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City in Transition: Urban Open Innovation Environments as a Radical Innovation

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1 ABSTRACT

In this paper we apply the transition prespective to the field of urban development. As many sectors of our society the field of urban development is undergoing major changes. Commom ways of working and traditional business models fail under the present economic circomstances and are not able to answer to the challenges that climate change, peak oil and the shortage of rare earth minirals present. We view new approaches to the process of urban area development and the introduction of the Smart City concept as prominent examples of potential transitional change in urban development and explore their possible synergies. In order to do so, we use the key concept of radical innovation and find that Urban Open Innovation Environments, such as Fab Labs, have most transitional potential. We conclude with some examples of these environments in the city of Rotterdam and preliminary success factors.

2 SOCIETY IN TRANSITION

Society is in transition: 'We do not live in an era of change, but we are experiencing a change of eras' (Rotmans, 2013, with reference to Verhagen, 2011). We are moving towards a sustainable society. Authors like Rifkin (2011) and Freedman (2009) forsee a new industrial revolution based on advanched digital communication and production and energy from renewalble sources. Such fundamental changes are brought about by transitions.

2.1 Transition studies

Over the last decade a new scientific discipline has emerged focussing on the transition of society (Grin et al, 2010, Van der Hoeven, 2010). A growing number of politicians and academics are convinced that only through drastic system innovations and transitions it becomes possible to bring about a turn to a sustainable society. Often reference is made to the Brundtland report Our Common Future (World Commission on Environment and Development, 1987) definition of sustainable development as one 'that ties in with the needs of the present without endangering the power of future generations to satisfy their own needs,' as inevitable for solving a number of structural problems on our planet, such as the environment, the climate, the food supply, and the social and economic crisis. Sustainable development is not an exclusive type of development that addresses the needs of a select few; it attempts to express the interests of multiple actors in a society as well as the interests of different generations. To summarise, sustainable development is a complex, long-term, multi-level, integrative, multi-actor process (Frantzeskaki et al., 2012).
Transitions are processes of structural change in societal (sub-)systems such as energy, supply, housing, mobility, agriculture, health care, and so on. Transitions come about when the dominant structures in society (regimes) are put under pressure by external changes in society as well as endogenous innovation. Under certain conditions, seemingly stable societal configurations can transform relatively quickly (Loorbach, 2010, with reference to Geels, 2002 and Rotmans et al, 2000). Transitions are conceptualised as societal processes of fundamental change in the structure, culture and practices of a societal system (Frantzeskaki and de Haan, 2009). Table 1 shows the multilevel character of transitions which is central to the systems approach and that researchers have adopted in order to deal with the complexity of transitions.

Transition management types	*Focus*	*Problem Scope*	*Time scale*	*Level of activities*
Strategic	Culture	Abstract/societal system	Long term (30 years)	System
Tactical	Structure	Institutional/regime	Mid-term (5-15 years)	Subsystem
Operational	Practices	Concrete/project	Short term (0-5 years)	Concrete

Table 1: Transition management types and their focus (Loorbach, 2007).

The central assumption is that societal systems go through long periods of relative stability and optimisation that are followed by relatively short periods of radical change. Transitions as processes of 'degradation' and 'breakdown' versus processes of 'build up' and 'innovation' (Gunderson and Holling, 2002) have been witnessed in history, e.g., the transition in the mobility system from the horse-carriage to the automobile (Geels, 2004). Transition management offers a prescriptive approach towards governing these processes as

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basis for operational policy models, and it is explicitly a normative model by taking sustainable development as long-term goal (Loorbach, 2010). Leading transition management scholar and activist Jan Rotmans' (2013) views on the present changes in societal culture, structure and practices are summarised in table 2.

