IRIS Utrecht presenteert:

Smart city business model incubation

Development and barriers in the city of Utrecht

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Achtergrond/context van het rapport of product:
Binnen het project IRIS Smart Cities is de Universiteit Utrecht in samenwerking met Utrecht Inc verantwoordelijk voor het opzetten van een incubatietraject voor (nieuwe) verdienmodellen op het gebied van Smart Cities. Om een dergelijk programma op te zetten zijn incubeerbare ideeën nodig. In het project worden door de Universiteit Utrecht drie wegen verkend om tot incubeerbare ideeën te komen, namelijk 1) via (spin-offs) van bestaande bedrijven, 2) via start-up challenges en 3) via *user innovations*. Dit verslag, gericht op het identificeren van kansen en ideeën voor nieuwe verdienmodellen, is de uitkomst van interviews met 17 bestaande bedrijven uit de regio Utrecht.

Kernvraag:
Welke (commerciële) kansen en obstakels worden door bestaande bedrijven, actief op het gebied van de vijf *transition tracks* binnen IRIS Smart Cities, geïdentificeerd?

Samenvatting/opbrengst:
Aan de hand van interviews zijn verschillende bestaande bedrijven, gelieerd aan het project IRIS Smart Cities of actief in de regio Utrecht op het gebied van Smart Cities, geïnterviewd met als doel om incubeerbare ideeën/verdienmodellen te identificeren. De interviews hebben geresulteerd in interessante data rond gepercipieerde kansen en obstakels in het Smart City ecosysteem, maar hebben geen incubeerbare ideeën/verdienmodellen in de juiste ontwikkelingsfase opgeleverd.

Tags:
Smart City, Business Models, Stakeholders, Ecosystem

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IRIS

Integrated and Replicable Solutions for Co-Creation in Sustainable Cities

Task 3.1 (WP3)

Smart city business model incubation: Development and barriers in the city of Utrecht

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1 Introduction

The purpose in WP3, T3.2 is to identify and help develop new, bankable business models that support the transition tracks that have been identified in the IRIS project. Utrecht University, in close collaboration with Utrecht Inc. is responsible for setting up a business incubation program in which we aim to develop such new business models. An incubation program, however, obviously needs incubatable business ideas. Getting these is far from trivial. Generating and collecting such ideas, with capable teams to implement and develop them into a viable business, is a key challenge in any business incubation program (Hansen et al., 2000). In IRIS this challenge is even larger as we want to focus on business models in the five predefined transition tracks and search for teams and firms in the three lighthouse cities primarily.

From the literature we can derive that there are broadly speaking three sources of new business ideas that we can look at (see e.g. Alexy et al., 2012; Coyne et al., 2007; Dahlander and Piezunka, 2014): New business models can come from existing companies, active in the transition tracks already; from new entrants that look for new application of technologies and solutions they have available; and finally from citizens and users that experience problems along the way, for which solutions may have been developed non-commercially representing viable new business ideas. All three sources have their specific incubation challenges. With spin-outs from incumbents the team is often strong and capable, but the new business may not be in the strategic interest of the incumbent and the new venture competes with ongoing business concerns for attention, energy and resources. For new entrants this is not an issue, but these ideas are often supply push and market demand is doubtful. Whereas for user innovators, the demand is obviously there, but the team is often weak or even absent. A well-designed incubation program might alleviate these bottlenecks and thereby promote business development. In IRIS we proposed to try and tap into all three sources and perform a match making function between various stakeholders to generate incubatable ideas for new business (see Figure 1 below).

