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The Smart City, Integrated Design and Planning and Urban Tech

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1 ABSTRACT

In the past couple of years UrbanTech projects have raised an unprecedented amount of venture capital. They propose to combine IT, data and knowledge about the capacities of our built environment and offer their customers solutions in housing and energy use, design, construction and occupancy of buildings and transportation. Following individual business plans they are developed for predefined environments characterised by spatial scales and that can be modelled with easily available data. The for profit projects are different from "Smart City Solutions", which are a municipal service, target a city's entire population and aim for an integration across urban systems. In their current stage of development "Smart City Solutions" have, however, struggled in particular to achieve the interoperability between urban systems and urban management platforms.

The objective of the paper is to explore the potential of insular but structured entrepreneurial efforts of UrbanTech projects to create a city data marketplace. A concern is father the usefulness of these data to promote integrated types of planning and design of built spaces, thus increasing the overall quality of the built environment and the transparency of processes. This paper presents an analysis of UrbanTech projects receiving incubation or acceleration grants for piloting or scaling business models based on digital information sharing with the objective of creating better or improving built environments. Focus is put on comparing the spatial scales covered by the projects, the type of data shared, the process of data collection, storage and management and the interoperability of platforms as well as the alliances with professionals contributing and profiting from sharing. A framework for analysis and understanding of venture capital financed urban services is crucial for urban administrators concerned with achieving integration of urban processes and systems as well as for entrepreneurs seeking to make their projects relevant in the long term.

Keywords: Planning and collaboration; integrated design and planning; collaborative consumption; Incubators and accelerators; city data marketplace

2 INTRODUCTION

UrbanTech has emerged as a new market. UrbanTech enterprises promise to combine IT, data and knowledge about the capacities of our built environment and offer their customers solutions in housing and energy use, design, construction and occupancy of buildings and transportation. With small, local start-up companies, the UrbanTech sector promises to bridge the gap between urbanists and technologists. In the New Urban Agenda UN Habitat International has recognised the need to bridge the digital divide as a means of encouraging civic engagement and improving access to urban services (§132). The document highlights the importance of local governments in "data collection, analysis, and dissemination," including "locally-generated disaggregated data" as a means to promote "evidence-based governance (§135)." (UN HABITAT III 2016). A survey by the European Innovation Partnership for Smart Cities & Communities (EIP-SCC) found "that 75% of European cities have not yet planned an urban data platform." Reasons are a lack of confidence and capacity, a lack of cooperation between departments, organisations, sectors, and budget constraints (bsi 2017). UrbanTech, so the hopes, will achieve where large corporations that are traditionally driving smart city solutions have failed. But raising capital, forming partnerships to test ideas and approaching clients are complicated. Hence, start-up incubators and accelerators throughout the world have set up UrbanTech verticals, allowing private and institutional investors to share risks and take part in expected future revenues. This paper explores the nature of UrbanTech enterprises, and the potential for integration through digital information sharing that small, isolated projects can bring to a sector that is notorious for its lack of a systemic approach. A framework for analysis and understanding of venture capital sponsored urban services is crucial for urban administrators concerned with achieving integration of urban processes and systems as well as for entrepreneurs seeking to make their projects relevant in the long term.

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3 URBANTECH

3.1 Definition

Generally speaking, UrbanTech is solving problems of digital information sharing with the objective of improving the way built environments are designed, constructed and maintained as well as making life in buildings and neighbourhoods more comfortable and convenient. This includes IoT, construction-related tech (ConTech), real estate or property management related tech (PropTech), infrastructure tech related to urban mobility, energy and water management, street lighting, public safety and security, and transportation. From a customer perspective UrbanTech can, according to Boyden, be divided into three segments: "Urbantech-Tech with the intent of improving physical infrastructure or the built environment", "GovTech-Tech with the intent of improving government operations" and "CivicTech-Tech with the intent of improving community connectivity" (Bowden 2017). Urbantech-Tech comprises IoT, ConTech, and MobilityTech. It has the most diverse range of paying customers: government entities, private sector companies, and in many cases end consumers. GovTech, mainly Software as a Service (SaaS) is commissioned exclusively by government agencies to improve government operations. In the US where Boyden's cases are, CivicTech are social networking platforms for collaborative consumption, the sharing/shared economy or the peer economy with services paid for by end-consumers, advertisers, and elected officials. This approach to a definition of UrbanTech suits the study presented in this paper as the paper is interested in agency and business models as much in the resources, in this case digital information, sensors and devices, needed to deliver a service.