Culture		*Structure*		*Practices*	
Old	New	Old	New	Old	New
Individual	Community	Top-down	Bottom-up	Effectiveness	Affection
Mass production	Tailor-made	Vertical	Horizontal	Efficiency	Trust
Derived values	Created values	Centralised	Decentralised	Control	Autonomy
Linear/carbon-based	Circular/Bio based	Government	Citizen	Rules	Freedom of choice
Financial return	Societal return	Institutions	Lifestyle	Quantity	Quality

Table 2: Transitional changes in culture, structure and practices (based on Rotmans, 2013).

2.2 Present phase of transition: take-off

Next to the multilevel concept (Rip and Kemp, 1998, Geels, 2002), the multiphase concept is central to transition management. Although transitions follow a capricious pattern, from a distance a more gradual pattern emerges following a S-curve, typical for innovation studies, distinguishing between the predevelopment, take-off, acceleration, and stabilisation phases (Rotmans, et al., 2001). At present we find ourselves in the take-off phase, in which efforts should be targeted at facilitating a limited number of radical innovations that have the potential of leading to breakthroughs on a systems level (Rotmans, 2013).

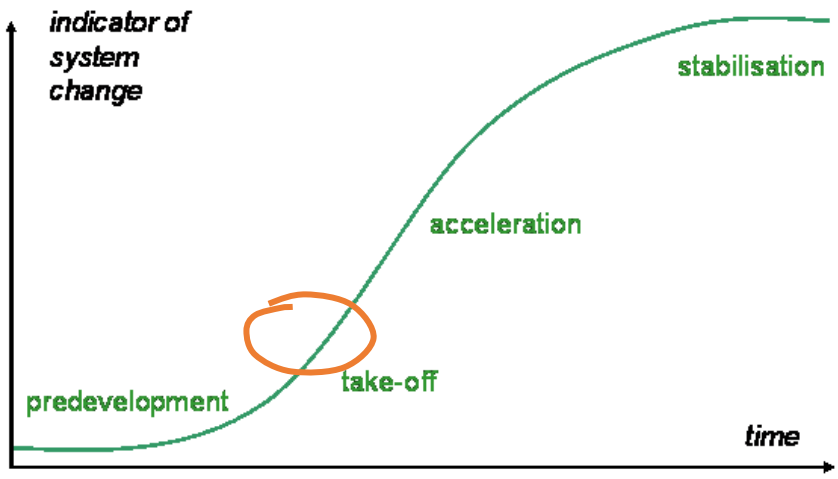

Fig. 1: The four phases of a transition (Rotmans et al., 2001).

2.3 Key concept: Radical innovations

Jonker (2013) explains the essence of the transition towards a sustainable society: Repairing a structurally unsustainable system leads to a patched up unsustainable system. This pattern may only be broken by shifting from a treatment of symptoms within the system to a system change. This calls for radical or disruptive innovations, not only creating new markets and values chains, but in the same time abolish and eventually replace old technologies and business models. This approach relates back to the process of creative destruction as described by Schumpeter (1942).

An example of a radical innovation today is 3D-printing. A 3D-printer turns every consumer into a producer. As such local manufacturing re-emerges and present global manufacturing and distribution systems will change (Brody and Pureswaran, 2013). In a similar manner open data is a radical innovation, challenging the monopoly of governments over information, as is the local production of renewable energy.

In the take-off phase of transition the combination of grassroots radical innovations and changes in the overall external landscape destabilise the system and start its break-down. Within the multilevel model, Rip and Kemp (1998) distinguish between niches, a dominant regime, and an external landscape. In practice, innovations often seem to emerge in niches outside of the leading regime (Kemp, Schot and Hoogma, 1998). When the right niche actors find each other and collate with change minded actors within the dominant regime the configuration of a new regime may emerge and the change becomes irreversible. For the

transition to take-off in this way this group of frontrunners requires certain room to experiment and innovate (Rotmans, 2013).

