CHAPTER 2

# In- and out-of-sync: temporal coordination in innovation ecosystems

*In innovation ecosystems, organizations of different sizes, industries, and structures need to collaborate to develop integrated solutions and together create value. To coordinate these collaborative efforts, heterogeneity in temporal structures, resulting in temporal complexities, needs to be overcome. In this chapter we draw on the time research literature and the theory of entrainment specifically, to analyse an in-depth longitudinal field study around the development of a smart city solution. We found three strategies for temporal coordination in which organizations were able to circumvent temporal complexities: 1) leveraging temporal concurrence, 2) creating suspension by temporary excluding actors, and 3) bringing the future to the present. While entrainment theory suggests that achieving synchrony between different rhythms, paces, or time orientations with the most dominant temporal structure is the key to effective collaboration, we find that in more complex multi-party settings like innovation ecosystems this is not always the case. Instead, we show that synchrony and asynchrony go hand in hand and discuss these insights in terms of the literature on coordination in ecosystems.*

# 2.1 Introduction

In innovation ecosystems, a multitude of heterogeneous organizations come together to collaborate, with the aim of developing and delivering integrated solutions (e.g. Adner & Kapoor, 2010; Davis, 2016; Autio & Thomas, 2017). Consider for example how digital technologies allow for making new connections among previously separate devices (e.g. from phones to running shoes to door locks), thereby creating new opportunities for value creation. To do so successfully, inter-organizational activities need to be well-aligned (Adner, 2017), in particular because the ecosystem members involved vary considerably (e.g., in organization specific aspects such as size, tenure, motivation, and industry). Each organization may have a different perspective on and expectation of the overall value proposition around which the ecosystem is organized. Misalignment among members can also result from *temporal complexity* (Garud, Tuertscher, & Van de Ven, 2013), i.e. differences in temporal structures, that is, the way activities are organized with regard to temporal aspects such as cycles, paces, and time frames (Orlikowski & Yates, 2002).

In this paper, we argue that organizing innovation in ecosystems asks for *temporal coordination*. Entrainment theory suggests that temporal coordination is achieved when actors adjust their temporal structure to one dominant pacer or rhythm, thereby synchronizing activities and reaching optimal performance (Ancona & Chong, 1996; Pérez-Nordtvedt et al, 2008). Synchrony in ecosystems is achieved when "multiple organizations act simultaniously" and "organizational activity is unified in time" (Davis, 2014, p. 198). However, in innovation ecosystems synchrony may be hard or too costly to achieve, for example, because a dominant pacer is lacking and uncertainty about with whom and which rhythm to synchronize is high. We therefore pose the following research question: *How is temporal coordination accomplished in innovation ecosystems?* We empirically investigated this question in an in-depth qualitative field study of an innovation ecosystem that emerged around the development of smart city solutions and consisted of highly heterogeneous actors.

This paper's contributions lay in taking a temporal lens on coordination of innovation ecosystems. Our study shows that in order to innovate, both instances of synchronous and asynchronous action are necessary to coordinate activities among heterogeneous ecosystem members. We find that coordination can occur without adaptive temporal alignment. Instead, organizations may search for opportunities in which different temporal structures coincide to be in-sync, and strategically use these moments to start collaborating from there. In other instances, temporal conflicts can be avoided by purposefully remaining out-of-sync through excluding partners with a mismatch in temporal structures. Finally, the organizations in our field study also benefited from disconnecting from the 'now' to circumvent temporal complexities by aligning their visions of the future.

This paper is structured as follows. In the next section we discuss the need for temporal coordination in innovation ecosystems, followed by a review of prior research on entrainment theory and its underlying assumptions. After that we introduce our research setting and methods, and in the subsequent section a description of our analysis and results. In the final section we conclude this paper with a discussion of theoretical and practical contributions, limitations, and suggestions for future research.

# 2.2 Theory

## *2.2.1 Temporal complexity in innovation ecosystems*

When multiple interconnected organizations innovate together to develop complex new technologies, products, or services, we refer to *innovation ecosystems* (Adner & Kapoor, 2010; Autio & Thomas, 2012; Davis, 2016). Examples include ecosystems revolving around the development of personal computers (e.g. Cusumano & Gawer, 2002), semiconductor equipment (Adner & Kapoor, 2010; Adner & Kapoor, 2016), ERP software (Wareham, Fox & Giner, 2014), and television systems (Ansari,

Garud & Kumaraswamy, 2015). The interactions between the ecosystem participants are organized around a central shared value proposition (Adner, 2017). At the same time, each ecosystem member can have different incentives and perspectives on the overall value proposition, and thus the alignment of activities is key to achieving joint value creation (Adner, 2017). As a result, the success of an innovation ecosystem depends on how well the participants are able to coordinate their efforts despite their differences.

This need for coordination is compounded because organizations may vary considerably on firm-specific dimensions, such as size (from large corporations to independent software developers), lifecycle (from incumbents to start-ups), or aims (from profit-driven to not-for-profit). In addition, organizations may be embedded in different sectors. For example, in our current digital age previously separated industries become connected as new combinations of existing physical modules (following an engineering logic) and new digital technologies (software) are increasingly integrated into one product-service system (e.g., Yoo et al., 2012).

Such differences on organization and sector level do not only inform ecosystem participants' perspectives on the collective value proposition, but also how they organize their business and innovation processes. Specifically, organizations follow different paths, rhythms, and paces for how and when they perform activities. Orlikowski & Yates (2002) label this as *temporal structures* and argue that "through their everyday action, actors produce and reproduce a variety of temporal structures which in turn shape the temporal rhythm and form of their ongoing practices" (p. 684). For example, Dougherty et al. (2013) found that science-based projects are typically *'event-time paced'*, that is, scientists focus on unpredictable new discoveries and learnings, while at the same time, strategic management is focused on linear planned progress milestones, i.e. '*clock-time paced*'. Another example is the difference between private and public organizations: commercial businesses focused on profits and efficiency gains typically favor speed and short term gains, while public organizations, concerned with solving societal problems, are focused on the long term

(Slawinski & Basal, 2015; Caldwell, Roehrich & George, 2017).