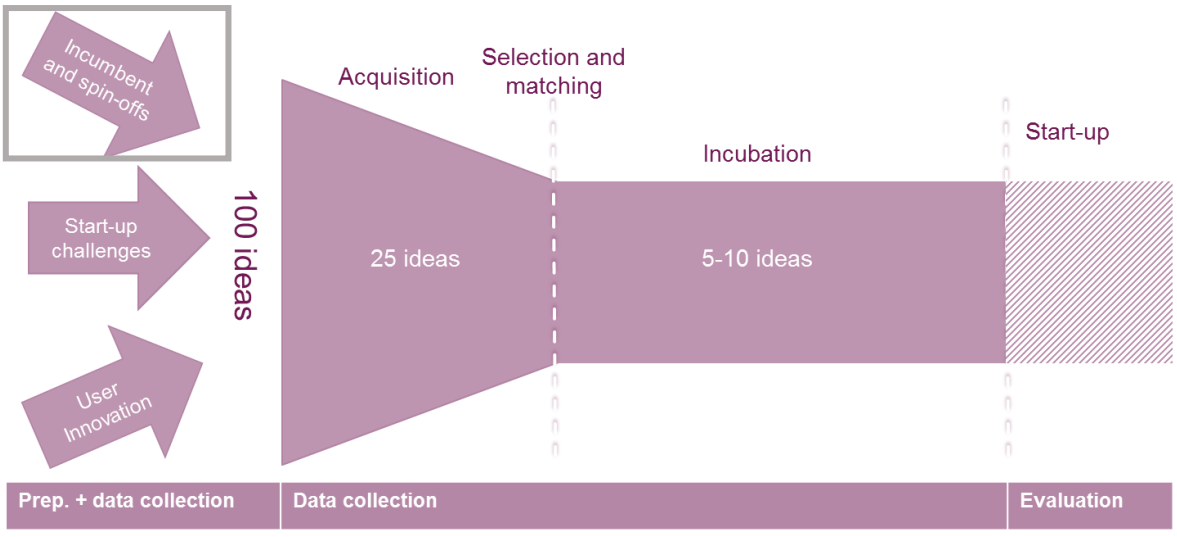

Figure 1: Focus of this report

Our first step in developing the full program was to scan the existing local ecosystem in Utrecht for opportunities and ideas. As this exercise also generates relevant information for other parties in the consortium, we produce this intermediate report. In it, we present the results of interviews that were held in the period November 2017-April 2018 in Utrecht. We contacted 37 and interviewed 17 businesses in and around Utrecht in order to generate data and collect information into the inner workings of their innovation processes (Taylor, Buck and While, 2017). The targeted interviewees were found in the consortium and local entrepreneurial ecosystem and were selected to be active in the five transition tracks targeted in IRIS: 1) Smart renewables and closed loop energy positive districts, 2) Smart energy management solutions, 3) Smart e-mobility, 4) City Innovation Platforms and 5) Citizen engagement and co-creation. As there are no commercial firms active in the latter transition track and our user innovation focus in the years to come will cover citizen engagement, the latter transition track was left out of scope in the first year. The following questions were discussed with innovation managers, business developers or strategy representatives in these firms.

1. How does your company act in the IRIS transition pathways?
2. What kind of problems do the clients of your company face in these areas?
3. What would be potential solutions, and could they be commercially exploited?
4. Is your company actively pursuing these ideas (for example through the creation of spin-offs or through or forms of 'start-up support')?
5. Which barriers prevent the commercialization of (your) smart city ideas?

Not all firms were able or willing to provide detailed answers to all these questions and we regret to say that our interviews did not uncover any readily incubatable ideas. Responses on questions 3 and 4 were thus usually limited. But this was perhaps to be expected. We managed to only interview 17 people in as many firms and it would indeed be a rare coincidence if one of these people would have detailed information about a potential business idea in the exact right stage for it to enter incubation. Still our interviews, together and individually, do give a good overview of the current state of things in the Utrecht ecosystem and we thought it useful to report on our findings. The structure of our interview guide (see appendix) implies we carefully mapped the current business models on a well-established business model canvas and the discussions with our interviewees were revealing on opportunities and barriers they perceive in the Utrecht ecosystem for smart city innovation. In addition to the results of our interviews, we also draw conclusions on our own process and discuss how we have pivoted the incubation program to address the challenge of identifying viable business models in the future.

The remainder of this report first briefly presents the research context and methodology. Then section 3 discusses the data we have collected and describes the business models that our interviewees currently operate in the different IRIS-transition tracks. Our interviewees, short of offering detailed future business models they want to develop, did give us a lot of information on the trends and opportunities they see in their respective markets. Section 4 presents the results on these outlooks for the IRIS transition paths. Section 5 then presents the major barriers our interviewees identified for their firms to address challenges and engage with new opportunities. Section 6 concludes and reflects on the results as well as the next iteration of the IRIS-incubation program for Utrecht.

2 Research context

In this research, a qualitative research approach (Patton, 2002) was used. A team of research assistants[1] contacted businesses of various sizes and asked to discuss business ideas with innovation managers, business developers or strategy representatives (see e.g. Alexy et al., 2012). To build a relevant database of interviewees, our research assistants conducted several interviews with multiplier parties. We kept doing multiplier interviews until saturation was achieved. That is, new multipliers would not mention new target interviewees. We started by contacting the IRIS Project partners, and then continued to contact other companies using snowball sampling, the multiplier interviews and the researchers' professional networks (Bryman, 2016). In total, 37 organisations were identified as relevant and approached for an interview. Out of these organisations, 17 organisations (46%) agreed to have an interview representing typical cases from a smart city eco-system.

The interview guide is reproduced in the appendix. To allow for a comprehensive assessment of new business ideas we mainly based our questions on the established business model canvas that is used in the lean start-up method process (Osterwalder et al., 2005). After a brief introduction of the research process, interviewees were asked to elicit their current and prospective involvement in the smart-city ecosystem. The interviewers then turned towards (most promising) business ideas as well as its origin (one of the contributions of this research). The remainder of the interview revolved around properties of this potential new idea, including the customer value proposition, key resources and process to implement that idea (value delivery) and the profit formula (value capture) (see also Bocken et al., 2014). In a final part we discussed future developments of the business models (with respect to the transition track) as well as barriers with the company representatives.