3 URBAN AREA DEVELOPMENT IN TRANSITION

One of the societal (sub-)systems that is undergoing structural change is urban development. In the Netherlands, the traditional market driven way of urban development, involving large real estate developers and municipalities acting actively on the land market, has failed as a result of the financial and economic crisis. Private and public actors are exploring new ways of working together and new actors, such as private individuals and local collectives, have entered the marketplace. As such the field of urban development is the take-off phase of transition and radicale innovations are key to a further development of the process of change.

3.1 Urban area development

Urban area development may be defined as the integral development of a (large scale) area, in all its dimensions, over a long period, with different stakeholders (public and private). There are no clear limits in terms of size, in terms of investment volume or mere square meters. Complexity is the common denominator as both content and context of the development are complex as a result of a certain combination of the elements above. This distinguishes urban area development from common real estate or property development which involves less stakeholders, takes less time and concern one objects rather than an area based portfolio (Peek and Franzen, 2007).
Although there are many differences between urban area development and real estate development, the core activities that have to be undertaken are quite similar. These can be categorised under five main disciplinary aspects: public-private, land, financing, design and image. The way of dealing with these aspects in area development is very different form project development, both in time and in the relation to the context. Figure 2 shows the specific definition of each of the five aspects for urban area development.

Public-private partnership	Establishing a stable basis for collaboration by allocating authority, responsibilities, risks, costs and revenues
Land assembly	The way the land is or can be assembled and zoned determines the area development to a great extent
Financial engineering	Accessing the future value of the development that determines the amount of investment in land, design and construction
Urban design	Deals with creating the spatial outlines for individual buildings, infrastructural and other works
Branding	Enables to communicate about the core-values of the future area upfront and change its reputation

Fig. 2: The five main disciplinary aspects of urban area development (Peek and Franzen, 2007).

Next to these aspect we identify four phases of an urban development process: initiative, feasibility, realisation and management. These phases essentially show the same sequence that is found in real estate or project development, and the two are interlinked. As urban development establishes the preconditions for project development, the latter typically starts its initiative phase in the realisation phase of urban development.

3.2 Past, present and future of urban area development

By defining the disciplinary aspects and phases of urban area development we have constructed a simple framework that helps us to clearly summarise the changes in urban area development in the Netherlands as we have experienced over the last decade. Before the financial and economic crisis started in 2007 large scale urban developments may be characterised as in figure 3, involving a municipality actively purchasing land and developing it in partnership with large private property companies based on a long-term residual financial model and a ‘blue print’ master plan containing certain landmarks or iconic buildings. The phase of

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management after the works are complete was not part of the area development process as profits were made at the moment parcels of land and constructed buildings were sold to new owners and public space was transferred to the municipal department of urban management.