As a result, collaborative innovation in ecosystems may lead to temporal tensions and misalignment. Each ecosystem member enacts its own temporal structure, including time frame, paces and cycles, and experience of time (Orlikowski & Yates, 2002). The multiplicity of temporal structures leads to temporal complexity in the innovation process (Garud, Tuertscher, & Van de Ven, 2013), which may hamper joint action. To make progress, ecosystems members need to deal with this complexity, and need to engage in temporal coordination.

### *2.2.2 Temporal coordination through entrainment*

A way of managing a multiplicity of temporal structures is through the process of *entrainment*. Building on McGrath and Kelly (1986), Ancona and Chong (1996, p. 253) define entrainment as "the adjustment of the pace and cycle of an activity to match or synchronize with that of another activity." The entrainment concept originates from the natural sciences and was first discussed by Huygens in the seventeenth century. He observed how two pendulum clocks that were in perfect synchrony regain this synchrony within a half hour after one of them was disturbed. In biology we also see entrainment in the human body; when traveling across time zones our bodily rhythms re-entrain to the new cycle of day of and night.

Ancona and Chong (1996) show how entrainment is a useful analogy to discuss synchronization in organization theory. Like our body has its own rhythms and cycles (e.g., of body temperature), organizational entities also enact temporal structures (Orlikowski & Yates, 2002). Entrainment means that this temporal structuring is aligned with the strongest temporal structure in the environment, i.e. the *dominant pacer* or "zeitgeber" (Pérez-Nordtvedt et al., 2008). An example of such an external pacer are the quarterly cycles of the fiscal year for commercial businesses and the academic calendar for universities. Other examples are industry standards or collective roadmaps. Besides pace and cycles, entrainment involves alignment of temporal structures with regards to temporal orientation of organization members

and activities (Standifer & Bluedorn, 2006). That is, whether the focus is primarily on the past, present or future, as well as how far into the future (i.e. short or long term) the organizations consider their time frame (e.g. of project planning, roadmaps and investments of resources).

Although entrainment as observed in biology and physics seems something that happens almost automatically (e.g., having to re-entrain to a timezone when experiencing a jet lag), in organizations this synchronization is often an effortful and intentional accomplishment (Pérez-Nordtvedt et al., 2008). When organizations pursue entrainment with the external environment (Pérez-Nordtvedt et al., 2008; Khavul et al., 2010), they for instance strategically decide to introduce new products in the market around the holiday season so that they intentionally benefit from consumer spending cycles. Further, activities with organizations can be internally entrained by matching the rhythms and paces of internal activities (Dibrell et al., 2015). Finally, organizations may align the timing of activities and the time orientations in interorganizational alliances (Standifer & Bluedorn, 2006; Das, 2006). Especially when the activities of internal and external collaborators are highly interdependent, it may be beneficial to ensure that activities are ready at the same time or in time for interdependent subsequent activities (Standifer & Bluedorn, 2006).

Synchronization may draw upon different types of coordination mechanisms, including the use of boundary objects (Star and Griesemer, 1989; Carlile, 2002). For instance, timelines function as visual representations of time, which are crucial for managing projects and "coordinating the activities of consultants, clients, users, and other participants" (Yakura, 2002). Innovation narratives form another type of coordination mechanism. They help interdependent actors to interact and coordinate the innovation process, by enabling translation across multiple organizational individuals and groups at different stages of the process (Bartel & Garud, 2009; Kaplan & Orlikowski, 2013). Furthermore, field configuring events, i.e., conferences that bring together actors in a particular industry or field with different visions of the future, provide a forum for interaction and coordination of actions (Garud, 2008).

One of the main assumptions underlying temporal synchronization through entrainment is "that under conditions when entrainment [...] occurs with the appropriate environmental pace, rhythm, and cycles, higher performance of the system is usually the outcome" (Ancona & Chong, 1992, p. 22). Several authors have argued that entrainment is beneficial for organizations in general (Pérez-Nordtvedt et al., 2008; Dibrell et al., 2015; Hopp & Greene, 2017) and innovation processes in particular (Bonneau, 2007; Khavul et al., 2010; O'Sullivan, 2003). When a multiplicity of temporal structures come together tensions may be experienced and temporal conflicts may arise. Organizations that are out-of-sync may intentionally entrain to the environment or seek to enact its own temporal structures for others to follow (Pérez-Nordtvedt et al., 2008). Thus, situations in which organization's endogenous temporal patterns are coupled with external pacers and collaborators' patterns are assumed to be more favorable than asynchronous situations.

We problematize this assumption that entrainment is desirable and beneficial in the context of multi-party collaboration in innovation ecosystems. First, synchronization may force fit activities into a rhythm that hampers their proper execution. Synchronization may create a Procrustean bed where too little time is allowed for an activity because it has to be aligned with other activities. Consider the development of innovations that combine physical products with digital technologies (such as smartphones and internet-controlled lighting). In those innovation processes, software and hardware development have their own cycles: software development consists of highly iterative short cycles, whereas product development is typically more preplanned and longer in duration. Also, the product life cycle of hardware is much longer than of software; whereas software may be outdated soon, the hardware may have a much longer lifetime. Rigid attempts at synchronization would imply adaptation of at least one of the two processes and, therefore, potentially involve force fitting.

Second, because ecosystem members are embedded in multiple collaborations with heterogeneous actors from different organizations, synchronizing with one

organization's rhythms and paces might imply getting out-of-sync with the rhythms and paces of other organizations. In situations that involve such heterogeneous actors it will be very unlikely that all will march to the same beat (Dougherty et al., 2013). Even if this were possible it might require substantial coordination costs that outweigh the benefits of synchronization. This means that organizational actors need to decide which rhythms and paces to follow and which to ignore.

Third, synchrony may be hard to achieve due to a lack of one shared dominant pacer. What is dominant for one actor might not be for another. Examples of dominant pacers are typically on industry-level, e.g. the three year approval time cycle of the U.S. Food and Drug Administration (FDA) (Pérez-Nordtvedt et al., 2008). In innovation ecosystems, organizations are embedded in different industries and are entrained to different dominant pacers instead of to one that is shared by all participants. In mature ecosystems, organizations may find a common ground and can reach consensus about the dominant rhythm (so-called pro-active temporal enactment, Pérez-Nordtvedt et al., 2008), that is, the ecosystem creates its own zeitgeber. However, in emerging ecosystems this might be difficult to achieve.

