

Pursuing legitimacy for solar energy: essays on temporality and collective spaces in nascent fields

Heli Nissilä

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Solar technology has emerged as a significant option in energy provision in a rather short time globally. It is also often considered a spreadhead technology in the transition of the energy domain towards an increased use of new renewable energy sources and one key solution in tackling grand challenges like climate change and resource depletion. In Finland there have been several waves of local initiatives aimed at legitimating the technology and mobilizing actors behind shared courses of action. However, legitimation has stalled time and again, with persistent difficulty in forming a 'coalition of believers' for the new technology. Solar energy has also remained strikingly illegitimate in political terms, also compared to other northern contexts with similar conditions.

In this research I explore, how legitimation has unfolded between different communities in the field. The research is a longitudinal and in part real-time study that covers four decades of initiatives in 1973-2015, based on a comprehensive qualitative dataset of 51 interviews, 200 hours of observations at industry events and other collaborative settings, 3400 news stories and 3000 pages of archival material. I focus on two distinct topics. First, I study the role of temporality in legitimation processes, pointing to "time" as a socially constructed, negotiated and changing construct. Second, I explore how engaged actors have capitalized on collective spaces in the nascent field to attach the new innovation to changing policy concerns. The term collective space refers to transitory settings that forge uncommon interactions between disparate actors, such as field-configuring events and technology experiments.

The findings of this study point to legitimation as a continuous negotiation of temporal experience among key communities. The research shows how shared time constructs have brought disparate actors together and created momentum in the face of scattered perceptions and interests. Yet overall such constructs have been fragile and lost their significance – due to challenges in managing temporal complexity in the nascent field. In particular, asynchronicity between the engaged communities and asynchronicity between the rhythm of innovation development when compared to the rhythm of acute and changing policy concerns have hampered legitimation. Further on, the research illuminates the role of collective spaces as sites of political entrainment, i.e. settings where initial actors urge timings and rhythms of developing the new innovation that would relate meaningfully to changing policy concerns. The study shows how spaces have contributed to recurring hype and disappointment in the field, related to their appearance as fleeting and sporadic windows of opportunity for issue construction. The research contributes to scholarly understanding on temporality in organizations and management by a focus on a complex multi-actor setting and generates dialogue between different literature streams that study spaces in fields.

Keywords legitimation, nascent fields, temporality, collective spaces**ISBN (printed)** 978-952-60-8994-2**ISBN (pdf)** 978-952-60-8995-9**ISSN (printed)** 1799-4934**ISSN (pdf)** 1799-4942**Location of publisher** Helsinki**Location of printing** Helsinki **Year** 2020**Pages** 164**urn** <http://urn.fi/URN:ISBN:978-952-60-8995-9>

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In Helsinki, 28.10.2019 – *Heli Nissilä*

Table of Contents

List of publications.....	1
Author’s contribution	2
1. Introduction	3
1.1. <i>Research focus and research questions</i>	4
1.2. <i>Introducing the sub-studies</i>	6
2. Theory section	8
2.1. <i>Legitimation and collective action in emerging fields</i>	8
2.2. <i>Temporality and institutional change</i>	10
2.2.1. <i>Managing temporal complexity during issue emergence</i>	12
2.3. <i>Visions and expectations in technology-driven fields</i>	13
2.4. <i>Collective spaces as sites of coordination among communities</i>	14
2.5. <i>Structure and scope of the study.....</i>	17
3. Empirical setting, data and methods.....	17
3.1. <i>Solar energy in Finland – a brief history of global and local developments</i>	17
3.3. <i>Data collection</i>	20
3.4. <i>Summary of analytical process.....</i>	23
4. Summaries of the essays.....	24
<i>Essay 1: When the time never comes – temporality and legitimacy in nascent fields</i>	24
<i>Essay 2: Creating expectations for solar technology over multiple field-configuring-events: a narrative perspective</i>	25
<i>Essay 3: Conferences as sequential arenas for creating new sustainable fields</i>	26
<i>Essay 4: Demonstration buildings as protected spaces for clean energy solutions – the case of solar building integration in Finland</i>	27
5. Discussion.....	28
5.1 <i>Legitimation as a continuous negotiation of temporal experience across groups.....</i>	28
5.2. <i>Conceptualizing sustainable development as “patience” – a temporal ontological perspective to field emergence</i>	31
5.3 <i>Collective spaces and political entrainment.....</i>	34
5.4 <i>Limitations and further research.....</i>	38

List of publications

This doctoral dissertation consists of a summary and of the following sub-studies.

1. Nissilä, Heli; Granqvist, Nina; Holopainen, Mari; Rajala, Risto 2019. When the time never comes: temporality and legitimacy in nascent fields. Presented at the Academy of Management Conference, Boston Massachusetts, U.S., August 2019. [A shortened version of the included paper].
2. Nissilä, Heli; Lempiälä, Tea; Lovio, Raimo 2014. Constructing Expectations for Solar Technology over Multiple Field-Configuring Events: a Narrative Perspective. *Science and Technology Studies* 27(1).
3. Nissilä, Heli 2015. Conferences as Sequential Arenas for Creating New Sustainable Fields. *Industry and Innovation*, 22 (1): 209-228.
4. Heiskanen, Eva; Nissilä, Heli; Lovio, Raimo 2015. Building Demonstration Projects as Sustainable Niches for New Technology: Solar-Building Integration in Finland. *Journal of Cleaner Production*, 109, 347-356.

Author's contribution

Sub-study 1:

Heli Nissilä has developed the empirical analysis of the study and analyzed the data. She carries main responsibility for data collection. In the final manuscript, she has written the empirical analysis section, and carries main responsibility for writing the section on methods and data analysis. Heli also carries half of the work load related to writing the theory section. She has taken part in writing the discussion and introduction of the manuscript.

Sub-study 2:

Heli Nissilä has developed the empirical analysis of the study and she has taken part in data collection. In the final article, she carries main responsibility for writing the empirical analysis, and the method section and she has participated in writing all other sections, including theory and contributions, together with her co-authors.

Sub-study 3:

Heli Nissilä has carried out this study by herself.