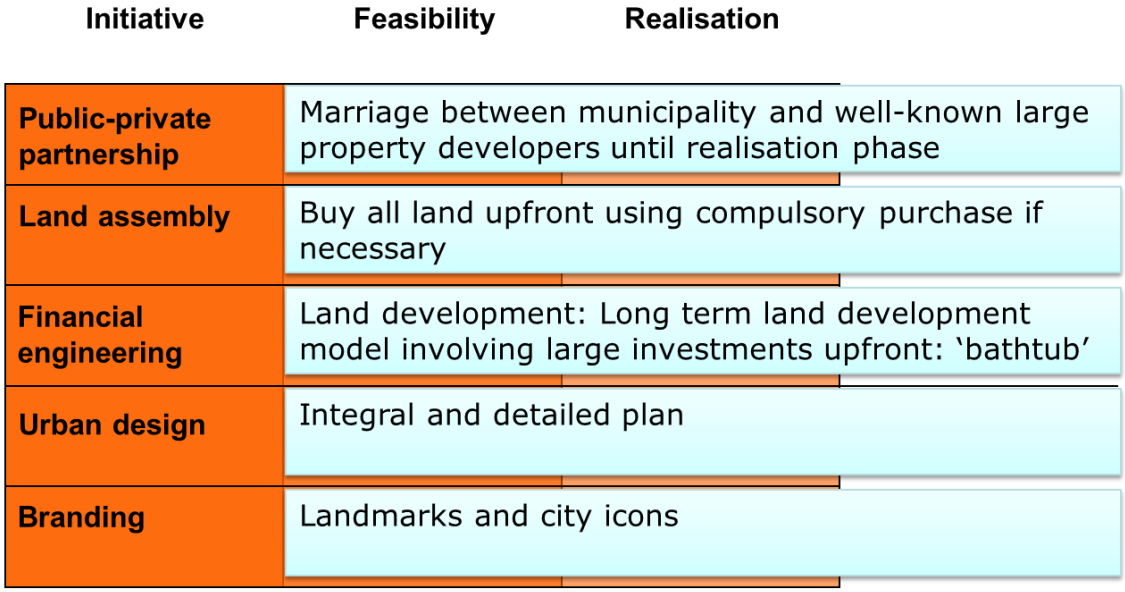

Fig. 3: Typical characteristics of Dutch urban area development before 2007 (Peek, 2011).

After 2007 the lack of available debt finance and the sudden shift from a sellers' market to a buyers' market brought most large scale area developments to a hold. The capacity to (re)develop no longer lies with municipalities and the large property developers. Their 'marriage' dissolved or is in a state of divorce as both actors have to largely depreciate on the land assets they hold.

Fig. 4: Typical characteristics of Dutch urban area development after 2007 (Peek, 2011).

This situation leaves room for other actors to get directly involved in real-estate development, such as local contractors, present land-owners and users and future users of an area. The involvement of these types of actors results in a more bottom-up approach and a decreased project size. Figure 4 characterises the present state of Dutch urban area development. Most striking is the emergence of appreciation for the present state of the area. Where before a 'tabula rasa'-situation as start of the (re)development was preferred and strived for, currently actors see potential in the existing land use and aim to build on this, limiting investments upfront and benefiting from temporary uses.

In our opinion this type of urban area development does not suffice to answer the challenges our cities face. Especially in the field of sustainability the ability to invest on a larger scale is needed, for instance in infrastructure supporting renewable energy solutions and urban transit systems. In order to do so we advocate an area development process that also involves the future management phase. With this we move

away from a development approach focused on risk reduction and profit from a temporary – albeit lengthy – commitment, towards the users' perspective focusing on continuity and long-term value creation combined with a continued utilitarian valuation of the property. Figure 5 characterises our view on the future of urban area development process spanning five phases.

Viewing urban area development mainly as a process of urban management instead of a sort of property development XL offers opportunities for the coupling of juxtaposed (financial) flows in the area to those of the real estate business case. Coupling these flows, such as energy (electricity, gas, heat and cold), water, waste, transportation of people and goods and information, increases the financial base for development of the area and offers opportunities for more sustainable solutions for the future.