Lastly, entrained rhythms and paces may always be disturbed. Bonneau's (2007) study of the Quebec biotechnology sector shows how actors across organizations, such as investors and researchers, entrain to external pacers. Changes in the environment, such as restrictions on grants or breakthroughs in research, triggered resynchronization processes. Since emerging ecosystems are highly uncertain (Dattée, Alexy & Autio, 2018), changes happen frequently and continuous (re-)synchronization may be hard to accomplish.

In sum, given the specific dynamics in (nascent) innovation ecosystems, synchronizing may involve force fitting and high coordination costs, and may be challenging because of lack of one dominant pacer and a high level of uncertainty in the environment. As a result, it is not straightforward to assume that entrainment is also the solution to coordinate temporal complexity in a complex web of interactions among organizations in innovation ecosystems. Thus, it is unclear how temporal

coordination is accomplished in innovation ecosystems.

## 2.3 Methods

The aim of this research is to gain a better understanding of how organizations manage temporal complexity in the context of collaborative innovation in multi-party ecosystems. We adopt a qualitative, process research approach (e.g. Langley et al., 2013), where we follow the interactions between the organizations involved and document events over a longer period of time. We follow the recommendations by Pérez-Nordtvedt et al. (2008) and collected a variety of qualitative data to uncover temporal changes and responses in relation to entrainment, together with the aim of gaining in-depth insights how time is experienced in organizations (Langley & Abdallah, 2011).

### *2.3.1 Research setting*

The empirical setting of our study is a local innovation ecosystem aimed at developing smart city solutions to improve a local night life area through novel usage of emerging digital technologies. The particular area comprises 50 different bars (e.g. salsa bar, clubs, coffee shops, alternative music bars, restaurants, snack bars). The density and mixture of nightlife offerings attracts people from different ages and backgrounds, and has its peak hours on Thursday, Friday and Saturday night. The area needs serious improvements, in order to make it a pleasant environment for people to go out both during day and night time. One major issue is safety; there are around 800 violent incidents a year. Another (related) issue is the economic viability; the bar owners have trouble generating enough revenue.

The municipality provides private and public organizations (including universities and knowledge institutions) the opportunity to experiment with new digital technologies that have the potential to contribute to the overall improvement of

the area. The umbrella for the variety of projects is the so-called 'LivingLab'. The development and alignment of the different projects and technologies requires coordination between the different parties that are part of the LivingLab ecosystem.

Since each organization has their own temporal structures, the heterogeneity of the different members of the ecosystem makes the setting relevant to study how the coming together of different temporal rhythms is managed. Although some organizations have previous experience in working together, the LivingLab ecosystem is novel in the sense that it is much more open-ended and emergent compared to typical projects. That is, traditional projects have fixed outcomes (deliverables) that are defined in advance, and contracts are signed to ensure that objectives are met and that each partner is accountable for their commitments. In the collaborations that we study, the partners therefore find themselves in new roles and need to find new ways to manage the dependencies and create shared goals. Since each organization has their own expectations and time frame for the project, coordination and alignment are important aspects to ensure a smooth collaboration. In addition, with the passage of time, unanticipated issues emerge that the members involved need to act upon. We elaborate on how these dynamics were dealt with in the Findings section.

### *2.3.2 Data collection*

Data were collected through a mixture of methods, including semi-structured interviews, observations and a variety of documents. As a result of our interest in understanding how processes unfolded over time, we adopted a longitudinal approach and collected data for a longer period of time. We combined both real-time observations with retrospective accounts. We started our data collection in the Fall of 2014. At that moment an exploitative phase of initial conversations, grant applications and plan-making among the first ecosystem members had already taken place, resulting in the kick-off of the LivingLab initiative. In January 2016 we left the field but continued to follow the developments from a distance by collecting news articles and press releases that were published as the LivingLab continued to be successful

and attract media attention. In the Spring of 2017 we did another short cycle of more intense data collection through an additional round of follow-up interviews to see how the activities had progressed and how actors reflected on the process so far.

**Interviews.** Our main data source are semi-structured interviews (Patton, 2002) with informants from the organizations involved in the management and execution of the LivingLab or associated projects. A snowball approach proved to be successful to make sure we got in contact with all involved actors. In the interviews we asked general questions about background of the organization; motivations for participating in the LivingLab; the interviewee's role in the project; the digital technologies employed; their view on other partners' roles; the expectations about the project and, evaluation of the outcomes so far. We probed for important events, such as bottlenecks and milestones, and asked the interviewees to describe the process around such events in more detail.

In total we held 32 in-depth interviews, with an average duration of 69 minutes per interview. We did follow-up interviews with key informants over time. The interviews were voice recorded for transcription. In addition, the first author made notes of her impressions of the interview setting and atmosphere immediately after each interview, which were eventually merged with the interview transcripts. One interviewee did not give permission to record the interview; in this case extensive notes were made.

**Observations and informal conversations.** To supplement the semi-structured interviews, we collected data through observations and informal conversations to immerse ourselves in the setting of our field study. The complexity of the research setting, and our aim to get a deep understanding of the dynamics at play, required that we first were able to get a good overview of the context of our selected case, i.e. what exactly the LivingLab and the projects entailed and how it was perceived by the different organizations. To create a holistic understanding of the project from the perspective of the different organizations, it was particularly helpful to conduct some observations and have informal conversations besides the interviews.

The first author attended several public seminars and gatherings where one

or more organizations involved presented and discussed specific aspects of the LivingLab. These included for example a networking event hosted by the project leader from the municipality for which a variety of partners and outsiders were invited to come over to the LivingLab. Another event that the first author attended was an international conference on 'experience design' where different partners presented their design philosophy behind different projects taking place at the LivingLab. Furthermore, the first author merged herself with work of the researcher of the university by being a participant observer. Here, she took the role of a research assistant during one of the experiments that were part of the research project. By being part of the research team, the first author helped to observe and document the atmosphere and behavior of the people on the street on a regular Friday night from 9PM to closing time (4AM), and at the same time had ample opportunity to talk informally with the researchers.

Overall, these kinds of occasions allowed for getting a good understanding of the context in which these organizations operate as well as how they represent themselves and view the projects in which they are involved. In addition, those were good opportunities to have informal conversations and build rapport with interviewees, as well as to get in contact with new people who were later invited for an interview.

The observations and informal conversations were documented in hand written field notes. These notes were written out digitally, preferably the same day. They contain descriptive information as well as initial personal reflections and thoughts by the first author.