Sub-study 4:

Heli Nissilä has the main responsibility for developing the analysis section of the study. She has also participated in data collection. In the final article, she has the main responsibility for writing the empirical part. She has participated in writing all other sections together with her co-authors.

1. Introduction

Solar technology has emerged as a significant option in energy provision in a rather short time. Prices for solar photovoltaic (PV) systems have decreased rapidly from 2005 to 2015 and the industry has turned into a major business with a global outlook (Bohnsack, Pinkse, & Waelpoel, 2015; Solar Power Europe, 2015). Solar energy is also often considered a spreadhead technology in the transition of the energy domain towards an increased use of new renewable energy sources. It is the fastest growing emerging distributed energy source globally, and recent forecasts expect solar PV capacity to overrun that of wind power before 2025 and push past hydro power around 2030 and past coal before 2040 (International Energy Agency, 2018b). Many energy experts foresee a bright future for solar – due to rapid technological progress, great availability and usability in different settings such as in off-the-grid locations.

In Finland there have been several waves of local initiatives aimed at legitimating solar energy. These started by the time of the two oil crises that first triggered considerations on alternative energy sources in the late 1970s. The efforts have aimed at mobilizing actors engaged in the field and aligning them behind shared goals, and attracting resources for research and innovation and market construction. The kind of sector-building among key communities is one central aspect in and a first step towards the actual rise of a novel field. Prior research has found also that solar energy has gained political support and legitimacy in the eyes of external audiences in countries, where policy actors perceive that there is a coherent entity of organizations locally connected to the technology (Georgallis, Dowell, & Durand, 2018).

Despite the initiatives, coalition building has halted time and again and the technology has remained strikingly illegitimate. Actors in the field remain disparate and disconcerted in their efforts to form a representative body to the new technology (Berninger et al., 2017; Haukkala, 2018; Lund, 2009), and politicians have been skeptical about the potential of solar energy. As one example, Finland remains one of the few countries in the EU that has not introduced direct subsidies for solar or a target for increasing its share in the energy mix (Haukkala, 2015; Heiskanen, Jalas, Juntunen, & Nissilä, 2017). The country is also characterized as one of the harshest contexts for the technology globally (Haukkala, 2015; Hakkarainen et al. 2015; WWF Finland, 2013). These observations are worthwhile considering that governments around the globe have invested in developing supportive policies for boosting local industries and markets, such as Germany as the early market leader (Bohnsack, Pinkse, & Waelpoel, 2015; International Energy Agency 2018a) and countries with similar conditions like the U.K., Canada, Sweden and Denmark as some examples (Smith, Kern, Raven, & Verhees, 2014; Walker, Schlosser, & Deephouse, 2014). Finland also has similar over the year insolation rates to Germany, which also gives reason to wonder how the mobilization of initial actors has come to stagnate over multiple decades.

In this study I explore how disparate communities, consisting of e.g. businesses, scientists and innovation and policy bodies, seek to legitimate the nascent solar energy field in the north and create concerted action – over a period of four decades. More specifically, I focus on legitimation as a process among different communities (David et al., 2013; Deephouse & Suchman, 2008), that is, on actors' changing legitimation efforts and perceptions and the dynamics that ensue between groups over time. With the term nascent field, I refer to emerging groups of actors that begin to share a

common meaning system and develop joint practices (Nissilä, Granqvist, Holopainen, Rajala, 2018). The legitimacy of a nascent field refers to emerging “perceptions or assumptions [among field members] that the actions of [the field as] an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (Suchman, 1995: 574). Studies in the neo-institutional stream of management research state that the persistence of emerging fields depends on the way by which initial actors, when theorizing an issue, are able to relate it with the interests of multiple stakeholders and align it with their routines (Maguire, Hardy, & Lawrence, 2004; Rao, 1998; Zietsma & Lawrence, 2010). New actors need to engage in sector-building and attract a coalition of supporters (Aldrich & Fiol, 1994; Suchman, 1995; Wijen & Ansari, 2007), and coordinate the behavior of different groups; for instance by developing shared standards, values and practices.

1.1. Research focus and research questions

I focus on two specific topics in legitimation, namely *the role of temporality*, as the first theme, and *the role of collective spaces in nascent fields*, as the second theme. With temporality I refer to a changing, constructed and context-dependent organizing of time (Butler, 1995; Orlikowski & Yates, 2002), epitomized by shared understanding like “this is the right time to invest”, “a future billion dollar market” or “a rapid industry expansion is underway”. Such beliefs and experiences inform and are an inseparable part of peoples’ perception (Barley, 1988), and studies depict for instance that shared time perceptions can be influential in bringing about institutional change (Granqvist & Gustafsson, 2016). The term collective space is an aggregate concept with which I refer to different types of shared field-level spaces that are ephemeral in nature and that trigger uncommon interactions between actors who do not normally connect (Furnari, 2014; Lampel & Meyer, 2008). In so doing, collective spaces also serve as platforms for legitimation attempts and influence actors’ legitimacy perceptions. Such shared spaces may include different types of field experiments (Cartel, Boxenbaum, & Aggeri, 2018), informal meet-ups and gathering (Furnari, 2014), conferences and industry events (Schüßler et al., 2014) and projects that bring together actors from different fields for a limited time (Tukiainen & Granqvist, 2016).

These two specific topics emerged inductively – in a phenomenon-driven manner – as the empirical setting and my initial dives in the data pointed to certain endeavors as fruitful for theorization and developing a contribution to the literature. Over the course of the sub-studies of this dissertation, me and my co-authors discovered that understandings on temporality were central in how different communities legitimated the field. We noticed that actors capitalized on future expectations and other time constructs when seeking to make a case for the technology and, equally, their temporal experiences and timing norms formed a backdrop in evaluating legitimacy claims by others and anticipating the future. Temporal deliberations and understandings such as “will solar make it in time to compete against nuclear power” or “can we catch up with global markets from a laggard position” appeared as central in crafting a sense of shared purpose, and they also seemed influential of decisions to engage with the new technology or withdraw from the domain. The informants of the study also described how they had often experienced times of momentum and forward-movement in the field, yet these episodes had surpassed and initiatives had repeatedly died out. Such experiences of break-downs in the initiatives also seemed to have lasting residue and impact actors’ attitudes and engagement over time. As a result of these observations, temporality stood out as a significant theme in this case.