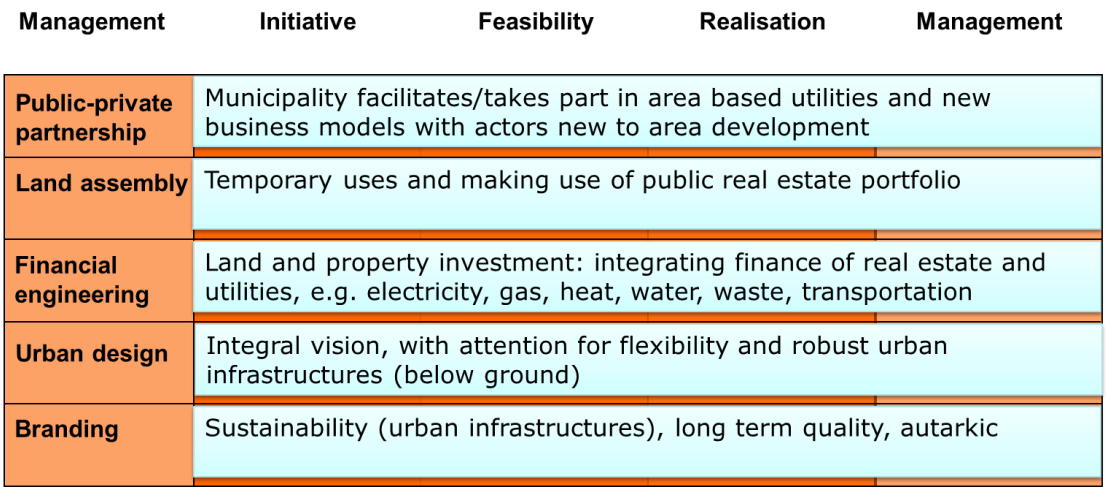

Fig. 5: Characteristics of a future urban area development process (Peek, 2011).

3.3 Key concept: Supply chain integration

We agree with Rotmans (2013) and consider the present Dutch practice of urban area development to be in the take-off phase of a transition process. Changes in the external landscape of area development like a decrease in population in certain regions of the country, changing work patterns (flexible hours and working from home) and space for water resilience, have resulted in a deadlock of the pre-crisis development model. The crisis itself was merely a trigger to reveal the faults of the system. In the meantime on a local level many bottom-up experiments are on their way. People start producing their own renewable energy, individually or in collectives. Others seize this opportunity to design and build their own home. Some experiment developing floating homes for living on water or make use of vacant plots of land for urban farming.

Analysing these niches for the perspective of our vision on the future of urban area development we find that all in some way or another deal with supply chain integration (Peek and Van Remmen, 2012). Some initiatives lead to vertical integration, as end-users take the lead in the development process or emphasis is on the transformational powers of the current owners and users. Others mainly focus on an area based approach to utilities such as energy and water and by that resulting in a horizontal integration of real estate with these adjacent sectors.

4 SMART CITY CONCEPT

Technology is a main driver of innovation. In the field of urban development we find an entire movement based on new technologies under the umbrella of the 'Smart City'. The Smart City approach has gained a lot of momentum out of the belief that the availability of intellectual capital (or knowledge) and social capital are urban production-factors that determine the competitiveness of cities (Caragliu et al., 2009). Smart City refers to sustainable urban development (smart environment); to the incorporation of information and communication technologies in the management of services (smart economy); to the generation of participatory spaces in terms of collaboration and innovation (smart governance). Table 3 gives an overview of the core-aspects of the Smart City approach. As such the concept may serve many different intentions, not touching upon interrelations and contributions to overarching goals, and remains particularly polysemous and vague. This is probably why it has turned into a highly used term when proposing or justifying urban reforms (Tironi, 2013). Smart City is also a successful term for marketing new urban technologies used by multinationals like IBM, Cisco, Siemens, General Electric and Philips.

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Why?	*What?*		*How? (technology)*		*How? (organisation)*	
Sustainability	Resources	Utilising	Infrastructures	Communicating	Public	Providing conditions
Resilience	Economy	Adding value	Buildings	Producing	Private	Investing
Quality of life	Politics	Connecting	Places	Meeting	Individuals	Participating

Table 3: Core-aspects of the Smart City approach.

We value the innovative power of the Smart City, but question its transition force as the concept is already captured by the dominant regime with showcases like Songdo International Business District and Masdar City.

4.1 Benchmarking 'smartness'

As no city wants to be a 'dumb' city, the Smart City concept is quickly adapted for benchmarking cities. An example is the Smart City-model ranking European medium-sized cities (Centre of Regional Science, 2007) that defines a Smart City as a city that is well performing in a forward-looking way in economy, mobility, environment, citizenship, quality of life and governance, built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens. These aspect also feature the Smart City Wheel (figure 6) that was introduced by urban and climate strategist Boyd Cohen and that he uses to benchmark the world's major cities (Cohen, 2012a).