**Documents.** To supplement the interviews and observations we studied a variety of documents, ranging from internal confidential presentations that were shared by interviewees to articles in publicly available magazines and press releases. Because the LivingLab was unique in terms of being the first in its kind, it generated a lot of media attention resulting in numerous articles in local and national newspapers. The documents contained factual data such as project descriptions and precise timestamps

of events, as well as information on future visions and history, and opinions from people within and outside the LivingLab. Studying such documentation helped us to get a feeling of the context of the project in which we have to interpret what actors said and how they acted.

### *2.3.3 Data analysis*

The qualitative data analysis followed an iterative process, which already started early during data collection. Initial impressions by the first author were regularly discussed with and reflected on by all members of the research team to form an initial shared understanding of the phenomena. By combining an insider and outsider's view new insights emerged, which then in turn allowed us to focus further data collection. We continued this cycling between data collection and explorative analysis throughout the whole duration of our study.

More systematic analysis took place after we finished the first round of data collection. First we created a timeline of events, in which for each event we marked which ecosystem participant was involved. Some events were only directly related to one organization, for example the change in organizational structure or the end of a contract. In other events several organizations were affected or collaborated closely, e.g. a presentation at the national police academy by the project team, or winning an award for the collectively proposed city safety solution.

We then identified episodes, i.e. "series of related events" (Berends et al., 2011, p. 945) where actors (or a subset of actors) interacted to move the ecosystem forward. To identify episodes we used the timeline of events that we created prior. We started to make connections between events, and after that looked more closely in our data for moments of delay or acceleration of progress taking place in interconnected events, and traced back what caused the change in pace. By comparing and contrasting episodes we gained insight in how actors dealt with temporal complexity in different ways. Three clusters of strategies emerged: *leveraging temporal concurrence*, *creating suspension* and *bringing the future to the present* (see Table 2-1 for an overview of

episodes per strategy). We present for each strategy an illustrative episode in the Findings.

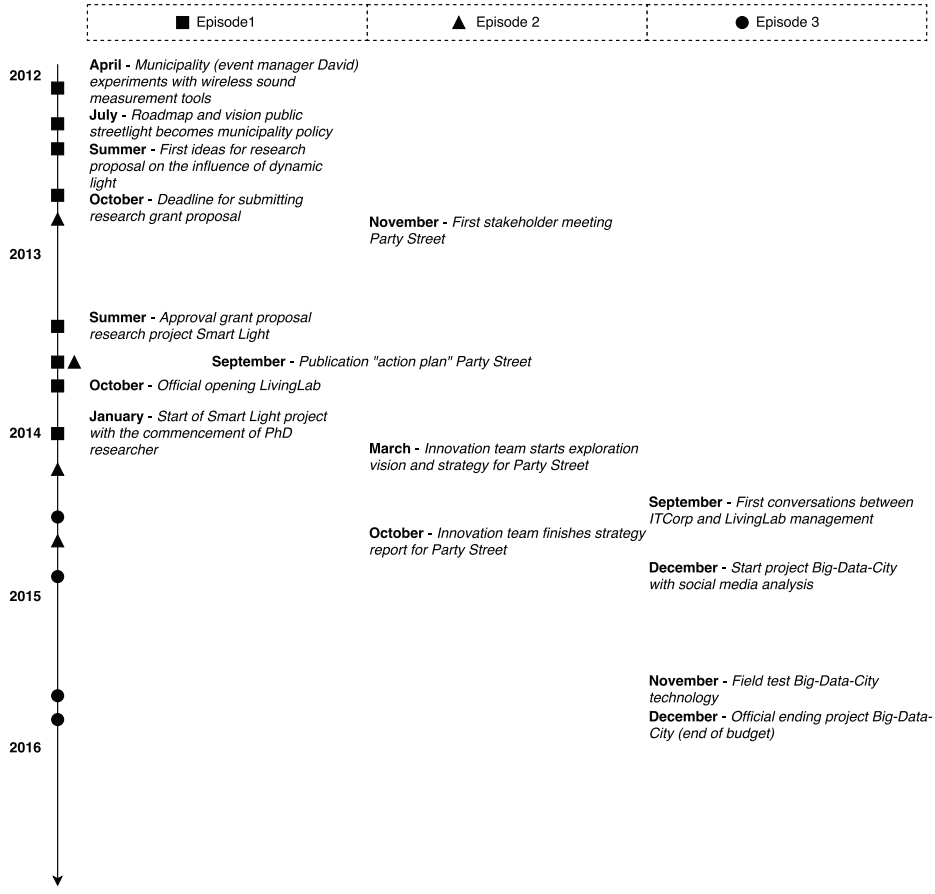
**Table 2-1** Episodes per identified strategy

| Strategy | 'Leveraging temporal concurrence' | 'Creating suspension' | 'Future to the present' |
|---|---|---|---|
| Episodes | *Summer-fall 2012:* Deadline for research grant, roadmap for streetlight and need for change at party street generated opportunity for collaboration.<br><br>*Summer-fall 2015:* When the Livinglab matured and initial funding was ending, there was a need for more formal organization. At the same time, an independent institute for safety solutions was in need for field labs and "adopted" the Livinglab.<br><br>*Spring 2015:* ITcorp could quickly start their big-data-city project at the Livinglab because an existing infrastructure was already in place. It was a win-win because the Livinglab needed a new impulse. | *Spring-fall 2014:* Innovation team excludes bar owners from process of developing strategy for party street 2.0 because of a mismatch in time frame.<br><br>*Summer 2014:* Techcorp decides to start internal exploration on light effects in parallel to the research project, because they felt that they cannot wait for the first results to be published.<br><br>*Fall 2014-winter 2015:* The police was not taken in the loop when developing the new dynamic streetlights. This speeded up discussions about the technical design and costs. When the actual prototypes were installed, the police was taken back into consideration to make sure the lights comply with safety standards. | *Spring 2014-present:* The "control room" that has been created with screens and demonstrators attracts many visitors from outside who like to observe what smart cities "really" look like.<br><br>*Fall 2014-present:* After finishing the vision for party street, the innovation team build a "situation room" where the members gather regularly to discuss concrete actions.<br><br>*Spring 2014-present:* Local and national media regularly covered the developments at the Livinglab. Articles were sometimes positive, appreciating what has been achieved, but also negative, giving critique for crossing a line with regards to regulations and privacy. |

# 2.4 Findings

In this section we first introduce the innovation ecosystem that we studied and the temporal complexities as a result of the heterogeneity of organizations involved. Then we zoom in on three selected episodes where temporal coordination was performed to illustrate the three strategies identified in our data analysis. Figure 2-1 gives a simplified timeline with events relevant for the three episodes.