3.2 Relevance and potential of UrbanTech for Smart Cities

Following individual business plans UrbanTech solutions are developed for predefined environments to improve and make local infrastructure, the built environment and social processes in and around buildings and neighbourhoods more efficient. This is great news for the local economy as well. The smart cities market is estimated to grow globally to USD 2.57 trillion by 2025 (Grand View Research 2018). The projects UrbanTech start-ups engage in are in stark contrast to corporate-designed smart cities. Corporate-designed Smart Cities like Songdo (Korea), Masdar City (UAE), or PlanIT Valley (Portugal) are guided mostly by the experience with hardware and software. The large corporations who undertake them, Siemens, IBM, Cisco, and Phillips are early players, qualified because of their product range and to a lesser degree by their knowledge about how cities function. Albino et al are critical towards the outcomes of corporate-designed smart cities. They see them as 'empty' overly planned cities lacking the quality of technology to empower citizens by giving them a chance to adapt the technology (Albino, Berardi, and Dangelico 2015). Fragmented, individual, small-scale efforts on the other hand will yield a large range of information and this pool of data could crucially improve smart prognostics of diverse urban processes (Hernández-Muñoz et al. 2011). This hope raises the question of governance of digital information and it sources. Researchers and administrators have long called for more integrated governance models, tailored to local conditions that can facilitate the operation of smart cities (Fernandez-Anez, Fernández-Güell, and Giffinger 2018; Belle 2015). Söderström et al. debunked the smart city initiative as storytelling, a strategy employed by large data companies to gain traction and dominance in the urban planning market (Söderström, Paasche, and Klauser 2014). The question is whether the many smaller UrbanTech initiatives bundled by accelerators and seed funds are a legit response to Söderström's et al. call "for the crafting of alternative smart city stories" (Söderström, Paasche, and Klauser 2014). In their 2018 report the global consultancy McKinsey highlights the option for "an open approach to support innovation and private sector participation" giving Amsterdam Smart City as an example. Here, municipal agencies, educational institutions, non-profits, private-sector companies, and start-ups come together in private-public partnership (Woetzel et al. 2018)

3.3 Problems intrinsic to UrbanTech

Compared to the earlier corporate efforts, UrbanTech projects have the advantage of scale and timing. They start small and propose to solve existing pain points. But they also face challenges stemming from this set of characteristics. Short-term worries are raising capital, forming the right partnerships to test ideas and making their products and services known to potential clients. In the medium to long-term UrbanTech companies need to create a self-sustaining flow of revenue and position themselves within an eco-system of hardware (product) suppliers, software (service) suppliers and clients who have the cash to pay adequately for these services. In a smart city eco-system the utility of products and services combined is larger than their sum if

infrastructure and collected data can be shared. Cities and venture capital investors know this. Municipalities as well as tech venture capital funds started to solicit small scale UrbanTech projects, which they help to seed fund or accelerate. Municipalities invite innovators to test-bed and pilot. VC investors give them access to initial or further rounds of funding and entrepreneurial coaching. They create opportunities to pitch to potential clients and to explore business models. UrbanTech incubators/accelerators hence have a distinct advantage over corporate efforts to design smart cities: They curate a batch of ideas, explore them and only keep the best, teaming up with end customers.

Morozov and Bria who write about the emergence of a "City Data Marketplace" are undecided whether the activities of private companies in a traditional government domain are for better or worse, regardless of company size. In their opinion the outcome depends. Should governments "manage to preserve their ability to implement independent, effective policies and decide their own fate" when defining a "conceptual apparatus to reassess their relationship to technology, data and infrastructures" everyone would benefit. Solidarity networks and alliances between cities to protect urban data to become locked down in corporations could steer development in the right direction (Morozov and Bria 2018).

4 STRUCTURED ENTREPRENEURIAL EFFORTS OF URBANTECH

For this paper, 20 UrbanTech projects were analysed that receive or received funding from Dreamit Ventures and Urban-X. The two accelerators were chosen, because their websites provide an introduction to new and still small-scale companies. Also, thanks to the mentoring received at the accelerators, companies tend to present their product and service in a concise format that is easy to compare. 10 projects are presented below. For the other half of analysed projects there was not enough data available.

4.1 Criteria for analysis

Smart city platforms create value by using information in three ways: (1) descriptive (they describe what happened), (2) predictive (they anticipate what will happen, e.g. is inherently probabilistic, using data as a key source of insight), and (3) prescriptive (they provide recommendations on what to do to achieve goals). The questions are thus: What kind of data needs to be read to analyse the past? What kind of sensors or means of real time data collection in the present are necessary to predict a future that is enough to be relevant and far enough to have time to compute the prognosis and implement recommendations? The effect of prognostic systems is always to avoid mistakes. How are mistakes defined? To this end the case studies are analysed according to the service they offer or the problem they propose to solve, the types of data they need to create this service (definition of mistakes) and the way they collect the data. The geographic range they currently cover and their potential to scale is assessed, along with the type of clients and professional partnerships and alliances they formed so far to assess the relevance of the project for a smart city platform.