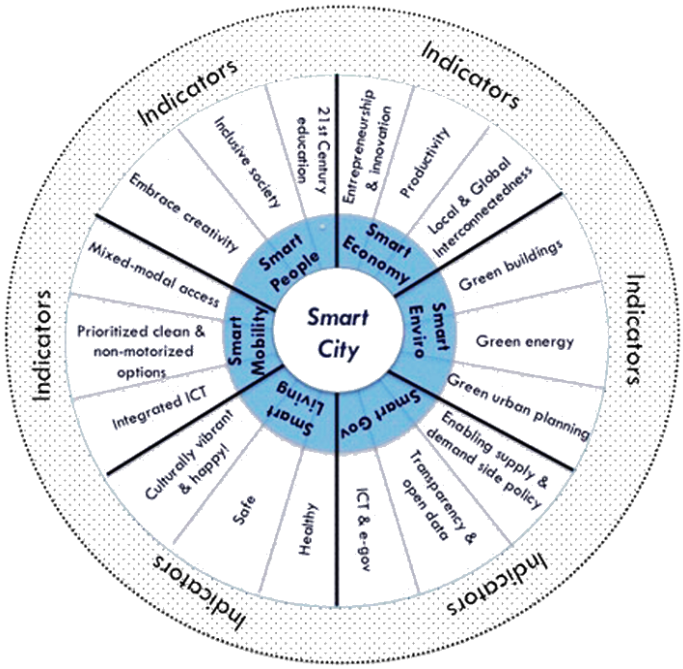

Fig. 6: Smart City Wheel (Cohen, 2012b).

4.2 Key concept: empowering ICT

Although citizens' participation is emphasised and the benchmarks even hint at possible change in roles of government and citizens, the Smart City concept remains, both as benchmark and as marketing tool, highly top-down oriented aimed at better managing and controlling city systems by collating ever-detailed information about real time functioning, and being able to optimise decision making in the immediate, short and long term. Cosgrave et al. (2013) state that 'the Smart City should not necessarily be interpreted as top-down vision delivered solely through government investment. Quite the opposite, the Smart City is largely an organic system of systems (Harrison and Abbott Donnelly, 2011), which comprises an ecosystem of products, services, companies, people and society that are working together creatively to foster innovation within the city'.

From a transition perspective the key concept of the Smart City should be application of ICT that is aimed at empowering citizens, rather than focussed on improving control of city systems. 'Citizens are not only engaged and informed in the relationship between their activities, their neighbourhoods, and the wider urban ecosystems, but are actively encouraged to see the city itself as something they can collectively tune, such that it is efficient, interactive, engaging, adaptive and flexible' as Arup (2011) describes in their Smart City vision.

5 URBAN OPEN INNOVATION ENVIRONMENTS

The combinations of our key-concepts of transition, urban area development and Smart City – respectively radical innovations, supply chain integration and empowering ICT – leads us to believe there is a new type of urban use emerging, next to the traditional mix of residential, offices, retail and leisure, that is able channel the transitional opportunities as described: the Urban Open Innovation Environment. Existing and tested concepts of the Living Lab and the Fab Lab are part of this new typology.

5.1 Open innovation

Radical innovations, supply chain integration and empowering ICT all highly depend on the openness of their respective processes. In contrast to closed innovation, the open innovation paradigm was introduced by Henry Chesbrough (2003) and implies companies opening their innovation processes for the inflow and outflow of knowledge and information. Chesbrough et al. (2006) defines open innovation as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively'.

Open innovation is at the core of Finnish society. Finland has created a bottom-up, dialogical, collaborative and human-centric strategy that is central to its development as a nation (Finland's Country Brand Strategy, 2010). This fresh picture of a people-driven society is based on the idea that the society best develops based on its dynamic individuals and their networks. Since the Finnish EU Presidency in 2006 (The Helsinki Manifesto, 26 November 2006), the EU presidencies have promoted open, ecosystem-based human-centric research, development and innovation in real-life contexts such as living laboratories (Living Labs) that engage people (European Commission, 2013).