**Figure 2-1** Event timeline for the three example episodes



### *2.4.1 General case introduction*

The local innovation ecosystem around which our case study is centered is focused on developing smart city solutions for a safer and more enjoyable nightlife. The ecosystem has formed and grown mostly organically over the years as more and more partners joined and contributed through smaller projects. The goal is highly experimental: organizations are invited to bring new innovations that build on 'smart' technology. The solutions proposed do not have to be fully developed products or services; organizations are also welcomed to try out new technology, employ prototypes, and subsequently refine these based on feedback and experiences gained within the LivingLab.

The activities are taking place at Party Street, an area in the city centre that has been considered troublesome for many years. The street had fallen in decay: it faced violent incidents and the bar owners and breweries struggled to make a profitable business and survive. The municipality had appointed a street manager, Joey, as independent "intermediary" between the entrepreneurs, police, and municipality. Being frustrated about the negative developments, Joey recalled: *"at a certain moment, it was 2012, I was visiting Party Street. I realized: why do I want to have my name connected to a street but at the same time is only getting worse? Then I said to myself: either I quit, or I am going to make this a project again, take the lead and make sure the street gets better."* Joey felt his day-to-day operations were not sufficient to turn the negative trend around and urged the municipality to take more serious action by devoting additional resources to improving the situation in the long term. The mayor supported his ideas, invented the term "Party Street 2.0", and gave the street manager together with the municipality's responsible area manager, Sophie, permission to start a project exploration aimed at radically revitalizing the street through long term sustainable solutions.

While the two were developing an "action plan", they came in contact with the municipality's event manager, David, the person who was at that time was responsible for crowd management during large events such as Queen's day (a Dutch

national holiday where the Queen's birthday is celebrated). David was playing around with new technologies to help perform his task. For example, advanced 3D sound measurements were used to make sure noise levels would not exceed the limits and in addition analyze the data for other deviations that would disturb the residents' well being (such as cleaning trucks making a lot of noise early in the morning). When the street manager Joey got notice of the event manager David's ideas, he immediately encouraged David to come to Party Street. The ideas for a "living lab", i.e. using digital technologies to gather data about what is happening, and based on these develop insights and new ideas for improvement, were born. It was a natural fit with the municipality's decision makers, who were always supporting innovation and technology use, as they liked to promote themselves as the *"smartest region in the world"*.

Besides the technology providers the event manager was already collaborating with, more organizations expressed their interest when they heard about the initiative through presentations or word of mouth. Sophie remarked: *"in the beginning I did not announced it too loudly, we justed started doing it. But then, quickly, all kinds of parties contacted us. Just because David was sharing his ideas everywhere. And organizations thought 'I see opportunities as well, can I join?'"* At the official opening of the Living Lab in October 2013 a collective of around twenty partners was announced.

The LivingLab is an umbrella for smaller projects carried out by the ecosystem participants, taking place at Party Street, with the goal of improving the safety or atmosphere in the area. Some projects are relatively small, such as a student assignment by a local university, while others involved joint action by several ecosystem participants. Over time new partners entered and new collaborations were formed, all together contributing to the overall success and growth of the ecosystem. Two major projects taking place are SmartLight and Big-Data-City[2].

2 We focus on these projects because they involve most complex interactions and interdependencies, and stretch for a significant period of time at the LivingLab. We elaborate on these in the example episodes that follow.

First, SmartLight is a design-driven research project with dynamic streetlights. The project was initiated in the Summer of 2012 by the local university and supported by TechCorp. The goal was to test, in a real life setting (as opposed to in a lab), if and how different light colors and intensities could be used to turn aggressive behaviour down. It was a win-win for all project partners to join the LivingLab ecosystem: the data gathered through other sensors employed could be used to measure the effects of the interventions. After a process of preparation, including the application of a large research grant, the four-year project officially started in January 2014 with the commencement of a PhD researcher who would carry out the experiments at Party Street.

A second substantive project was Big-Data-City, which began when ITCorp entered the ecosystem in the Fall of 2014. ITCorp manager John heard about the existence of the LivingLab through personal contacts, and after a round of conversations, the municipality welcomed ITCorp to use Party Street as a testbed. The project started at the end of 2014 with analyzing social media data, to pick up any negative emotions that could indicate trouble. Over time, the project grew and ITCorp started to collaborate with existing partners in the ecosystem to expand the system, for example by analyzing data on visitor's behaviour from video material and sound meassurements. The ultimate goal was to feed the outcomes of the data analysis to a dashboard accessible to the police, who in turn could better respond on potentially undesirable events at the street.

As a result of the variety of projects and ideas, the ecosystem around the LivingLab is highly diverse. Members range from local stakeholders, like the bar owners and police, to global technology providers, with each having their own interests for participating. These differences also lead to temporal complexities. For example, whereas the bar owners and police are in an urgent need for solutions as soon as possible – as they are dealing with the situation every weekend – the technology companies view their participation in light of a larger long-term goal, i.e. further developing solutions that can be later commercialized elsewhere. The research

institutes and universities involved are following different cycles as the municipality: e.g. a four year PhD project and subsequent time consuming publication process as opposed to short durations of budgets and change of local governments with election cycles.

We now turn to three strategies and accompanying example episodes to show how the ecosystem members were able to deal with these temporal complexities that form potential barriers for collaboration. The first episode focuses on the establishment of the SmartLight project and LivingLab as a whole through what we label 'leveraging temporal concurrence'. The second episode takes place around the development of a new strategy for revitalizing Party Street where we found a-synchronous collaboration take place by temporarily 'suspending' stakeholders in order to move forward. In the third and last episode we zoom in on the Big-Data-City project, where partners are synchronized with a shared simulation of the future by decoupling from the present.