The interviews were conducted in the time-period November 2017 to April 2018. The interviews had an average length of 41 minutes, the shortest lasting 23 minutes, and the longest lasting 78 minutes. During the interviews, the interview guide (see appendix) ensured our research assistants consistently asked about the way the organisation acts in the IRIS transition pathways, what problems companies face in these areas, and what potential solutions they think would be feasible and could potentially be commercially exploited. There was a strong focus on (potential) new business models. The coding strategy started from a top-down analysis by using the business model canvas (Johnson et al., 2008). In addition, during the coding process, codes that arose from the interview data were added (Patton, 2002; Yin, 2014). All interviews were coded independently by at least two researchers and the senior researcher checked consistency in blind samples.

3 Interviewed organisations

The interviewed organisations consist of partners of the IRIS consortium (Utrecht) such as Bo-Ex, Civity, LomboXnet, Qbuzz as well as other parties active in the smart-city ecosystem of Utrecht. Further companies that took part in the study were Solease, Suez, Elaad, Wocozon, van Scherpenzeel, Viriciti,

[1] We are grateful for the excellent work of Elisa de Weerd, Inge Scholman, Fernanda Ardiles Morgado, Thomas Achtereekte, Aleksander Tase

Senfal, Qwiksense, Sundata, Veolia, Strukton and Antea Group as well as intermediary organisations (TNO). An overview about the consulted organisations can be found in Table 3-1.

Table 3-1: Sample

Name of the company	Sectoral focus	IRIS consortium	Transition Track
Antea Group	Engineering & Consultancy	No	3
Bo-Ex	Housing corporation	Yes	1, 5
Civity	Data management	Yes	4
Elaad	(Smart) charging infrastructure	No	3
LomboXnet	(Smart) charging infrastructure	Yes	2, 3
Qbuzz	Public transportation	No	2, 3
QwikSense[2]	Energy data management	No	2
Senfal	Energy data management	No	2
Solease	Solar energy	No	1
Strukton	Rail infrastructure	No	3
Suez	Waste processing	No	1
Sundata	Solar energy	No	1
TNO	Research institute	No	1, 2, 3
van Scherpenzeel	Waste processing	No	1
Veolia	Resource management	Yes	2, 3
ViriCiti	(Smart) charging infrastructure	No	3
Wocozon	Solar energy	No	1

Bo-Ex, Solease, Suez, Sundata, TNO and van Scherpenzeel are all active in transition track 1, Smart renewables and closed loop energy positive districts. Both **Suez** and **van Scherpenzeel** are trying to turn waste into energy, closing the loop. **Bo-Ex**, as a housing corporation, is looking to make their portfolio energy neutral. Both **Wocozon** and **Solease** are provider of renewable energy, marketing solar panels as a service, targeting renters and private home owners respectively. **TNO** is a research institute working on research questions in this transition track, as well as transition tracks 2 and 3.

In transition track 2, Smart energy management and solutions, active organizations are LomboXnet, Qbuzz, Qwiksense, Senfal, TNO and Veolia. IRIS-partner **Qbuzz** puts the organization of storage of energy at the core of their business model development activities. They aim at storage and sell electricity with their busses and provide enhanced load-management to the grid operator. **LomboXnet** also targets storage and control, by providing solutions to storage in cars but also stationary storage. **Qwiksense** uses data to improve the indoor climate in i.e. schools and offices. Senfal uses artificial intelligence to manage energy use and production. **Veolia** is a French transnational company with activities in four main service and utility areas traditionally managed by public authorities – water management, waste management, transport and energy services, extending its activities to both transition tracks 2 and 3.

Antea Group, Elaad, LomboXnet, Qbuzz, Strukton, TNO, Veolia and Viriciti are active in transition track 3, Smart e-mobility. **Antea Group** is an internationally active engineering and consultancy agency,

[2] QwikSense was declared bankrupt in February 2018 and has since continued activities as Unicornify Labs.

specialized in the infrastructure of (e-) mobility, a specialization they share with construction company **Strukton**. **LomboXnet** and **Qbuzz** both work on mobility solutions (vehicle to grid) including cars solutions, as well as electric busses. **Elaad** is a knowledge centre for electric mobility and **ViriCiti** provides monitoring systems for electric trucks and busses.

Civity is a main provider of City Innovation Platforms, transition track 4, whereas **Bo-Ex**' core business is social renting of houses, putting citizen engagement – transition track 5 – very close to their core business, because Dutch law and regulations largely protect renters from changes to their housing situation and prior consultation and consent is usually required.

4 Trends and Scenarios for Transition Tracks

During the interviews, interviewees were asked to reflect on the most relevant trends for the future. These outlooks can be clustered according to the transition tracks identified above and give us an overview of the future the active players in each transition path are currently planning on. Taking the most common elements from these outlooks together we can build scenarios that organisations active in these tracks are most likely to face when it comes to developments in the are smart city innovation.

