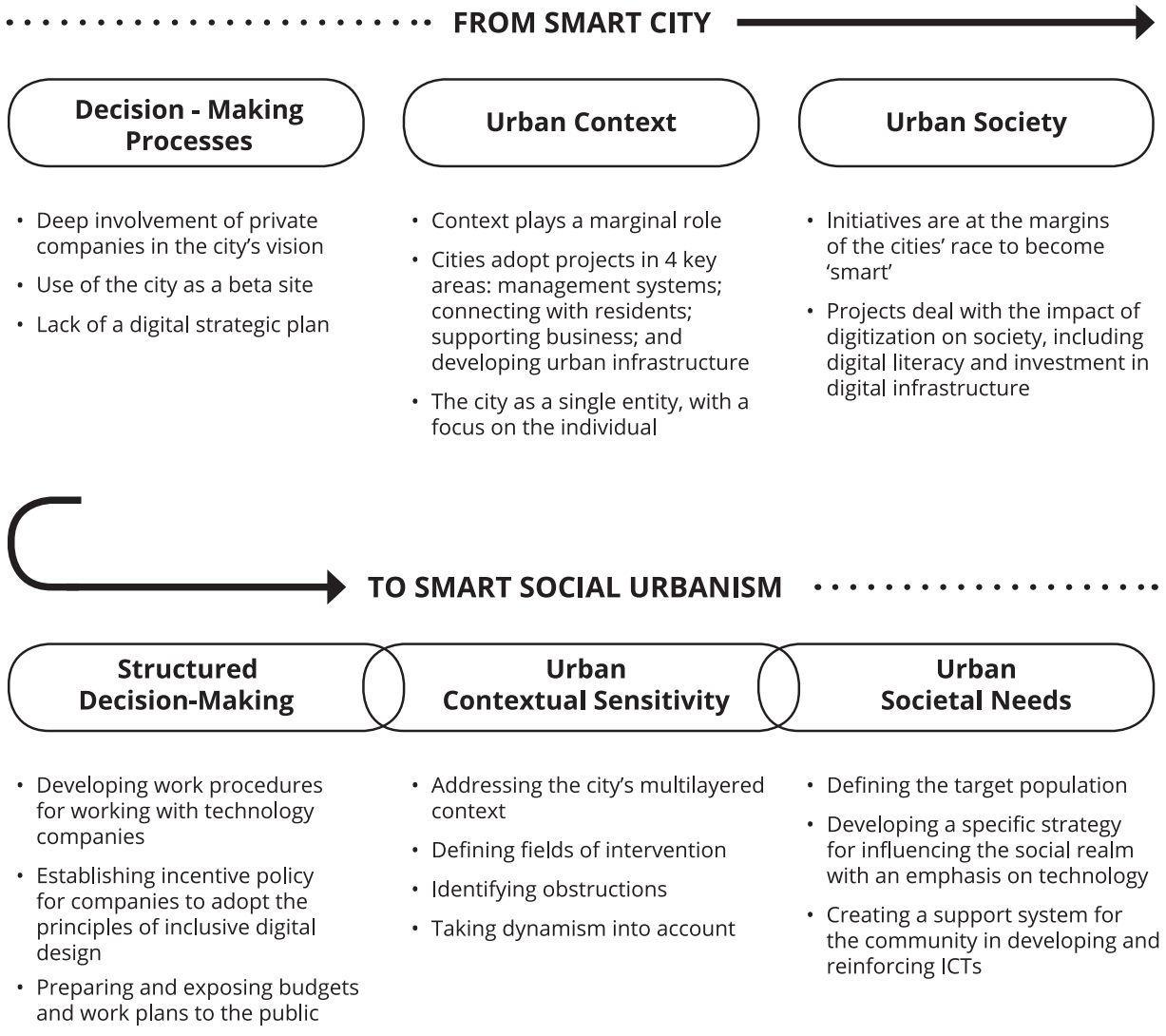

Fig. 3. From the city to the society: focusing on smart social urbanism.

Fernandez-Anez et al., 2018; Hollands, 2008; Leitheiser and Follmann, 2019; Luque-Ayala and Marvin, 2015; Valdez et al., 2018).

3. **Feebleness**, the presence of the companies in the development process results in the lack of municipalities playing a central role in shaping the smart urban vision.

Different from researchers who call for more social- and human-centric smart city model through strengthening civic participation (Berntzen and Johannessen, 2016; Castelnovo, 2016; Effing and Groot, 2016; Simonofski et al., 2017), this paper suggests that the core of the problem in smart urbanism is the blurred relationships between technological companies and municipalities. This blurred and evolving relationship is also a result of a lack of leadership in developing the vision for future digital cities. Municipalities hold the responsibility for public good and thus, digital tools should be developed after the needs of the municipalities are clear and the goals that support those needs are evident.

Following these conclusions, it is suggested to shift away from the smart urbanism model to *smart social urbanism*. This concept

positions society and the urban context as the primary parameters when developing digital initiatives. Cities are complex agglomerates of sociospatial units; thus, digital initiatives should be assessed in the social, spatial and geographical context (Crang et al., 2006; Hatuka et al. 2020). Furthermore, smart social urbanism counters recent studies on the need to enhance social innovation (Leitheiser and Follmann, 2019; Thompson, 2019) and shifts the focus towards social and human capital to reduce social polarization (Fernandez-Anez et al., 2018)

Smart social urbanism is not merely an abstract idea but is also a framework for shaping the socio-technological ecosystems in cities based on the premise that municipalities should constructively lead the process of city digitization. In doing so, they should address the three anchors of smart social urbanism: a structured decision-making process, sensitivity to the urban context and sensitivity to the needs of an urban society.