### *2.4.2 Leveraging temporal concurrence*

The first strategy we identified is achieving temporal coordination through 'leveraging temporal concurrence'. For this strategy, there is no adaptation to one dominant external pacer (as in entrainment); instead multiple endogenous (internal) pacers relevant to each participant meet, thereby generating an opportunity for actors to engage in joint action. When organizations make strategic use of such opportunities of temporal alignment, and thereby accelerate collaborative efforts, we label this 'leveraging temporal concurrence'. We illustrate this strategy with an episode about the realization of SmartLight, one of the first and major projects taking place at Party Street.

**Episode 1.** During the Summer of 2012, senior researcher Eva, employed by the local university, came up with the idea to study the effectiveness of using dynamic light scenarios to de-escalate aggressive behavior through experiments in the public space. The research group had much experience with light effects on

human behavior, but experiments were almost always performed in controlled lab settings. Studying the effects in real life settings was the next step. A call for research proposals by the Netherlands Organization for Scientific Research triggered her interest to further develop the ideas into a grant application. As part of the funding, also so-called 'matching partners' had to be found as well. These should be public or private organisations who are willing to contribute financially or 'in kind' (e.g. through supplying materials). To supply the required light equipment to run experiments, the researcher contacted TechCorp. Eva recalled: *"we have known TechCorp for a long time already, and then you also know what they are interested in. So we explained our ideas to them, and they were immediately enthusiastic about it."*

The next step was to approach the municipality to see if they would be willing to offer a space to perform the experiments. The municipality was well aware of the opportunities that digital technologies offer, and at the same time felt the need for up-to-date street lighting. As a result, the municipality decision makers had pushed for the development of a roadmap for urban light. The roadmap, an extensive document with recommendations for the short and long-term, was published and became policy in July 2012. One of the recommendations in the roadmap was to have 'pilots' in certain areas of the city, that is: *"a small scale experiment with the roadmap."* The rationale behind doing pilots is to have *"faster implementation of innovations, which are also visible to the public [and] to involve external parties in order to give a boost to the internal organization of the municipality."* The timing of the proposed experiments with dynamic street light by the researcher fitted nicely with the timing of publication of the roadmap. The roadmap created urgency for the municipality: *"so actually, everything accelerated when the roadmap became policy. It created a moment, like, 'now we cannot ignore it any longer, now it has to be done'."*

In addition, the municipality had one condition for their participation: the light experiments would have to take place at Party Street. At that time, the ideas for setting up a Living Lab at were already floating around as part of the "action plan". When the researcher's ideas got into the picture of one of the initiators of the

LivingLab, the event manager David reflected that it was a *"trigger to say: hey, if we are going to influence at Party Street with technology, let us then also measure the effects with technology [...] Because, how would you else know what the results are? It would be guessing. Yes, you can have researchers, doing interviews, but let's put up sensors at Party Street."* Potentially having the dynamic street light project at Party Street would make the LivingLab more worthwhile, and the other way around: the research project benefits from the sensor data that is collected.

While the grant application was submitted by the deadline in October 2012 and got into the review process, the municipality together with other partners started to make arrangements for the LivingLab. The research project was awarded the grant in the Summer of 2013, and the LivingLab officially opened a few months later, in October 2013.

Our interviewees shared the reflection that it was a *"pleasant coincidence of circumstances"* (area manager Sophie). The three pacers, i.e. urban light roadmap, together with the timing of the grant application process, and the action plan to revitalize Party Street, generated momentum and brought the different actors together. The involved actors from the municipality were driven by their roadmap for urban street light, while the university structured their activities around the grant cycles. TechCorp, another key partner in the project, was in a transitional moment where digitalization became an important trend that required attention. Though seemingly unplanned and unorchestrated, the alignment of multiple pacers was used purposefully to facilitate and accelerate smooth collaboration among the organizations. Awareness of each other's temporal structures allowed for making strategic use in reaching out to the right partner at the right time (prior collaborative experiences was helpful in this case).

Thus, despite the absence of one dominant pacer relevant to all organizations, coordination through a form of synchrony was nevertheless achieved. Organizations align when internal pacers come into sync. We see that this strategy was in particular useful in the early stages of ecosystem formation.

### *2.4.3 Creating suspension*

When suspending, organizations in the ecosystems collaborate while excluding certain partners. The actor that is temporarily excluded has a mismatch in temporal frame with the other organizations in the ecosystem. Thus, instead of trying to get everyone on board to adapt and synchronize (following the entrainment logic), potential temporal conflict is avoided in order to make progress. This episode shows how excluding partners from the early stages of the innovation trajectory is a way to move the project forward.

**Episode 2.** Once the "action plan" was approved by the local government, budget was made available to take the next step and undertake concrete action. One of the first activities was to do a more thorough analysis of the current situation and based on that establish a vision for Party Street "2.0". In March 2014 the street manager Joey together with the area manager Sophie and a local marketing agency formed an "innovation team". Among other things they performed a series of meetings, held brainstorm sessions, did extensive desk-research, and went on a two-day "inspiration tour" to trendy areas of London.

In our interview, Joey noted that to realize change the municipality has only "limited resources" in that they could only "stimulate and facilitate" through providing subsidies. As such, the real transformation had to come from the bar owners and breweries. At the same time (interestingly) the innovation team purposefully decided to exclude these key stakeholders from the process: only a small selection of bar owners were invited to take part in the process. The team justified their decision as follows: *"The team that contributed to the development of this proposal, as mentioned earlier, has worked very carefully. It has attempted to involve as many parties as possible without hindering progress in speed. Various stakeholders have not been involved in the past stage on purpose, to respect the administrative process."* (report)

The underlying motivation was that these stakeholders were having a different

time orientation than the innovation team members. That is, the innovation team and the goals of their initiative are aimed at long term, radical improvements, to be realized in approximately four years (the envisioned future scenario was for the year 2018). The bar owners, on the other hand, have a present-orientation: they are preoccupied with managing day-to-day operations. In particular those who have a hard time surviving in the first place are not so much concerned about the situation in a few years, because they most likely will not be able to be part of it. According to Sophie, a time frame of four years is for some bar owners *"very far ahead: he [a bar owner] does not even look that far with his own business plan."* The apparent mismatch in time-frame was the reason for excluding these stakeholders in the process. In a similar vein, the founder of a start-up company who had ideas to build an online community for the street's visitors admitted that *"...we did not talk with everyone. Simply because they [bar owners] are not thinking about this change that we would like see: the future of the street."*

The strategy to suspend the bar owners' involvement was mainly preventive: by doing so the innovation team avoided temporal conflict and made sure they could progress and innovate without dissonance. Since the street manager Joey was already involved with Party Street since the 1990s, he was well aware of the different mindsets and businesses of the individual bar owners. Based on his extensive experiences he selected only those bar owners that shared the long-term time frame.