Table 4-2: Trends and scenarios for Transition Tracks

Transition Tracks (TT)	Likely scenarios
TT1: Smart renewables and closed loop energy positive districts	• Data protocols will be put in place, so available data can be easily linked • Increase in need for connecting organisations (i.e. municipality, incubators, etc.), who link smaller organisations together to generate co-created ideas and business models • The B2B and B2C markets will change from a purchasing market to a service market, changing underlying business models. Where currently as much products as possible need to be sold to make profit, future products need to last to make a profit; • Product production will become increasingly circular, more often using recycled raw materials;
TT2: Smart energy management and solutions	• Housing and offices will become energy-neutral and use of renewable energy will be substantial • Consumers will increasingly enter the energy market as producers; • Innovation will become increasingly data-driven, as historic data can be used to predict future developments; • A clear link will emerge and develop between smart mobility and smart energy, in terms of generation and storage of energy

TT3: Smart e-mobility	• An increase in number of smaller organisations with very specific knowledge (data, expertise, etc.) • An increase in size of object printing possibilities is expected, making it possible to print i.e. houses, bridges, etc. • Time-to-market of innovations exponentially decreases; • Increase in drones as a means of transport (people, packaging) • Decline in (ownership of) cars • Self-driving cars and public transport (buses, trains, etc.) • Increase in use of public transport • Transport will become electric
TT4: City Innovations Platforms	
TT5: Citizen engagement and co-creation	

Taking the most common elements from these outlooks, we conclude from table 3-2 that the interviewees in Transition Track 1 foresee a need for so-called orchestrators. A lot of activity is happening concerning smart city developments, increasing the need for connecting existing organizations and streams of data, to bundle resources in moving towards these future scenarios. This expected scenario is shared by organizations active in Transition Track 3. Interviewees for example said:

> *"We're now constructing a part of the puzzle that touches upon other parts of the puzzle. I think the biggest opportunity is how to, in a smart and efficient way, combine all these pieces of the puzzle together. [..] the role of the incubator can also be the role of an integrator of all these different pieces of the puzzle."*
>
> Renewable energy producer

> *"One of the main challenges is going to be linking all available data. Gathering all the data from public transport companies, car and bike sharing businesses, et cetera, and putting them in one place."*
>
> Mobility consultant

In terms of business modelling, we can conclude that players in the energy service market see the trend where the need for more sustainable products represents a clear opportunity for business, as a shift from a product to a service-market is expected. If businesses have the incentive to sell as many goods as possible, the sustainability level of the respective goods will not be optimal.

> *"When making long-lasting sustainable products - which do not easily break down, that are easy to repair, and in the end of the life cycle are easy to recycle - you'll only have the financial benefit of the product in a service business model."*
>
> Renewable energy producer

In terms of smart energy management (TT2), interviewees expect a large impact from the transition from fossil fuels to renewable energy when it comes to production and consumption of energy, increasing the need for balanced grid-use. In finding this balance, there is an increasing need for energy storage and large quantities of data to predict flows of energy.

> *"We have had the situation in Germany, where during a very sunny day, there was not enough demand for energy. This resulted in a negative price for energy (consumers received money for using energy, red.). Now it must be possible to switch off solar parks, which is absurd."*
>
> Mobility infrastructure producer
>
> *"Using data, we can predict and look at historic patterns."*
>
> Energy manager

A conclusion we can derive from interviews with organizations active in smart e-mobility (TT3), the transition to electric cars and busses, accompanied with the transition from product to a service market, will largely impact (inner) cities. Decreasing ownership of cars and more frequent and efficient use of public transport will also change the use of public space. Or as an interviewee put it:

> *"Public transport use will increase, and we will see more use of car services instead of ownership. [..] You're going to need less parking spots, opening up the possibilities of rethinking public space."*
>
> Mobility consultant

No future scenarios are mentioned in the interviews with organizations active in Transition Tracks 4 and 5. This is not necessarily strange, since both tracks are horizontal tracks overlapping Transition Tracks 1 to 3, largely covering the same activities.

5 Barriers to smart-city business model development

Throughout the research several barriers to business model development and implementation were mentioned. In the process of open-coding, we coded these into commercial, communication and partnership, legal/taxation, societal and technical barriers. In the axial coding phase we linked these to existing literature (Bocken et al., 2014; Ceschin, 2013; Rauter et al., 2017). Technical, commercial and communication barriers mainly link to the customer value proposition, value delivery and value capture part of the business model (Bocken et al., 2014). Legal, tax barriers and partnership barriers as well as

societal barriers more explicitly are part of the wider socio-technical environment that influences the development and implementation of business models (Ceschin, 2013; Rauter et al., 2017).

Our coding scheme is thus not exhaustive perhaps, but it allows us to discuss the barriers identified in more general terms. For an overview see Table 5-1. We will refer to "an interviewee" if only one mentioned it, "some interviewees" if it were at least two and "all interviewees" when in a transition track all interviewees mentioned and described similar barriers (see also Polzin et al., 2018).