Prior studies have addressed legitimation in nascent fields from multiple perspectives, such as the role of societal values (Garud, Gehman, & Karnøe, 2010; Patala, Korpivaara, Jalkala, Kuitunen, & Soppe, 2017), and the emergence and mobilization of collective meanings (Aldrich & Fiol, 1994; Lawrence, Hardy, & Phillips, 2002). Simultaneously, understanding of how temporality and legitimation intertwine in nascent fields is still scarce. On a different note, there is an emerging stream of studies on temporality in organization and management. Scholars have explored e.g. executives' time-frames and capacity to address the distant future (Bansal & DesJardine, 2014; Reinecke & Ansari, 2015; Slawinski & Bansal, 2012, 2015) and the presence of conflicting timing norms during industry emergence (Zietsma et al., 2018). A few studies address the role of time in the deliberate pursuit of certain ends (Buhr, 2012; Granqvist & Gustafsson, 2016). However, theoretical understanding on temporality is still scattered and underdeveloped in several domains. For instance, the role of temporality in complex, emerging multi-actor settings remains understudied. Against these starting points, I formulate my first research question as follows:

RQ1: How does temporality influence legitimation processes among communities in nascent fields?

Also my second research question is empirically-driven. Namely it stems from the observation that different types of collective spaces have been central in legitimating solar energy in the case context throughout history. When I started studying the nascent solar energy field, there was an ongoing sequence of technology conferences in place, where previously disconnected actors in the field came together to exchange views on the industry and its local development. This opened up an opportunity to observe interactions between participants in real time. I observed, for instance, how the conferences attracted increasing interest with actors from different social domains and industries joining in, how the events grew in size and instigated further events and how interactions triggered nascent networks and structures for collaboration. The spaces served as platforms for legitimation and provided channels for developing the field, as other structures and ties between actors were missing. They also served as potential sources of togetherness and concerted collective action – in the face of otherwise scattered perceptions and interests pertaining to the rising field.

After this initial stage of observing interactions and developments in real time over the conferences, I then turned to study the history of solar in the local setting and discovered that the technology had been promoted over multiple waves of technology experiments and programs in the country since the late 1970s. Various demonstration projects and programs had served in a similar manner in the past as the conferences did at a later point. Whereas the conferences co-located actors physically at the same setting, the experiments integrated disparate actors into a virtual negotiation on the technology with implications for shared understandings of legitimacy. Hence, it seemed meaningful to address these spaces as “prime venues” (Garud, 2008) in the legitimation of the solar field.

On top of the centrality of the spaces I also discovered, how the initiators and active members used these settings to generate favorable perceptions of the new field among government and policy bodies, that is actors who managed key resources for developing new technologies and innovations. In this the actors capitalized on the opportunities that emerged from disparate actors coming together in one setting and the detachment of the spaces from ongoing field activities of members and their institutional norms. In particular, I detected efforts to attach the new technology to changing social

and environmental challenges over time. Overall, it seemed that the spaces had a function as subtle policy tools, where seemingly non-political members aimed to influence political perception. It was also apparent that actors' experiences in and perceptions of the spaces were highly influential of how they perceived the future of the technology and whether they wanted to commit further resources to its development.

The neo-institutional stream has introduced a range of concepts that refer to collective spaces in emerging fields, including that of field-configuring events (Lampel & Meyer, 2008), experimental spaces (Cartel et al., 2018) and interstitial spaces (Furnari, 2014). Researchers have investigated, for instance, how the United Nations Climate Conferences served as field-configuring events and led to the maintenance of the status quo (Schussler, Ruling, & Wittneben, 2014), how experimental spaces, as temporary settings where actors try out new solutions, functioned as a source of institutional innovation and crafting legitimacy for the European carbon market (Cartel et al., 2018), or how conferences, where harmful chemical substances are discussed, allowed new narratives to be told and led to change in an institutional field (Hardy & Maguire, 2010). However, these literature streams remain separate from each other, and literature lacks an articulation of how different kinds of spaces serve in coalition-building. While some of my findings are particular to certain types of spaces and initiatives, my case still provides good starting points for articulating generic empirical insights on the matter; applicable to different kinds of settings. This is so, as my work covers a wide range of organized field-level events and initiatives and analyzes them in great detail. Furthermore, while studies have explored spaces as sites of new policies, there is not much research on how actors use spaces to urge a fit between a new innovation and policy concerns of a given period. Consequently, I articulate the second research question of the study in the following way:

RQ2: How do engaged actors capitalize on spaces to attach a new innovation to changing policy concerns?

1.2. Introducing the sub-studies

The main work of this dissertation is conducted in four individual sub-studies – three of them published in peer-reviewed journals and one unpublished essay. The analyses are based on a qualitative data set consisting of 51 interviews with key actors and organizations in the field, more than 200 hours of observations at conferences, multi-stakeholder project meetings and other collaborations, a large archive of reports on for instance experiments, workshops, political statements and strategies (3000 pages) and 3400 news items from two key newspapers in the country during 1973-2015 (see also table 1). The introduction part takes a step beyond the findings of the sub-studies as separate units. Hence, the research questions as well as their answers emerge in part via retrospective reflection and by reconsidering my findings in the compiling part, at the end of the research process. RQ1 guides the first sub-study, that also forms a major empirical body of this thesis due to the large data set and analysis work behind it. RQ1 is also addressed in sub-study 2. Answers to RQ2 are provided in all of the four sub-studies.