5.2 Living labs

Centred on co-creation, exploration, experimentation and evaluation Living Labs bring together public and private actors, such as companies and associations, and individuals to test new services or products. They provide a user-centric approach to develop and prototype complex solutions to emerging socio-technical challenges to promote open innovation and involve users early in the desig.. This all happens in a real life context. Their success relies heavily on user co-creation.

However, little attention has been paid so far to the question if and how the participating users could not only be the Guinea pigs (worst case) or co-creators (best case) in a Living Lab setting, but actually become co-owners of the solutions proposed and developed. Results from true co-creation, one might argue, should not disappear behind corporate walls. As it is the case with open innovation, the game logic of Living Labs is still to benefit corporations that are focusing on selling services and technology to governments and other public entities. The accreditation of Living Labs through a single non-profit association – the European Network of Living Labs (ENoLL) headquartered in Brussels – as the legal representative entity of the network, does not exactly paint a more network oriented picture of the Living Lab approach.

5.3 Fab labs

Radical innovation, in the authors' view, is rather to be expected from communities and 'institutions' that adhere to principles of open source, open content and open access. Such communities would need to be inclusive in terms of of societal and systemic innovation to thrive and become sustainable. In the world of software and information, some open source projects have demonstrated such characteristics. While the modern DIY – or Maker – movement is often seen as a hedonistic pass-time activity, its manifestations – Fab Labs, Makerspaces and Techshops – are attracting growing interest in many industries. Fab Labs are a global network of local labs, enabling invention by providing public access to digital fabrication. They share an inventory of core capabilities and can be considered a community resource. Makerspaces are similar, often equipped with the same machines, but lacking the global network. Techshop is an a US based provider of state-of-the-art public manufacturing workshops.

Globally, big players have started to fund Fab Labs on a substantial scale. Schlumberger is supporting the development of Fab Labs in Russia, Aramco sponsored the first Fab Lab in Dhahran (Saudi Arabia), and Chevron promised support fort setting up Fab Labs in US communities where it is active. Ford in the US and BMW in Germany are partnering with Techshop to provide their employees with access to digital manufacturing technology for tinkering outside working hours.

More interesting, however, are small-scale but high-tech developments, certainly from a perspective of emerging socio-technical production paradigms. For instance, Barcelona is pronouncing itself as 'Fab City' and aims to develop neighbourhood Fab Labs in every city district. The Dutch order of Inventors was a key partner for setting up the Fab Lab in Utrecht. In Amersfoort, the Netherlands, an artists' collective is

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effectively transforming a former dye factory into a testbed for the transition town movement, centered around a Fab Lab. The Swiss clean tech accelerator Blue Lion in Zurich is setting up a Fab Lab for its companies.
In the following chapter we shall provide a series of case studies of urban open innovation environments in Rotterdam, the Netherlands, that defy the top-down approach of centrally planned 'creative hotspots'. They represent not the archetypal grass-roots, bottom-up, counter-culture projects, but stand for a new type of initiatives that appear to operate on a lateral rather than a hierarchical dimension, very much akin to Rifkin's projection of a shift away from hierarchical power and toward lateral power (Rifkin, 2011).

6 URBAN OPEN INNOVATION ENVIRONMENTS IN ROTTERDAM

In Rotterdam, there are many players who are actively working on combining real estate development and urban planning with the emergent phenomenon of the Maker movement. The incubator Dnamo in Rotterdam decided to refocus its activities as 'RDM Maker Space'. Urban developer Stipo Rotterdam together with the city council and possibly Techshop are working on converting the Zomerhofkwartier to the making neighbourhood ('maakkwartier') of Rotterdam. Other initiatives include the Platform Digital Manufacturing, de Bende with its plans to make crafts-based making accessible, the 3D Print Academy, 'De Makers van Rotterdam', an initiative of social enterprises centered around Making, and the 'Made in 4Havens', an emerging design and production hotspot.