Table 5-1: Categories, barriers and corresponding transition track

Barrier Type	Experienced Barrier	Transition Track
Commercial	Knowledge at customer's organization	2
Commercial	Long term planning (electrical cables, grits, etc.) make short term innovation hard	3
Commercial	New product innovations (much) more expensive than current products (electrical cars)	3
Commercial	Small financial margin in energy market	2
Commercial	Tax regulation doesn't promote enough the use energy during non-peak hours	2
Commercial	High storage costs	1
Commercial	Intelligent products often a lot more expensive than non-intelligent versions, not possible to earn difference back	2
Commercial	Finding developers	1
Commercial	Cost of infrastructure is very high	2, 3
Communication	Lack of skilled workforce within organization	3
Communication	Decision-making in organizations very cumbersome	3
Communication	Education level in city neighborhoods very different, need for different ways to communicate	5
Communication	Innovation also means educating customers	3
Legal and tax	Concerns about use of data in terms of privacy legislation	4
Legal and tax	Flying drones within 25 meters of the road is not allowed	3
Legal and tax	Need for more favorable regulations concerning energy (use of batteries, nudge people to use electricity in non-peak hours)	2
Legal and tax	Energy neutral buildings mean wind and sun energy collection in the neighborhood, not necessarily an energy neutral building itself	3
Legal and tax	Paying taxes when charging and using a battery, double	3
Legal and tax	Subsidies for fossil fuels doesn't help the development of renewable energy	3
Legal and tax	No regulation for taxes on the ocean	3
Legal and tax	Currently not possible to be an incidental heath supplier	1
Legal and tax	Rental laws don't help housing corporations to make homes more sustainable, because the individual renter doesn't always have the same interest as the collective	5
Limited Time	Lack of innovation capacity within the organization	3
Limited Time	Processes with governments take a lot of time, some which innovative small organizations (i.e. startups) don't have	1, 2, 3

Partnership	Governments should act as examples, for example regarding their procurement policies	1
Partnership	Organizations keep data to themselves, while seeming useless data could be useful for other organizations	3
Partnership	Bigger organizations often afraid to work with startups	1
Societal	Lack of people/organizations taking responsibility for tackling climate problems	3
Societal	High percentage of unemployment and crime in some city neighborhoods	5
Societal	Change of mindset needed for people when to use energy, cars, etc.	5
Societal	Sustainable alternative needs big upfront investment, with ROI in 30 years – no individual consumer thinks this far ahead	1
Societal	Hard to get people involved in societal challenges	1, 2, 3
Technical	Really hard to get the right data, and quality data, especially since it's almost impossible to get historical data	4
Technical	Problems for grid operators can be very, very local	2
Technical	Too few batteries, too few electrical cars, not enough capacity to store energy	2

Commercial barriers mainly referred to customer value proposition, value delivery and value capture (costs and revenues) of the business model and relate to transition tracks 1-3 which concern the main markets (energy production, energy efficiency and mobility). Some interviewees highlighted limited knowledge of wishes of potential customers and the challenge of creating (additional) value in the existing energy market. In addition, the long-term planning (electrical cables, grids, etc.) makes short term innovation hard for the companies in our sample. A second set of obstacles relate to the value delivery. Limited budget allocated to innovation per year and for finding technical developers on the job market makes it hard to commercialize new smart city ideas as value delivery is jeopardized. Overly long processes involving governments prove especially hindering for innovative small organizations (i.e. start-ups) that do not possess the endurance.

The biggest part of the perceived issues revolves around profitability of new business models (value capture). General commercial barriers such as small financial margins in energy market and the fact that new (smart) product innovations are (much) more expensive than current products (electrical cars) imply that

> "It is hard or impossible to earn investments back"
>
> Mobility consultant

In specific smart city innovations such commercial barriers, such as high cost of energy storage and infrastructure as well as high switching costs (for example for individuals to change heat system), make it hard or impossible to recover investments. Companies also emphasize the fact that tax regulation doesn't promote enough the use energy during non-peak hours, which

> "Makes it hard to create a business case for technologies that help people manage their energy use"
>
> Energy manager

Communication and partnership barriers indirectly relate to the individual business model as it mainly affects the ability of companies to integrate into a present and future (smart) city ecosystem. We found links to transition tracks 1, 3 and 5 that focus on the energy on the district level, integrated mobility systems and citizen engagement.

> "The energy transition only works if all organizations change at the same time."
>
> Research consultant

Governments should act as examples, for example regarding their procurement policies. Interviewees referred to internal struggles in the organisations such as a lack of skilled workforce and distributed knowledge which makes decision making and entering into a partnership difficult. Larger and more mature organizations often refrain from working with start-ups. Interestingly organisations keep most of the data they produce to themselves although seemingly useless data could be useful for other organizations.

Furthermore, the education level in city neighbourhoods is very different, which necessitates educating customers and governments as well as businesses communicating the challenges in different ways. Both activities do not happen to a sufficient degree according to the interview.

A large cluster of barriers revolves around *legal and taxation aspects* of new business models based on ICT technologies for smart cities that can be found in all of the transition tracks as they touch upon a variety of boundary conditions. The interviewees feel that

> "The regulatory environment is not ready for digital / smart society and city."
>
> Several interviewees

This concerns use of data in terms of privacy legislation and the use of new technologies such as drones. However, they also realize that future-proofing laws and regulation takes too much time in comparison to developing innovative business models.