In the first sub-study, I, Nina Granqvist, Mari Holopainen and Risto Rajala study how actors develop perceptions of temporality in nascent fields and how these are intertwined with the legitimation of a field. We draw on a grounded study, covering four decades of initiatives in legitimating the solar field locally in 1973-2015. We depart from Suchman's (1995) notion of

legitimacy, in which he defines the concept in temporal terms. Yet, even when literature acknowledges that temporal perceptions are central in legitimation, empirical investigations on how temporality and legitimation are intertwined are still scarce. As a new contribution to this void in literature, we develop a framework for understanding how legitimation is challenged in nascent fields and what is the role of temporality in such group dynamics. We depict that legitimation in nascent fields becomes apparent in their momentum. We recognize that illegitimacy is produced by two types of asynchronicity that curb momentum – asynchronicity in the perceived rhythm of local field development as reflected against the rhythm of an acute global challenge, and asynchronous timings of engagement among participating communities. The latter has two sources, namely divergence in the adopted time-frames of communities and different lengths of exposure to the field, which leads to some groups perceiving initiatives as part of a stagnant cycle and others regarding them as a sign of progress and forward movement in the field. These two types produce a lack of concerted action and lead to stalling momentum of legitimation processes between communities. We discuss the implications of our findings for studies on legitimation in nascent fields and temporality and institutions.

In sub-study 2, I, Tea Lempiälä and Raimo Lovio study a series of field-configuring events as a platform for collective “expectations work” (Bakker, Van Lente, & Meeus, 2011) among diverse actors in a nascent field. In specific, we investigate how actors construct shared visions and expectations for solar energy, and how the collective narration of the future evolves over time. We discover the development of six narrative themes, expressed as abstract commitments to normative goals, such as “progression and modernization” and “sustainability”. We conceptualize the narratives as shared “reference points” to diverse actors that are flexible enough to allow actors to promote their specific expectations and agendas, while also furthering the field as a whole. Our findings point to growing momentum for the technology stemming from the organized events, as one event leads to another and more actors join in. We emphasize the role of field-configuring events as a resource in crafting multiple complementary visions for a field’s future, enlarging the “narrative space” of a rising issue over time and drawing in and connecting a wider set of actors behind it. Through these means actors also used the conferences as sites for widening the political significance of solar from a mere energy policy issue to considering it also from an industry and innovation policy perspective. In this way, field-configuring-events may serve in strengthening the advocacy in a nascent field.

In sub-study 3, I investigate the potential of a field-configuring events sequence as a “sustainable niche”. These are conceptualized as “sources of novelty” within self-sustaining socio-technical dynamics (Garud & Gehman, 2012), or “protected” spaces that allow the development of new ideas, artefacts and practices, related to sustainable technologies and solutions, without them being exposed to the full range of selection pressures favoring the established industries (Geels, 2002). I find that the conference sequence served as a “niche” for solar technology by spurring two different types of activities and processes: processes that boost the rising innovation directly, and processes relating to the “disruption” and political contestation of established industries, understood as counteracting the emergence of novel sustainable solutions. I point out the presence of conflicting interests at conferences, emerging when niche actors and mainstream actors from established domains are brought together. My findings depict how, despite clashing interests, field-configuring events can serve as a stepping stone for niche actors to strengthen their networks aimed at shaking up established industries. Hence, the study portrays the role of organized field-level events as settings where niche actors gain legitimacy from the presence of incumbents and how this dynamic can bring about change.

My findings also point out how conference organizers use field-configuring events as subtle policy-tools for intentionally promoting policy-laden fields.

In the fourth sub-study, I, Eva Heiskanen and Raimo Lovio examine the role of building demonstration projects as “sustainable niches” (Schot & Geels, 2008) for new technologies. We study three sequences of local projects conducted between the late 1970s and 2010s and investigate how these gradually developed into patterns and arrangements that served to protect an emerging sustainable technology. Our findings show that the demonstrations created a small community of dedicated members in the field; in specific a domestic expert base of scientists committed to bringing solar technology to Finland. However, the demonstrations have struggled to transfer lessons from one demonstration to the other, especially because the early demonstrations have suffered from unfavorable timings with regards to external developments and high ambition levels vis-à-vis the know-how of their time. Participation in projects that have not delivered expected outcomes have remarkably curbed commitment and created time lags in granted resources in the early decades in 1980-1990. We also find that direct participation in successful demonstrations has a high capacity to legitimate a technology and convince public bodies and financiers of further investments.

I begin this chapter by providing an outline of the literatures on field emergence and legitimation, temporality and institutions, sociology of expectations, and field-configuring events, experiments and other collective spaces in nascent fields. This section introduces the key concepts and prevailing understanding on my topic that serves as a basis for formulating my contributions. After this, I discuss the findings and my contributions to the presented literatures, and to current understandings of legitimation in nascent fields.

2. Theory section

In this section, I summarize literature that builds the theoretical premises of the study and the theory basis for formulating my contributions. Namely, I recognize four streams as significant: studies on legitimation and collective action in nascent fields (Aldrich & Fiol, 1994), research on temporality and institutional change (Zietsma et al., 2018), studies on visions and expectations in technology-driven fields (van Lente, 1993) and, finally, research on collective spaces in nascent fields (Schüßler et al., 2014).

2.1. Legitimation and collective action in emerging fields

The emergence of organizational fields has been widely investigated in the neo-institutional stream of management research (Granqvist, Grodal, & Woolley, 2013; Lounsbury, 2003; Weber, Heinze, & DeSoucey, 2008). The term organizational field refers to “sets of organizations that, in the aggregate, constitute a recognized area of institutional life; key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products” (DiMaggio & Powell, 1983). Fields may form around issues that bring together disparate constituents (Hoffman, 1999; Zietsma & Lawrence, 2010), or they may develop in the context of a profession (Greenwood, Hinings, & Suddaby, 2002) or an industry (Garud, Jain, & Kumaraswamy, 2002). Whereas established fields tend to be legitimate by definition and benefit from perceptions of persistence, regularity and stability (Aldrich & Ruef, 2011; Scott, 2001), nascent fields on the contrary are only in the process of developing shared perceptions of new activities as desirable and

proper. Emerging fields lack shared understandings of the field's meaning and boundaries, and hence participation is often considered uncertain and susceptible to failure (Golant & Sillince, 2007).

Research has investigated how actors legitimate emerging fields. Some scholars address legitimation as a process, meaning that the focus is on how legitimation unfolds over time (David et al., 2013; Deephouse & Suchman, 2008; Aldrich & Ruef, 2011), rather than how legitimacy is achieved as a final outcome of field activities. Legitimacy perceptions ultimately define whether a nascent field survives over time or whether it dissipates in established institutional structures. Prior research categorizes legitimacy perceptions as being either cognitive and based on the formation of common understandings, or evaluative and building on an assessment of means and ends, that is, a recognition of how e.g. a new technology contributes to society or how it aligns with social values and institutional standards (Suchman, 1995).