After six months of hard work, the outcome of the process was an attractive visionary document with ambitious plans for the future of the streets. The innovation team made bold statements. For example, they wanted the street to compete not only on a national level with other nightlife areas, but more importantly, they wished to compare themselves with the most fancy and "hip" European cities.

The episode illustrates how ecosystem members were able to carry on with their activities without the need to adapt to each other's diverging time frames. Instead, they avoided temporal misalignment by purposefully only including actors that already shared a similar time frame (long term in this case). In a similar vein the police

was also temporarily suspended from negotiations about interventions at the streets. The core task of the police in the current situation is to be present on the street during peak hours to monitor behavior and intervene when incidents take place. The solutions that are being developed will change the role of the police, for example, because big data analytics can track down and possibly even predict incidents before they take place. While exciting and relevant, this is a scenario for the future. The police on the other hand needs to focus their attention primarily on the present. In this specific case it made more sense not to adjust, but instead follow different parallel paths in which the police was able to focus their attention on the present and other ecosystem members collaborate to develop future solutions.

### *2.4.4 Future to the present*

In this episode we show how the LivingLab was able to bring 'the future to the present' through the use of demonstrators and simulations. Temporal alignment took place by synchronizing to one future 'reality' instead of adapting to the now. Disconnecting from the present facilitated collaboration among partners, but at the same also generated confusion among actors external the ecosystem.

**Episode 3.** Besides being a 'virtual' collective of organizations, the LivigLab has also established a physical presence. From the very beginning, David, the event manager who became day-to-day project leader of the LivingLab over time, had started to equip an empty office room in of the buildings at Party Street with several displays. On these displays several dashboards and data streams (for example of the people walking on the street) are running, making it look like a "control room from the future". Having this physical space with the monitors:*"makes it visible, we also refer to it as a shop window."* (David)

While it looks like a real control room, what is displayed on the monitors are basically simulations developed by the different ecosystem partners. That is, they are "demonstrators", movies that run or snapshots, to showcase what could become reality when the pilots are successfull and further developed into real working

solutions. David noted: *"I can also just sit and work in an office at the town hall [...] I don't need to be here, I am not controlling anything. It is just a showcase, a presentation space."*

The creation of a tangible future scenario helped to bring together partners. Aligned to 'as if' generated much positive attention, appreciation as well as learnings. For example, in the Big-Data-City project, the police was an important stakeholder and potential client for the proposed solution. Despite that the local police in essence is more focused on day-to-day operations, i.e. keeping the street safe coming weekend, the national police had created a special team that was having more freedom and able *"look over the horizon"* (project leader police). In particular, being part of this simulation of the future in the present allows them to bring to surface new questions that require careful consideration and potentially new procedures or regulations, such as, how police reports based on big data analysis should be handled.

For outsiders it seems like the future is happening *now*. To illustrate, the LivingLab has attracted many visitors who were interested to see what is going on. In particular other municipalities from both within The Netherlands as well as abroad came over to see what has been done. The manager of one of the partners shared his observations with regards to these visits: *"suddenly, all this high tech equipment, the monitors: it works! And then the visitors will go out on the street and they will see the sensors and cameras hanging: 'wow you just did it!' [laughter] everyone who comes to visit really feels that we have done it."*

At the same time, by decoupling from the present, it also lead to *a-synchrony* with what is reality *today*. We observed that outsiders were confused about what was *really* happening at Party Street in terms of interventions and data collection. For example, when people heard about the LivingLab they were concerned about their privacy. In newspapers, articles with links to "big brother" and "minority report" regularly appeared. It was also for us, researchers, in the beginning unclear what was "real" and what was a mere demonstrator.

Although loosely defined what time frame the solutions had to be fully

deployable, by making tangible how the future could really look and feel, temporal alignment was achieved successfully. Having a shared representation that everyone could relate to facilitates interaction and brought about discussion about the future value proposition.

## 2.5 Discussion & conclusion

We started this study with an interest in better understanding how organizations in innovation ecosystems are able to overcome differences in temporal structures that could potentially interfere with organizing collaborative activities. The literature on temporal coordination, and entrainment specifically, has predominantly advocated for synchronization through adapting cycles, rhythms, and temporal orientations to one dominant *zeitgeber*. However, given the dynamics and characteristics of innovation ecosystems (e.g., multiplicity and heterogeneity of actors and high levels of uncertainty), we were puzzled whether temporal coordination through synchrony could still be accomplished, and if so, how. While prior research concerning this topic was mostly conceptual or theoretical (Ancona & Chong, 1996; Pérez-Nordtvedt et al, 2008; Granqvist and Gustafson, 2016; Standifer & Bluedorn, 2006), we offer an empirical investigation of temporal coordination.

Our findings from the field study of the LivingLab ecosystem suggest that temporal coordination in innovation ecosystems involves both synchronous and asynchronous action, and that they need to go hand in hand. This is different from current views where the general assumption is that reaching synchrony is the desired outcome (e.g., Pérez-Nordtvedt et al., 2008; Davis, 2014). Furthermore, when members in the innovation ecosystem achieve temporal alignment, organizations get in sync without rigid adaption of their temporal structures, which is opposed to entrainment theory (e.g., Ancona and Chong, 1996).

Based on our analysis, we identified three strategies, alternative to entrainment,

for temporal coordination in innovation ecosystems. First, organizations are able to get in-sync by aligning multiple 'internal' dominant pacers. We labeled this strategy *'leveraging temporal concurrence'* because the organizations are not adjusting to one temporal rhythm or pace, however they are still achieving synchrony by making strategic use of a (coincident) match in temporal structures. This form of synchronization can be triggered by opportunities that emerge, thereby catalyzing the process of formation and collaboration. For instance when an internal roadmap shares a time frame with a pacer such as a deadline or budget of another organization, alignment of resources is easier to achieve then when one needs to adjust and deviate from their own temporal structure to match with that of another. Such 'right timing' can also be purposefully generated when actors are aware of each other's important pacers. As we saw in the example episode, prior experiences were helpful in reaching out to the right potential partners for participation in the project. Familiarity can thus also aid this type of temporal coordination (Okhuysen & Beckhy, 2009). At the same time, actors can strategically reach out to potential partners when opportune moments arise. For example, Hallen and Eisenhardt (2012) describe how entrepreneurs use proofpoints (critical milestones) as catalyzers for forming new interorganizational ties. Thus, being sensitive to timing can aid temporal coordination.