The energy sector is one of the most regulated business environments. The interview participants stress the need for more favourable regulations concerning energy (use of batteries, nudge people to use electricity in non-peak hours). Also, the concept of energy neutral buildings means that wind and sun energy collection in the neighbourhood, not necessarily an energy neutral building itself. However:

> "Rental laws don't help housing corporations to make homes more sustainable, because the individual renter doesn't always have the same interest as the collective."
>
> Housing manager

In the energy literature this is referred to as 'split incentives' (Sorrell, 2015). On a more general note, subsidies for fossil fuels do not help the development of renewable energy.

In a deep transition, such as the current smart-city and sustainability transition, *societal barriers* play an important role. We mainly see overlap with 'system-focused' transition tracks 1, 3 and 5 (district energy, mobility and citizen engagement). The interviewees mention the struggle to involve people in addressing societal challenges, reflected in the fact that few people and organisations take responsibility for tackling climate problems. Most potential customers are preoccupied with a high percentage of unemployment and crime in some city neighbourhoods and only secondarily think about their role in a smart city.

> "It requires a change of mindset when to use energy, cars, etc."
>
> Research consultant

On the business side that means a change from product market to service market. In the current transition towards a smart city people willing to move first in energy transition are not rewarded or advantaged hence there is no incentive to use new products or services. In addition, they require large upfront investments.

> "With an ROI in 30 years – no individual consumer thinks this far ahead".
>
> Renewable energy producer

Challenges that are mentioned in relation to *technical barriers* are the quality and suitability of data and missing technical infrastructure and equipment e.g. on the side of the grid operator or properties of technology. These understandably link to the more 'technology-oriented' transition tracks 2 and 4 (energy management and city innovation platform).

6 Conclusions and next steps

6.1 Conclusions

In this report, we have described the findings derived from interviews with employees of seventeen organizations active in five different transition tracks. The interviewees have described different scenarios they foresee regarding these transition tracks. According to the interviewees on transition track 1, the main changes and developments will occur in business modelling – shifting from a product market to a service market. Also, a clear need for orchestrators of activities in this transition track is described. Interviewees in transition track 2, smart energy management, expect many more players on the market and therefor emphasize the need of a balanced energy-grid and the need for large quantities of data to for prediction purposes. The third track, smart e-mobility, expects mobility will become more of a service, compared to the current ownership of vehicles, foreseeing changes in demand of public transport and use of public spaces.

In terms of barriers, a few exist for multiple transition tracks. Being a commercial barrier, friction is mentioned between long-term planning of infrastructure and wishes for short- and medium-term innovation. Both commercially and with regard to communication, organizations highlight the lack of knowledge inside and outside their organization. Regarding legal and tax barriers, interviewees promote more favourable regulations for smart city innovations and stress the need for clarity on privacy regulation. Looking at limited time barrier, we can conclude the lengthy processes in the smart city domain do not benefit start-ups with short-term horizons. The main conclusion we can derive looking at the partnership barrier, is that to reach the in section 4 described futures, organizations need to open up and collaborate more with other organizations in the same domain. In a deep transition, such as the current smart-city and sustainability transition, societal barriers play an important role. The interviewees mention the struggle to involve people in addressing societal challenges, reflected in the fact that few people and organisations take responsibility for tackling climate problems. The quality and suitability of data is a technological barrier which organizations currently face.

Regarding the first iteration of the SCUIBI-program in T3.2 we can conclude that the approach we have designed and implemented to track and find incubatable ideas in the Utrecht ecosystem did not deliver the readily incubatable ideas for active incubation.

We have deployed resources to interview incumbents (project partners) to look for incubatable spinout ideas and snowballed through the Utrecht ecosystem to identify incubatable start-ups and start-up ideas. These efforts have resulted in interesting data and information that is useful also in the ecosystem assessment, but it did not yield ideas in the right stage of development. Still, our search in the haystack did deliver some relevant information that may be useful for other partners working in the IRIS-project. Moreover, the identified barriers for incumbents represent opportunities for newcomers. It is not to be expected that incumbents have solutions to these barriers readily available but not yet implemented. This implies the barriers are opportunities for new business development, but we are looking for needles in a haystack. We have quickly learned that this is easier done with a magnet than with a magnifying glass. Therefore, we have decided to now pivot our approach for the second iteration of the incubation program in Utrecht, Nice and Gothenburg. We are discussing the possibility to join the Utrecht Startup in Residence program for 2019 and the work presented in this report may serve us well in formulating specific challenges in that or a similar program.

6.2 Next steps

The main aim of our program was to widen the funnel for attracting incubees. We still have that ambition, but we now want to use a magnet to attract the needles, instead of tediously sifting through the haystack ourselves. In close cooperation with Utrecht Inc. we will pivot the SCUIBI-program itself in the following way:

1. Utrecht Inc. develops a program to more intensively engage students and academics. To effectively do so, we need to approach them with clear challenges. Given that all LH cities have universities, this strategy can be replicated there, if not in all follower cities.

2. Information gathered in the interviews will be disseminated and can be used as blueprint for similar analysis and to take stock of the development of the business ecosystem in the other two lighthouse cities. Potential barriers, and how to overcome them, will become a part of the SCUIBI-program. The forecasted scenarios will be used in the search for related ideas and guiding incubatable ideas.