6.1 RDM Maker Space

RDM Maker Space is based in the former shipyard of the Rotterdamsche Droogdok Maatschappij (Rotterdam Dry-dock Company, RDM) that has been converted to an innovation hub where higher education, research institutions, start-ups and companies are located. The place provides opportunities for sharing knowledge, exchanging best practices, conferences and networking. RDM Maker Space offers access to high-tech manufacturing equipment as well as prototyping and manufacturing services. RDM Maker Space aims to spur innovation and entrepreneurship and to create a place where smart, creative and experienced people with different skills come together and eventually form a large community of makers.

6.2 Zomerhofkwartier

Zomerhofkwartier in Rotterdam, an area in walking distance of the central train station, is almost a textbook example of the aforementioned new style of urban development. The owner of the area has decided on a time-out of ten years to study the potential of the area and its bottom-up initiatives after traditional approaches to development turned out to be difficult and little promising. The time-out approach allows the developer to involve everybody in shaping the neighbourhood. The transitional character of the area attracts the creative industry; and the developer has pronounced the neighbourhood as the 'maakkwartier' (making quarter) with an emphasis on the creative and niche manufacturing industry and with a view to possibly attract Techshop to set up a large making facility there. Yet they remain open for others who embrace their philosophy, and remain open to the precise result of such developments (Van den Berk, 2013).

6.3 Made in 4Havens

Made in 4Havens is an emerging initiative in a former but now derelict dockland area in Rotterdam managed by the city council and the harbour board. The area has been designated to house innovative business in the fields of clean tech, medical and food. However, the area is also home to quite a few leading Dutch designers. Made in 4Havens currently serves as a platform to make local design visible and to connect it to local craft and manufacturing. One vision of Made in 4Havens is to integrate the local workforce to complement design with local production (Sant-Barendregt and van Dael, 2013).

7 CONCLUSION

Relocating production and research functions to the centres of neighbourhoods adds to liveability and to the local economy. Instead of focusing on offices, retail or residential areas as the core of urban area development, it call for exploring the possibilities of centring such a developments on a lab like approach. This requires a rethinking of the spaces of production, including the relationships between people and tools and people and the existing authorities. The open nature of a lab-centric approach ensures that government control is limited and provides conditions for radical innovations in the realm of urban development.
Eventually, the emerging lab-centric initiatives might well be developing into new institutions of a radically different type of economy, an economy that fundamentally contrasts the conventional top-down organization of society that characterized much of the economic, social, and political life of the fossil-fuel based industrial

era. Its new paradigms are 'distributed' and 'collaborative', paradigms that appeal to a new generation of people who grew up with the Internet and who have for all their live been engaged in distributed and collaborative social spaces in parallel to the traditional, hierarchical environments of family, school and job.

As such we find the new type of use of the Urban Open Innovation Environment a potential strong change agent for radical innovation in the field of urban area development as they combine supply chain integration and empowering ICT. The success of these new environments large depends on their open character, not being part of the dominant regime of large companies and (governmental) institutions, but also not being trapped by a counter culture driven niche of grassroots/bottom-up actors that are not willing and able to leverage on their efforts. True openness in this respect refers to the ability to not only involve niche players, but make cross-overs to change minded actors within the dominant regime so that though lateral development (Rifkin, 2011) new regimes may emerge and the change becomes irreversible. Fab Labs appear to be more successful in this respect than Living Labs, which mainly benefit the private companies involved and not society at large.

Governments have an important role to play here. For Urban Open Innovation Environments to be truly open certain room to experiment and to innovate is required. Yet, only focussing on the operational level of concrete projects is not enough. For a new regime to emerge efforts on the tactical level have to be made, involving the support of emerging new, lateral 'institutions' that are able to generate business from radical innovations. These environments should enable new types of entrepreneurship, such as micro-multinationals, and even social enterprises operating beyond traditional business models. In this way, Urban Open Innovation Environments are able to become a constant force in the field of urban area development making cities in transition more sustainable and resilient, and adding to the quality of life.

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