Suchman (1995) suggests that, when embarking on a new activity, new entrants must engage in sector building and construct a winning coalition of believers, who perceive partaking as socially desirable (see also Aldrich & Fiol, 1994). Hence, field emergence requires that distinct communities develop some degree of "togetherness" and start to regard the field as a shared reference point to diverse interests (Hoffman, 1999; Wry et al., 2011). Prior research has recognized a multitude of resources in bringing about concerted action. For instance, the emergence of a shared value base (Garud, Gehman, & Karnøe, 2010; Patala et al., 2017), the mobilization of linguistic elements like rhetorical strategies, narratives and shared meanings (Garud, Gehman, & Karunakaran, 2014; Ibarra & Barbulescu, 2010; Weber et al., 2008) and the construction of conjoint goals (Lawrence & Phillips, 2004; Maguire, 2004; Mair & Hehenberger, 2014) can serve in aligning actors.

Studies have found that the early stages of a nascent field are commonly characterized by excitement and momentum around common goals (Grodal, 2017). However, excitement may fade over time and challenges may emerge related to the development of coherent understandings. Fields consist of communities that approach it from different vantage points and hold scattered understandings of what the field represents and what logic, goals and means for achieving field-level goals to pursue (Grodal, 2017; Lounsbury, 2003; O'Mahony & Lakhani, 2011). Hence, disparate community interests, and diversity and inconsistency between actors can create fragmentation in a field over time (Grodal, 2017; Schüßler, Rüling, & Wittneben, 2014) and challenge legitimation (Meyer & Scott, 1983).

Sometimes actors in new fields legitimate new activities or technologies by connecting it to legitimate others, such as mainstream authorities, industry leaders and other dominant organizations (Patala et al., 2017). While borrowing legitimacy from the mainstream has been found useful in some cases (Deephouse & Suchman, 2008; Zimmerman & Zeitz, 2002), there is also evidence for how such an approach can jeopardize coalition-building. The integration of mainstream actors may lead to perceptions of a compromised novel field (Granqvist & Laurila, 2011; Lounsbury, 2003). For instance, changes in key values or the collective political agenda can emerge and change group dynamics in fields, also as incumbents often seek to reframe the new field or category to better align with their interests (Hardy & Maguire, 2010). Incumbents have also been found to hijack an emerging category related to cleantech and absorb its resources, thereby undermining entrepreneurs' activities and hindering field emergence (Zietsma et al., 2018). In line with this, literature suggests that an inside-out strategy in legitimacy building may ultimately be better in gaining sustainable outcomes (Human & Provan, 2000). This means that legitimacy is first established internally among field members, before seeking it in the eyes of external stakeholders.

Some fields emerge as sustainability-driven alternatives that replace technologies and organizations in established fields. Such field-level changes have been conceived as ‘sustainability transitions’, understood as long-term, gradual and broad processes of change at the level of socio-technical systems (Geels, 2002). For instance, new renewable energy technologies and electric transportation count as examples of such fields. They are distinct from other cases of field emergence, as the focus is on a normative pursuit to develop new sustainable solutions and because established industries resist such solutions, as transitions threaten their core products and activities (Garud & Gehman, 2012; Geels, 2002). Hence, a transition tends to depend on government commitment to sustainability and require a focus beyond the promotion of a single innovation to generating broad system-level change (Geels, 2002; Turnheim & Geels, 2012). Often, such change includes also the destabilization of incumbent industries (*ibid.*).

2.2. Temporality and institutional change

The relationship between temporality and institutional change is an emerging stream of research that is now attracting increasing academic interest. Temporality refers to the negotiated organizing of time (Butler, 1995; Orlikowski & Yates, 2002), i.e. to time as a social construct that is repeatedly produced and reproduced and, hence, continuously changing. With respect to field emergence and legitimation, people hold shared understandings related to the timeliness and modernity and the long- or short-termism of new issues, and whether change is occurring fast or slow and how long it will take for change to happen, as some examples. Such beliefs inform and are an inseparable part of people’s perception (Barley, 1988).

Institutions refer to shared rules, norms, understandings and practices that are taken-for-granted and provide durable frameworks for doing and envisioning. They have long been understood in relation to time. Institutions have been characterized as “repetitively activated, socially constructed controls” (Jepperson, 1991: 145) and as legitimate stabilizing mechanisms (Zietsma et al., 2018) that interlock with other institutions. Thus, institutions hold inbuilt forms of systemic maintenance (Hughes, 1936; Lawrence & Suddaby, 2006).

Literature implies also that legitimacy perceptions are tightly interlinked with perceptions of temporality. Suchman’s (1995) seminal paper on legitimacy recognizes three different forms – cognitive, pragmatic and moral legitimacy. He defines cognitive legitimacy as consisting of comprehensibility and taken-for-grantedness of actions and labels the first as predictability and the second as inevitability and permanence. Suchman also states that legitimacy enhances the stability of organizational activities, and that stability and comprehensibility are mutually reinforcing. Legitimacy is suggested to lead to persistence, and audiences are likely to give resources to organizations that appear desirable, proper and appropriate (*ibid.*). When an issue establishes legitimacy, also its temporal form may gain in acceptance and desirability. As an example of this, (Bluedorn, 2002) points to how the religions of Christianity and Islam introduced temporal elements from established religions during their emergence. For instance, the introduction of a weekly holy day served to reduce perceived uncertainty and to enforce legitimacy. Despite these insights on the temporal foundations of legitimacy, studies have not yet developed empirically founded understandings of the varying ways by which temporality and legitimation intertwine.