At the same time we also learned that reaching synchrony is not always the only solution to dealing with temporal complexities. The second strategy that we identified, which we refer to as *creating suspension*, implies that actors are able to make better progress when they temporarily exclude actors with misaligned time frames. This is in line with Davis (2016), who pointed out that members of ecosystems engaged in "group cycling": interacting in different dyads instead of triads, thereby temporarily isolating partners from multi-party collaborations, in order to minimize conflicts. Thus, temporal differences may be an additional reason for organizing activities in sub-groups.

In addition, the third strategy shows the importance of *bringing the future to the present* so that all ecosystem members could envision their contribution in light

of the overall value proposition. In particular, since innovation projects are typically prospective and future oriented, it makes sense to temporarily disconnect from the present and act as if the future is happening now. In the case of the LivingLab, having a physical space that felt like being in a control room of the future facilitated interactions by bringing unsolved but key questions (e.g. about privacy) to surface and have a dialogue on potential solutions, acting like a "cocreated scaffold" (Majchrzak, More & Faraj, 2011). In a sense it can be considered a boundary object for temporal coordination (Star and Griesemer, 1989; Yakura, 200; Carlile, 2002), but not as concrete like timelines and roadmaps with timestamps and deadlines for planning. Instead, ambiguity about the time frame of this future image allowed that all members were able to relate to it. In addition, such future representations are also able to create "trading zones [...] physical and cognitive arenas for communities with separate innovation trajectories to negotiate, collaborate, and learn through mutual perspective making and perspective taking" (Boland, Lyytinen & Yoo, 2007, p. 635), which facilitate (temporal) coordination and collaboration in innovation ecosystems.

Taken together, we argue that achieving temporal coordination by synchronization through an entrainment approach can be viewed as a form of *transforming,* while our three alternative strategies are more in line with a *transcending* approach. Majchrzak, More & Faraj (2011) use this distinction to show how knowledge differences are overcome in cross-functional teams. While it is generally assumed that in order to integrate knowledge, it is necessary to gain a understanding of other team members' deep knowledge and subsequently confront identified differences, the authors show that members are able to avoid conflicts without the need for transforming knowledge, but instead, bridge differences through collective sense making, thereby saving precious time and energy that would otherwise be spend on deep-knowledge exchange. Simarly, in dealing with diverging temporal structures, our study shows that differences can be transcended without first needing to engage in deeper transformation of own temporal structures.

Finally, our contributions have implications for the current emphasis on the 'need

to connect' in both organizational research and practice. Nowadays, organizations aim to connect products and services, and connect with network partners in various ecosystems. Maintaining such increasing number of connections over time involves coupling to particular temporal patterns, and may be highly taxing to coordinate. Our study indicates that organizations may choose to (temporarily) decouple instead, thereby allowing for following their own temporal paths.

In sum, by focusing on the implicit but ever present role of time, and how temporality affects the alignment of activities, our insights contribute to the literature on the nascent phenomena of coordination of innovation ecosystems. Furthermore, we contribute to prior research by addressing a call for research on entrainment in inter-organizational settings (as opposed to single firms or teams) (Standifer & Bluedorn, 2006).

### *2.5.1 Limitations and future research*

Our study was exploratory in nature, and provided us with some first in insights in how organizations avoid conflicts from temporal misalignment in innovation ecosystems. Future research could extend our work by further investigating under which conditions one or the other strategy for temporal coordination would be best suited. For example, the members in the innovation ecosystem that we studied were only loosely connected, while at the same time the network of partners grew when new organizations joined as the ecosystem matured over time. Comparing these conditions with Davis' (2014) study, which found that in more dense ecosystems synchrony is reached more easily and faster, it would be interesting to understand during which stage of ecosystem development and size synchronous is favorable over asynchronous action (and the other way around). Furthermore, particular patterns of alternations between synchronous and asynchronous activities may be required to address the highly uncertain and emergent nature of innovation processes.

Another relevant direction for future research is to see if temporal coordination is different in ecosystems organized by a central hub or focal firm who is coordinating

activities. A central platform can also act as a "coordinating artefact" (Autio & Thomas, 2017, p. 208). In situations where there is a clear leader and/or platform technology it might be that this is setting the pace for other ecosystem participants. The complementors then need to entrain to rhythms as predicted by the platform owner, otherwise they fall behind and their complementary products potentially loose system integration when platform interfaces change. For example, Apple sets the rhythm for its third-party app developer community by releasing new updates to the system, and through stages in the app review process. The app developers have no choice but to sync their activities with the pace set by Apple. At the same time, it would be interesting to evaluate if and how the complementors influence this dominant rhythm and possibly use it to their advantage.

A limitation that provides another promising avenue for future research is to explicitly incorporate the temporal structures of the technologies over time. In this study we focused primarily on the interactions of the organization's time frames, rhythms and paces. At the same time, the technology that is collaboratively developed also has its own temporality, including development cycle and life time. In the LivingLab case we noticed that some technical components (hardware and software) may over time become obsolete and had be removed or updated, while other components become part of the core architecture and can be used for a longer period of time by multiple ecosystem members, even after projects have finished. Understanding how such temporal aspects of the technology interfere with the organizations' temporal frames will give additional insight in how temporal coordination is achieved.

### *2.5.2 Practical implications*

This research also has practical implications. Since innovation increasingly takes place in multi-partner collaborations, organizations need to consider how they align activities within an ecosystem of highly diverse actors. Awareness of differences among ecosystem members can facilitate coordination. In particular, managers

should pay attention to the temporal structures and dominant pacers around which other ecosystem members are organized. In dealing with potential conflicts among temporal structures it might make sense to adapt to one rhythm or pace. At the same time, synchronizing can lead to force-fitting or result in high coordination costs. Alternatively, organizations may decide to temporarily exclude partners with a mismatch in time frame from collaborative activities with the aim of moving the project forward and avoid thereby delays. Our findings suggest that managers can make strategic use of different temporal coordination approaches to deal conflicting temporal structures.