4.2 The projects

4.2.1 Dreamit

Dreamit is a start-up accelerator founded in partnership with Strategic Property Partners, a joint venture by Jeff Vinik and Bill Gates. Dreamit has an UrbanTech vertical that uses the Tampa Bay Waterfront Redevelopment Project as a case to test "tool[s] that can be part of the workflows for all architecture, engineering and construction companies which want to integrate, BIM, GIS, CAD, loT, web services and visualise them in a worldwide 30 tool that gives them the ability to plan for the future and the impacts of current development."(Fee 2017).

Dreamit's UrbanTech vertical classifies its projects into 3 categories: construction, smart city and real estate. GovTech projects pertaining to electricity, water, waste and mobility are deliberately not included in the portfolio.

4.2.2 URBAN-X

URBAN-X is built by MINI and urban.us. The accelerator collaborates with BMW iVentures to explore follow-up investment opportunities and partners with HERE, Google Cloud, Amazon Web Services, Hubspot, Intercom, IBM, foundersuite, ReachNow and CitiBike for software applications. The program brings start-ups together with experts in areas like UX and UI, mechanical and electrical engineering,

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software development, growth hacking, communications, urbanism and design. The projects listed below belong to the Urban-X Built Environment and Real Estate Vertical.

Name	Service	Data types	Data collection	Interoperability	Professional alliances	Clients	Spatial scale
Amenify	CivicTec / in-home services	Property types and locations, services offered, service requests	Apps, phone hotline	Property management software (Yardi, RealPage, OneSite)	Lyft, Pupjoy, Corepower Yoga, Sun Basket	Multi-family property managements, local businesses, residents	4 cities, scalable
iDevelop.City	PropTech/ scenarios for real estate development	Zoning data, vacancies, requests	Self-digitized zoning codes, Apps	google maps	Unspecified off-site constructors	Real estate developers	3 cities, scalable
PassiveLogic	PropTech/ smart real estate	Building control and management data	Sensors, cameras, touchpads	Pre-installed mechanical building equipment	unknown	Owners and occupants of residential and office buildings and units	Unknown, scalable
Snappt	PropTech/ rental application screening platform	Applicant data	Self-uploaded documents, third party documents, filled in surveys	Bank and credit statements, etc.	Goldman Property Group	Landlords, property managers	US wide
Smart Barrel	ConTech/ construction staff supervision and time management	Photographs, personal identity, time sheets	facial detection camera, weather station	Unknown project management software	NOOS Labs, StartUP FIU, Miami Ironside	Construction companies, site managers	Construction sites, scalable

Table 1: Companies at Dreamit UrbanTech Vertical, 2018 Fall Intake, source: https://www.dreamit.com/all-dreamit-startups.

Name	Service	Data types	Data collection	Interoperability	Professionals /Alliances	Clients	Spatial scale
Envairo	PropTech/ smart real estate	Air quality, occupancy, temperature	Sensors	Unknown	Unknown	Property managements, office tenants	Unit, building, scalable
Avvir	ConTech/ real time construction monitoring	4D BIM, pointcloud	Point cloud scan	Unknown	Unknown	Construction companies, site engineers	Building sites, scalable
Campsyte	PropTech/ outdoor space booking	Description of outdoor spaces	App/ online form	google maps	Unknown	Citizens, owners of outdoor spaces	City, scalable
Rentlogic	PropTech/ Real estate rating	Hygiene (pests), damages, state of equipment	Physcal on-site inspections	Real estate ratings can be displayed on websites with a plugin	Streeteasy, Nooklyn, renthop, compass, Douglas Elliman, NYBits, Zillow, Realtor.com	Tenants, landlords	New York City, scalable
Hosta	DesignTech/ 3D models for design and renovation	3D models created from photos	Mobile phone camera	Unknown	MIT	Homeowners	Rooms, units

Table 2: Companies at Urban-X Built Environment & Real Estate Vertical, source: https://www.urban-x.com.

4.3 Analysis

The projects are rather evenly distributed along UrbanTech categories, with the omission of GovTech which is deliberate in the case of Dreamit and forms its own vertical at URBAN-X. In the ConTech category, Smart Barrel and Avvir improve the management of construction sites or the construction process itself. Barrrel uses real time portrait photos and face recognition to check work hours of staff. Timesheets can be adjusted with this data. Avvir matches point cloud scans taken of construction sites in regular intervals with the BIM model to detect mistakes and adjust construction schedules accordingly. Amenify and Campsyte qualify as CivicTech. They offer tenants and citizens more choices for spending their spare time or outsourcing chores around the house by matching demand and supply. Amenify reaches customers through partnering with