The main lesson we must draw from our first iteration of the SCUIBI-project is that the chosen strategies of interviewing existing firms and gatekeepers in the ecosystem yielded very few useful leads and ideas for incubation. Ideas are either in a very early stage and not yet ready for incubation or have already been implemented and are currently in development, beyond the stag of incubation. There simply are not that many ideas around in the right stage of maturity, let alone ideas with motivated and capable teams. This, however, is a general problem for incubators worldwide and there is no easy solution. We will try two things:

1. We will develop a more systematic and wider scan of the entrepreneurial ecosystem and list and scout relevant events like hackathons and challenges. We can then attend these events and get involved to build a longlist of potentially interesting ideas and people and thus cast a wider net in 2019.

2. We propose the Lighthouse Cities to open challenge(s). Utrecht has successfully experimented with a Start-up in Residence program last year and although IRIS was not directly involved and had no direct dealings with or access to the contestants, the challenge was successful in at least harvesting 5 to 10 ideas on IRIS-related challenges. This will cost additional money, but it was considered worthwhile even without the IRIS-project in Utrecht in 2017. We hope the lighthouse cities, possibly with corporate sponsoring from lighthouse partners, are willing to organize such a challenge in their respective cities and in collaboration with the partner-incubators in the Fall of 2018. With IRIS-contributing capacity and possibly money and (guaranteed) launching customers, we hope such a challenge will be attractive to all involved, including viable incubees. But we really need help with that. It goes beyond what was originally planned and budgeted in the IRIS-program and depends on the good-will of lighthouse cities and the respective corporate partners.

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8 Appendix

8.1 Interview guide for business (model) ideas

- **Introduction**
  - Introduction of the researchers
  - Explanation of the IRIS project and SCUIBI (the business incubation process)
  - Assurance of confidentiality!
- **Company's engagement in smart city innovation / background**
  - How does your company act in these five transition pathways (mobility, energy, …)?
  - Person of the entrepreneur/team/business: experience, motivation, etc.
  - Where does your company see NEW (business) opportunities/ideas regarding the transition tracks?
- **The business idea *(focus on most promising business idea?)***
  - (What's the name of the business idea?)
  - Please describe the product/service (as it currently stands)
  - (Can you give a brief description/summary ('30 second pitch') about the idea?)
  - Has it been tried out already (pilot), or is it a wild guess? Or is it emerging?
- **Origin of the idea**
  - Where does the idea originate: Incumbent/spin-off interview, challenge, user-source, other?
  - Can you please explain the origin of the idea?
- **Customer value proposition/value proposition canvas (required!)** 
  - What kind of customer demand do you see arising in the future?
  - What core value would you deliver to the customer? Which customer needs would you satisfy?
  - What kind of problems do the clients of your company face in these areas and how do they solve these problems today?
  - What would be potential solutions and could they be commercially exploited?
  - What kind of customers do you intend to serve? Who is your most important customer?
  - What bundles of products and services are we offering to each Customer Segment?

- **Key resources (optional)** 
  - What key resources does your value proposition require?
  - **What resources are important the most in distribution channels, customer relationships, revenue stream…?**
  - Who are your key partners/suppliers? What are the motivations for the partnerships?
  - Which Key Resources are we acquiring from partners?
- **Key processes (optional)** 
  - What key activities does your value proposition require?
  - What activities are important the most in distribution channels?
  - And in customer relationships?
  - And in production/manufacturing?
  - Which Key Activities do partners perform?
- **Profit formula (optional)** 
  - How will you make money with this idea?
  - What kind of revenue model do you foresee?
  - What does the cost structure look like?
- **Business idea development**
  - Is your company actively pursuing these ideas (for example through the creation of spin-offs or through or forms of 'start-up support')?
  - Which barriers prevent the commercialisation of (your) smart city ideas?
- **End of the interview**
  - Any comments, remarks, feedback from the interviewee?
  - Can be contacted for clarifications/additional information?
  - Who else would you suggest we could speak to with these questions? (You can always email it to us)

8.2 Potential follow-up questions for individual business model elements

Questions for developing new products

(if there are insufficient ideas coming from the interviewee)

De-average buyers and users

Which customers use or purchase our product in the most unusual way?

Do any customers need vastly more or less sales and service attention than most?

For which customers are the support costs (order entry, tracking, customerspecific design) either unusually high or unusually low?

Could we still meet the needs of a significant subset of customers if we stripped 25% of the hard or soft costs out of our product?

Who spends at least 50% of what our product costs to adapt it to their specific needs?

Examine binding constraints

What is the biggest hassle of purchasing or using our product?

What are some examples of ad hoc modifications that customers have made to our product?

For which current customers is our product least suited?

For what particular usage occasions is our product least suited?

Which customers does the industry prefer not to serve, and why?

Which customers could be major users, if only we could remove one specific barrier we've never previously considered?

Explore unexpected successes

Who uses our product in ways we never expected or intended?

Who uses our product in surprisingly large quantities?