Research has for long treated the relationship between time and institutions as implicit. Institutional scholars study how change occurs over time and build their analysis structure around

stages or cycles of development and present chronologies or narratives of occurrences (George, 2000). Lately, an emerging stream of research on temporality and institutions has started to incorporate time as an explicit construct in the theoretical and empirical analysis. These studies explore how time is intertwined with novelty emergence and the maintenance of institutions. Studies account different analytical roles to time. Time has been addressed as an intentionally manipulated construct (Granqvist & Gustafsson, 2016; Raaijmakers et al., 2015), as an experience and orientation towards e.g. the past, present and future (Garud, Tuertscher, & Van de Ven, 2013; Reinecke & Ansari, 2015), as a temporal structure that is embedded in institutions and organizations, and defines the rhythms and time-frames of activities (Berg Johansen & De Cock, 2017; Zietsma et al., 2018), and as a point of awareness in planning the timing of activities (Buhr, 2012).

Research also explores a wide range of temporal constructs that may be significant for understanding legitimation in nascent fields. Institutional renewal requires that at least some temporal elements and understandings of an institution are re-negotiated and accepted as appropriate. Granqvist and Gustafsson (2016) explore temporal institutional work in the renewal of the university sector. This refers to how actors “construct, navigate, and capitalize on timing norms in their attempts to change institutions” (ibid.: 1012). The study incorporates several temporality constructs as an explanation of a rapid process of institutional change. It identifies how actors produced windows of opportunity, synchronicity, and irreversibility as shared beliefs and how these, in turn, were influential in shaping a wider process of institutional change. A study by Buhr (2012) also focuses on efforts to change institutions, in specific institutional entrepreneurship in integrating aviation into the emissions trading scheme. It finds that activities took place within given policy windows, as actors purposely carried out activities with timely consideration of the institutional process. Other scholars address the maintenance of institutions by e.g. the continuous repetition of rituals and ceremonies (Dacin, Munir, & Tracey, 2010) or the collective restoration of breakdowns in institutionalized practices (Lok & de Rond, 2013).

One central topic of intrigue is the study of how organizations come to engage with the distant future and adopt long time-frames. This is an important theme especially in the sustainability context and when addressing far-reaching environmental challenges like climate change. Also engagement with future-oriented technologies requires that actors consider developments in the long term. A few studies point out the role of social, economic and political imagination in tackling sustainability challenges (Le, 2013; Wright, Nyberg, De Cock, & Whiteman, 2013). In addition, studies at the firm-level explore, how organizations incorporate sustainability concerns in their goals and activities and manage inter-temporal trade-offs, that is, balance out between short-term business aspirations as opposed to the long-term goals (Bansal & DesJardine, 2014). In general, organizations tend to fall prey to short-termism that drives daily market-driven activities. A study by Slawinski & Bansal (2012, 2015) finds that some firms have a linear clock-oriented understanding of time, regarding time as measurable, objective, and quantifiable, while others hold an event-based understanding and perceive time as cyclical, qualitatively determined, and endogenous to events and processes. The study states that firms with a linear understanding of time engage more in short-term action, whereas firms with an event-oriented understanding of time are better able to manage uncertainty and cope with both short-term and long-term actions. Reinecke and Ansari (2015), in turn, depict that actors with clashing time perspectives were able to reconcile conflicts between short- and long-term orientations and view the same issue from varying time perspectives. Studies have also discovered that freedom in interpreting the past and choosing what moments of the past to mobilize is connected

with enlarged agency and imaginaries of the future (Garud, Kumaraswamy, & Karnøe, 2010; Kaplan & Orlikowski, 2013). While not situated in institutional theory, per se, these studies still bring insight into conceptualizing novelty from a temporal perspective.

2.21. Managing temporal complexity during issue emergence

Studies also shed light on the temporal aspects of creating concerted collective action in the pursuit of shared ends. In their review of the innovation literature, Garud et al. (2013: 793) use the term “temporal complexity” to point out that in the emergence of new innovations and fields “multiple temporal rhythms and experiences [come together] rather than a single linear conception of time”. For instance, different actors interlinked with an innovation experience time in different ways (Ansari & Garud, 2009; Garud et al., 2013; McGivern et al., 2017), especially if actors in a nascent field have origins in different institutional fields. As a contrast, organizations in the same field tend to be temporally aligned and adopt similar timings and speeds of action; a phenomenon known as isochronism and thought to create an important homogenizing process (Pérez-Nordtvedt, Payne, Short, & Kedia, 2008). On top of actors’ inherent time orientations, temporal complexity manifests itself in the varying rhythms and repetitive patterns that relate to an institution (Orlikowski & Yates, 2002; Zietsma et al., 2018), as well as in stochastic events and trends, including environmental jolts (Garud, Schildt, & Lant, 2014; Meyer, 1982). As examples, political cycles like the government period of rule, technological turnover in the industry such as the life cycle of a power plant, and economic trends like a financial downturn, influence the timing and rhythm of resource commitments to new technologies.

Garud et al. (2013) note that temporal complexity creates a range of challenges for issue emergence. Multiple temporalities lead to asynchronies of different elements related to the innovation and the infrastructure that enables mainstreaming. Asynchronies, in turn, can generate barriers and delays in the adoption of innovations. In a similar vein, studies have depicted the difficulty of reconciling different temporal orientations between groups (Zietsma et al. 2018; McGivern et al., 2017). A study by Zietsma et al. (2018) investigates the stalled emergence of the clean-tech sector. The study shows, how the management of three vastly different sets of timing norms led to the effect that new entrants in the clean-tech sector were undermined, and how their failure validated understandings that the technology was not yet ready for use. In particular, the incumbents reproduced the existing temporal rhythms of the regime, i.e. the established industries and politicians, and the existing evaluative structures, which generated temporal complexity and made it challenging for entrepreneurs engaged with clean technology to capitalize on committed resources. This contributed to the unobtrusive maintenance of the status quo. Simultaneously, this study creates a temporal explanation to the de-legitimizing effect of mainstream actors in rising fields, as especially the timings norms of the regime were detrimental to small companies.

Studies have explored temporal coordination in different settings including the coordination of varying temporal rhythms (Bluedorn, 2002) and the resolution of tensions among different understandings of the past, present and future (Kaplan & Orlikowski, 2013). Also the aforementioned studies on shared time perceptions (Buhr, 2012; Granqvist & Gustafsson, 2015) and actors’ timely considerations of policy cycles (Buhr, 2012) presented means of temporal coordination. In addition, Garud et al. (2013) draw attention to considerations of “time pacing” (Brown & Eisenhardt, 1997) and “momentum” (Hughes, 1969) in overcoming asynchronies.