multi-family building managements. Building managements can offer a wider range of concierge services and in turn are granted access to data about their tenants' preferences. Campsyte's platform is open to anyone. Owners of outdoor spaces like gardens and pools and citizens looking for locations to hold outdoor events. Snappt and Rentlogic offer rating services for potential tenants and apartments respectively. Snappt uses documents like bank statements provided by third parties, but makes this an optional choice for applicants. Rentlogic collects data about the quality of apartments and buildings by conducting physical inspections. PassiveLogic and Envairo offer smart real estate solutions. With data collected from sensors they install both companies offer to adjust building equipment, to improve air quality and thermal comfort and reduce energy bills. iDevelop.City tackles real estate development questions that interface with government decisions like zoning, density and location. Hosta provides software for homeowners that turns photos taken with the mobile phone into a 3d model. With this model, scenarios for interior renovation can be developed, materials chosen and the renovation project can be costed.

With the exception of iDevelop.City, the projects obtain digital information from clients. Formats range from 3d or 4d BIM models, to specifications of indoor and outdoor spaces, to financial and other information of tenants, to housekeeping service offers and demands, to indoor climate and types of building equipment already installed. In the case of iDevelop.City government zoning information is digitised by the project. Many services link their data to existing software and data as part of their services. Most popular is google map to indicate geolocation. Rentlogic makes their rating of rental real estate accessible in the form of website plugins available to providers of online rental platforms. In terms of customers and partners, there is a trend to seek out organisations like large residential property management companies in the case of Amenify, to reach scales fast and reduce the number of partners to negotiate with. All of the projects analysed have potential for scaling.

In terms of data analysis and data management policies, not much could be found out. Most of the companies use proprietary software for data analysis. Data analysis software is just as important as the raw data to be analysed. They determine how urban processes are described, how they are predicted to unfold in the future and what kind of measures will be prescribed. Most of these algorithms appear to be based on advanced statistical machine-learning techniques. They use large amounts of training data to create models that can perform classifications and then make predictions. Because they are developed by a service company competing for customers and market share with other service companies, they are proprietary, meaning no one has authority to check how they function or what kind of training data they used.

5 FURTHER TOPICS WORTH DISCUSSING

UrbanTech cannot replace responsive, accessible, responsive and effective government administration. But it can stir up operations as usual and make existing services more efficient and possibly more accurate, and through ways of bottom-up data collection and evaluation, like proposed by Rentlogic, is a slight chance to escalate observations about property hygiene, pests and safety up the administrative hierarchy. Other apps that start as purely commercial services may be of interest to governments. In the example of Rentlogic, landlords apply for a rating of their real estate, because they want to let potential renters know how well their properties compare to other offers. Properties that are obviously substandard or even pose risks to public safety are unlikely to be inspected by the services. This brings up the question about participation. Participation in the digitalisation of urban information seems voluntary. Citizens without a habit of using smartphones and digital apps, are not represented and do not have access to these services. But their data might still be represented. The absence of any mention of how the proprietary algorithms underlying the case studies function raises questions. Concerned about the effect of proprietary algorithms in general, the USACM (U.S. Association for Computational Mechanics) has issued the "Principles for Algorithmic Transparency and Accountability" to start a discussion about the risks posed by the use of algorithms on societal information (Garfinkel 2017). This is far more rudimentary than the concern of data interoperability, while sharing of data is not even addressed here.

A fundamental question about VC funded incubator and accelerator projects are the constraints given by the business model of the VC fund itself. Such constraints can define the types of projects applying for funding, the types of projects admitted to the program and development of the projects after completing the program. In an interview, an insider to a VC incubator explained that incubators and accelerators are under immense pressure to multiply their investments rapidly. One way is to estimate the value of projects at the time of

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completing the program at a multiple of the value at the point of entering the program. This, backed by the public visibility generated during the program makes it possible for the VC fund to sell its shares with high profit. By their nature VC incubators and accelerators are driven by quick financial returns and do not necessarily have the long-term vision and strategy to become a player in the emerging city data marketplace.

6 CONCLUSION

The objective of this paper was to determine whether isolated UrbanTech projects can contribute to and form an integrated smart city platform. The projects that were analysed are all business ideas developed by small teams and funded by venture capital accelerators. Taken for themselves, the start-ups have to compete in a market of ideas and transparency; how data is processed is prohibitive in such an environment. At this early stage, interoperability is of concern only if it forms part of the business model. Some projects use existing online services, mainly google maps, or professional software like BIM software or timesheet software to sell their services. Others offer plugins to third party websites to display there and thus increase the user experience or decision making base of the end customer. The VC accelerators that select, invest in and mentor the projects and introduce them to clients show no long-term vision to position themselves strategically in a city data marketplace. This indicates that the market alone is not suitable to develop an integrated smart city platform, even if the players are fragmented, but the ideas and solutions developed by smaller companies can set an impulse.

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