- *Structured decision-making process*. This anchor implies (a) developing work procedures for working with technology companies. Technology companies must be considered, in all regards, suppliers who depend on the city. The companies need the city in order to implement and test their technologies. Therefore, 1. The local authority is the entrepreneur and owner of the vision, and the municipality has a holistic view of the entire society within its boundaries. 2. The municipality will define, based on its vision, which companies are suitable for implementing the goals of the strategic plan. (b) Establishing incentive policy for companies to adopt the principles of inclusive digital design. The municipality as well as the national government can incentivize and prioritize initiatives, enterprises, companies and projects that promote social inclusion, varied populations, the reduction of gaps and the optimal distribution of resources to populations in need. Thus, when developing each product, interface or project, it is necessary to think about the social aspects, language and design adaptation, and accessibility for different populations. Accessibility must include leaving nontechnological means and responses in place to allow freedom of choice and respect those who do not (or cannot) use the digital option (Calzada and Cobo, 2015; Hatuka and Zur, 2019). (c) Preparing and exposing budgets and work plans to the public. Technological projects have significant long-term costs and maintenance requirements. Therefore, intelligent evaluation of the project must include the implementation stage, the lifespan of the project and its overall yield from long-term economic (how much will it cost?) and social perspectives (who will gain from it?).
- *Urban context sensitivity*. This anchor refers to the need to define a vision for the city and develop a multiyear strategic plan for technology. The purpose of the plan is to build digitization processes for the city in accordance with its needs and abilities. Today, the plans are constructed primarily by consultants who sell technologies while relating to the city's space in a generic way. Strategic plans in this field must be based on in-depth knowledge of the technological, planning-spatial and economic-social realms. These three components are the foundation for the successful integration of technology in the city. When defining the plans, it is necessary to pay attention to the following main points: (a) Addressing the city's multilayered context. The vision should also be examined and defined as a cumulative process of technological-civil development, adjusted to the city, while also taking into account the local, regional, and national contexts. (b) Defining fields of intervention. Technological initiatives can have spatial and urban impacts. Therefore, the strategic plan must consider the influence of innovations on the planning and social arenas. (c) Identifying obstructions. It is necessary to examine the limitations, budgetary constraints and implementation of technological initiatives as a cumulative process in order to create a modular program that includes goals and milestones for the coming decade. (d) Taking dynamism into account. Since technology and applications change and are replaced, it is very important to have meta goals for the development of the city. If technology is defined as a means, then it will be possible to deal with changes in the current configuration.
- *Urban social needs*. This anchor implies examining technological initiatives or applications in the context of the social groups in the city – that is, considering spatiality, age and ethnic origin when analyzing the digital skills of groups within the city. More specifically, it suggests the following steps in developing technological initiatives: (a) Defining the target population. Although it is clear to mayors and local leaders that the residents should be at the center, three distinct population groups can be identified in each city: residents, tourists and business people. Each of these groups, especially residents, can be divided into subgroups that should be studied and understood. When thinking about the strategic plan and examining technological innovations, it is necessary to evaluate which of these groups will be best served by the digital initiative implemented. (b) Developing a specific strategy for influencing the social realm with an emphasis on technology. The connection between inequality and digitization should be explored as an opportunity to reduce gaps, with an emphasis on projects related to the distribution of resources, participation, accessibility, education, and opportunities to reduce gaps within the city. (c) Creating a support system for the community in developing and reinforcing ICTs. For the purpose of enabling the entire population to assimilate technology, it is necessary to emphasize digital education. On the city level, it is important to develop an ecosystem of digital support by recruiting the local population and educational institutions in the city (schools, cultural and sports centers, community centers and libraries). This ecosystem can help with support, training and creating opportunities for learning, as well as acquiring digital skills and using them. Community centers and other local institutions are focal points for challenging digital inequality because of their familiarity with the demographic characteristics of the community (youths, adults, immigrants), the needs of the residents (education, internet skills, Internet access) and the needs of local businesses (online marketing, Internet skills).

In sum, the starting point for municipal policymakers must be reliance on a comprehensive municipal social vision, built on the specific challenges faced by the city and their inhabitants; on this basis, the appropriate technological entrepreneurs should be chosen to allow clear power relations with the private companies to be defined and to ensure that the public good is maintained. Therefore, an in-depth analysis of the city's needs is critically important for the selection and success of technological enterprises. As the Deputy of Technologies at 'Digital Israel'[15] stated:

I would try to look for the most painful points for the municipal authority and residents in their daily lives and not follow the ideas of technology companies that are trying to sell solutions.… The departure point should be responding to the questions, which are the least efficient points in the interface between residents and the municipality, where residents are seeking greater satisfaction, and where residents are the most frustrated.

Finally, the evolving socio-technological ecosystem will continue for years; it is a dynamic process with high budgetary demands. Therefore, in developing the city in the digital age, policy makers should view technology as a means to improve the quality of life for the residents and employees working in the city while understanding that digitization is merely one dimension of the city's administration and organization systems.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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