In sum, this emerging body of research has made important contributions and explored a range of constructs that may be significant for understanding legitimation in nascent fields. A few studies also explicitly examine the temporal aspects pertaining to rising issues and industries (especially Granqvist & Gustafsson, 2016; Zietsma et al., 2018). However, many of the introduced concepts have not been examined empirically, and we still have an incomplete understanding of how temporality influences legitimation in nascent fields, and how fields and institutions are temporally constituted.

2.3. Visions and expectations in technology-driven fields

The existence of positive visions and expectations is essential also for emerging technologies that seek to attract resources for growth. The sociology of expectations literature investigates the role of expectations in technology-driven fields. Expectations are understood as a “state of looking forward” (Borup et al., 2006: 286), and considered central for innovation in contemporary science and technology. Van Lente's (1993) pioneering work recognizes expectations as significant for i) bringing actors together and generating a common purpose ii) attracting resources such as financing for R&D and political support for institutional and regulatory change iii) providing meaning and orientation for scientists and engineers and iv) reducing the perceived uncertainty of decision-making. Also Borup et al. (2006) have found expectations to be important for stimulating, steering and coordinating field development.

The expectations literature emphasizes the role of collective expectations, i.e. expectations that are shared by many actors or widely known and referred to (Borup, Brown, Konrad, & Van Lente, 2006; Konrad, 2006; van Lente & Rip, 1998). Collective expectations have been viewed as “performative” or even “constitutive” of phenomena (Borup et al., 2006; van Lente, 1993). They may become taken-for-granted and form “prospective structures” in a new field (van Lente & Rip, 1998) that exert ‘image pressure’ and generate an urge to invest in a new technology so as to demonstrate technological competence (Konrad, 2006). Hence, a withholding organization could even suffer losses in organizational legitimacy for not engaging with a new technology that is generally considered promising. In a similar manner, divergence in expectations may reflect that there is not broad consensus on the performance criteria for the technology, which in turn can create barriers for innovation system development (Alkemade & Suurs, 2012), i.e. slow down the formation of institutions that would support field emergence.

Studies in the stream point out that different groups of actors hold different expectations and respond differently during field emergence. Literature states that individual expectations depend on the preferences and interests of particular actors (Bakker, 2014; Konrad, 2006). For instance, the relative distance of an actor from knowledge production may be connected with future naivety and unrealistically positive expectations (Brown & Michael, 2003). Actors’ individual expectations have been found to define actors’ responses, and sudden changes in actor strategies can be explained by changes in expectations (Budde, Alkemade, & Weber, 2012). In addition, a study by Bakker et al. (2011) distinguishes between the ‘enactors’ of a technological variation and its ‘selectors’. They introduce the term “expectations work” to point to the contestation of expectations between alternative technological pathways. During expectations work the ‘enactors’ voice expectations related to a certain technology, while the ‘selectors’ compare and assess competing claims (Bakker et al., 2011).

The expectations literature also investigates hype disappointment cycles (Konrad, 2006; Brown & Michael, 2003). These are common patterns that occur at early stages of technology emergence, when expectations rise rapidly to inflated levels and collapse later on, if a technology fails to live up to established expectations. This can happen e.g. as an experimental project provides “hard facts” as evidence to the contrary (Konrad, 2006). Garud et al. (2014) demonstrate how early excitement can dissolve, due to entrepreneurs’ projective story-telling in setting expectations. In their study, the researchers state that ventures set high expectations at the beginning to gain legitimacy, yet are likely to deviate from them later on, causing potential losses in reputations. In sum, inflated expectations are claimed to potentially have huge disadvantages to the legitimacy of individuals and entire fields, as making high promises can lead to actors being “held to future account” (Borup et al., 2006; Brown, 2003).

2.4. Collective spaces as sites of coordination among communities

Studies in neo-institutionalism have introduced a range of different concepts for collective spaces that forge uncommon interactions for a limited time. For instance, studies on field-configuring events (Lampel & Meyer, 2008), interstitial spaces (Furnari, 2014), experimental spaces (Cartel et al., 2018) and institutional projects (Tukiainen & Granqvist, 2016) examine group dynamics in spaces and how they trigger field development and change. However, these different streams and concepts remain separate from each other, and literature still lacks an analysis of how different types of spaces concert disparate and dissimilar actors behind shared courses of action and how their influences differ. At the same time, scholars have recently shown that studying different types of organized events in parallel is useful, for instance, for understanding how and why institutional projects fail to create change (Schübler et al., 2014). In addition, it remains fairly unaddressed how engaged actors capitalize on spaces to legitimate a nascent field from the policy perspective and prove the fit between a new innovation and acute social and environmental concerns. A few studies have explored spaces in policy change (Hardy & Maguire, 2010; Schübler et al., 2014). Yet they do not specifically study legitimation efforts vis-à-vis changing societal concerns and changes in the topics that are high on the political agenda. In the following, I will first present the overall scope of this literature review. After this I will recognize distinct characteristics of spaces, as presented in the different streams, and analyze how these interlink with particular activities and inter-group processes.

My focus in this section is on spaces that create uncommon interactions that are usually not available (Hardy & Maguire, 2010; Lampel & Meyer, 2008). This points to encounters between disparate and dissimilar actors at the field-level, excluding settings that take place within an organization or other settings where actors’ interests align from the outset. Such interactions can occur either as actors co-locate in the same place physically, or when they connect virtually in ways independent of a physical setting, such as over the course of a demonstration program. Literature suggests that exceptional interactions in spaces can bring about novelty and institutional change e.g. through the emergence of trustful relations and learning (Schübler, Grabher, & Müller-Seitz, 2015), new solutions and practices (Hardy & Maguire, 2010; Lampel & Meyer, 2008), collective beliefs and cognitions (Zilber, 2007; Oliver & Montgomery, 2008), and shared stories and discourses (Hardy & Maguire, 2010).