Imagine perfection

How would we do things differently if we had perfect information about our buyers, usage, distribution channels, and so on?

How would our product change if it were tailored for every customer?

Look beyond the boundaries of our business

Who else is dealing with the same generic problem as we are but for an entirely different reason? How have they addressed it?

What major breakthroughs in efficiency or effectiveness have we made in our business that could be applied in another industry?

What information about customers and product use is created as a by-product of our business that could be the key to radically improving the economics of another business?

Revisit the premises underlying our processes and products

Which technologies embedded in our product have changed the most since the product was last redesigned?

Which technologies underlying our production processes have changed the most since we last rebuilt our manufacturing and distribution systems?

Which customers' needs are shifting most rapidly? What will they be in five years?

Explanations

Value Proposition

Describes the bundle of products and services that create value for a specific Customer Segment.

The Value Proposition is the reason why customers turn to one company over another. It solves a customer problem or satisfies a customer need. Each Value Proposition consists of a selected bundle of products and/or services that caters to the requirements of a specific Customer Segment. In this sense, the Value Proposition is an aggregation, or bundle, of benefits that a company offers customers. Some Value Propositions may be innovative and represent a new or disruptive offer. Others may be similar to existing market offers, but with added features and attributes.

Customer Segments

Defines the different groups of people or organizations an enterprise aims to reach and serve.

Customers comprise the heart of any business model. Without (profitable) customers, no company can survive for long.

In order to better satisfy customers, a company may group them into distinct segments with common needs, common behaviors, or other attributes. A business model may define one or several large or small Customer Segments. An organization must make a conscious decision about which segments to serve and which segments to ignore. Once this decision is made, a business model can be carefully designed around a strong understanding of specific customer needs.

Customer groups represent separate segments if:

- Their needs require and justify a distinct offer
- They are reached through different Distribution Channels
- They require different types of relationships
- They have substantially different profitabilities
- They are willing to pay for different aspects of the offer

Channels

Describes how a company communicates with and reaches its Customer Segments to deliver a Value Proposition.

Communication, distribution, and sales Channels comprise a company's interface with customers. Channels are customer touch points that play an important role in the customer experience.

Channels serve several functions, including:

- Raising awareness among customers about a company's
- products and services
- Helping customers evaluate a company's Value Proposition
- Allowing customers to purchase specific products and services
- Delivering a Value Proposition to customers
- Providing post-purchase customer support

Customer Relationships

Describes the types of relationships a company establishes with specific Customer Segments.

A company should clarify the type of relationship it wants to establish with each Customer Segment. Relationships can range from personal to automated.

Customer relationships may be driven by the following motivations:

- Customer acquisition
- Customer retention

Boosting sales (upselling)

Key Resources

Describes the most important assets required to make a business model work.

Every business model requires Key Resources. These resources allow an enterprise to create and offer a Value Proposition, reach markets, maintain relationships with Customer Segments, and earn revenues.

Different Key Resources are needed depending on the type of business model. A microchip manufacturer requires capital-intensive production facilities, whereas a microchip designer focuses more on human resources. Key resources can be physical, financial, intellectual, or human. Key resources can be owned or leased by the company or acquired from key partners.

Key Activities

Describes the most important things a company must do to make its business model work.

Every business model calls for a number of Key Activities. These are the most important actions a company must take to operate successfully. Like Key Resources, they are required to create and offer a Value

Proposition, reach markets, maintain Customer Relationships, and earn revenues. And like Key Resources, Key Activities differ depending on business model type. For software maker Microsoft, Key Activities include software development. For PC manufacturer Dell, Key Activities include supply chain management. For consultancy McKinsey, Key Activities include problem solving.

Key Partnerships

Describes the network of suppliers and partners that make the business model work.

Companies forge partnerships for many reasons, and partnerships are becoming a cornerstone of many business models. Companies create alliances to optimize their business models, reduce risk, or acquire resources.

We can distinguish between four different types of partnerships:

- Strategic alliances between non-competitors
- Competition: strategic partnerships between competitors

Joint ventures to develop new businesses

Cost Structure

Describes all costs incurred to operate a business model.

This building block describes the most important costs incurred while operating under a particular business model. Creating and delivering value, maintaining Customer Relationships, and generating revenue all incur costs. Such costs can be calculated relatively easily after defining Key Resources, Key Activities, and Key Partnerships. Some business models, though, are more cost-driven than others. So-called “no frills” airlines, for instance, have built business models entirely around low Cost Structures.

Revenue Streams

Represents the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings).

If customers comprise the heart of a business model, Revenue Streams are its arteries. A company must ask itself, For what value is each Customer Segment truly willing to pay? Successfully answering that question allows the firm to generate one or more Revenue Streams from each Customer Segment. Each Revenue Stream may have different pricing mechanisms, such as fixed list prices, bargaining, auctioning, market dependent, volume dependent, or yield management.

A business model can involve two different types of Revenue Streams:

- Transaction revenues resulting from one-time customer payments
- Recurring revenues resulting from ongoing payments to either deliver a Value Proposition to customers or provide post-purchase customer support