Secondly, I focus on spaces that are temporally bounded, that is, of limited duration (Hardy & Maguire, 2010; Lampel & Meyer, 2008) and that are exceptional and occur rarely in fields. Existing

research associates such events with potential to bring about radical field-level change, whereas periodic events tend to stabilize field processes (Oliver & Montgomery, 2008; Schüßler et al., 2014). Temporal limitations, such as the transitory nature of events or the setting of deadlines in projects, has been found to generate creative friction (Grabher, 2004), and to stimulate momentum for change (Gersick, 1989; Schüßler et al., 2014). At the same time, transitory spaces have been found to struggle with continuity. For instance, it has been discovered that new activities and ideas that are created in spaces are prone to “get lost” and that their repetition over time as well as their institutionalization is difficult (Furnari, 2014; Cartel et al., 2018). Similarly, studies discuss the challenges related to sustaining continuity across consecutive temporal projects (Bakker, Boroş, Kenis, & Oerlemans, 2013; Grabher, 2004; Lundin & Söderholm, 1995). As a contrast to these findings, Tukiainen and Granqvist (2016), in particular, explored a series of projects and found that it may produce sustaining institutional outcomes. These emerged, for instance, as the institutional project generated a lock-in that was difficult to reverse and that secured the continuity of institutional change.

One aspect that delineates different spaces from each other is whether a space forges interactional openness, i.e. engages a wide set of actors and perspectives, or whether interactions are limited to certain members. The feature of “openness” is associated with the development of broad understanding, learning, knowledge exchange and trust building (Schüßler et al., 2014). Open spaces can serve as platforms for reconciling different perspectives across diverse actors and communities and developing wide-spread and inclusive collective action. For instance, field-configuring events (Hardy & Maguire, 2010; Lampel & Meyer, 2008), interstitial spaces (Furnari, 2014), and inter-institutional projects (Dille & Söderlund, 2011, 2013) have been depicted as “interactionally open”. Field-configuring events (FCE) are “temporary social organizations ... in which people from diverse organizations and with diverse purposes assemble periodically, or on a one-time basis ... to become aware of their common concerns, join together and share information” (Lampel & Meyer, 2008: 1026). Interstitial spaces, in turn, are defined as small-scale settings where individuals positioned in different fields interact occasionally and informally around common activities to which they devote limited time, such as a workshop or a hobbyist club (Furnari, 2014). Studies explore how alignment is achieved across interests and perspectives. E.g. the interplay of front-stage and back-stage activities has been found to play a role (Mair & Hehenberger, 2014), as is the possibility to use organized events for conventionalizing one’s account to powerful actors (McInerney, 2008). A related study by Furnari (2014) shows that spaces can allow actors to break free from existing institutions for a limited time and thereby coordinate action.

Other spaces are more limited in membership, meaning that participation is restricted to selected constituents or that the space cultivates segmented interactions within sub-groups. Experimental spaces count as one example (Cartel et al., 2018). These are transitory social settings where field actors experiment with alternative action models (ibid.). Also e.g. conferences can foster interactions that are shielded, like in the case of back-stage settings that are not accessible to all audiences (e.g. Bucher & Langley, 2016). Limitations to engagement generally relate to a division between an in-group and out-group perspectives, and the creation of oppositional standpoints and cross-position collectives when compared to the status quo (Bucher & Langley, 2016; Cartel et al., 2018; Zilber, 2011). Actors may intentionally enforce boundaries to a space, so as to protect it from regular institutional pressures and allow a new solution to be tested without outsider scrutiny and sanctions (Zietsma & Lawrence, 2010). Studies also show that new solutions are likelier to spread into the mainstream, if a space diminishes the loyalty of members to the status quo and dissolves its

boundaries gradually upon termination, so as to protect the new solution from the opposition of non-members (Cartel et al., 2018).

Another aspect that differentiates spaces from each other is whether activities focus on the articulation of ideas and perceptions and are oriented towards the future, or whether they center on testing and experimenting with a new innovation and are present-driven. Multiple studies especially on FCEs characterize the construction of ideas and perceptions as a future-oriented activity. Studies relate idea creation to e.g. the development of future cognitions (Oliver & Montgomery, 2008), the simulation of unrealized shared visions (Lampel & Meyer, 2008) and to struggles over different visions of the future (Hardy & Maguire, 2010), that is, to different aspects of constructing the future. This also hints that spaces – as settings where interactions are detached from actors' regular institutional fields and norms (Furnari, 2014) – can allow actors to temporarily extend their time-frames and take into account the distant future. Hence, a future-orientation provides one means for breaking free from the timing norms and temporal perceptions that characterize actors' day-to-day institutional contexts.

Other spaces focus on experimental activities, i.e. testing a novel solution, appropriating it in accordance with experiment outcomes and providing other types of proof for feasibility (Cartel et al., 2018; (Zietsma & Lawrence, 2010). Experimental spaces and interstitial spaces that focus on experimentation, such as pilot projects or hobbyist clubs addressing certain technologies, count as obvious examples of this type. Also institutional projects can aim at justifying an issue by providing evidence of the potential of new solutions compared to ongoing institutional developments (Tukiainen & Granqvist, 2016), or they can focus on developing functionable solutions according to the know-how of the day. Studies in this context show how testing, experimenting and providing proof for the value of a novel solution have a high potential to create affirmative commitments (Cartel et al., 2018), that is urge immediate investments and engagement. These studies also hint that the activity of experimenting is focused on the present; experiments create a snapshot picture of the state-of-the-art of a new solution and an assessment of whether a solution is topical and ready for use. Hence, as a contrast to future-orientation, some spaces might be mostly interlin with crafting presence for new solutions.

Research from multiple streams acknowledges that spaces should only be understood as embedded in a larger stream of field activities and the institutional environment (Dille & Söderlund, 2011; Schübler et al., 2014; Tukiainen & Granqvist, 2016). Yet only a few studies have taken concrete steps to this direction. As one example of such a study, Schüssler et al. (2014) have explored the United Nations climate conferences. They found that growing field complexity and issue multiplication over events led to diverse actors finding event participation useful for their own purposes, which contributed to activities disconnecting from the institutions at the center of the conferences and generated field maintenance. Overall, however, spaces are commonly considered separate units with little interaction with their environment, and researchers have invited future research to focus on this particular matter (Dille & Söderlund, 2011; Schübler et al., 2014; Tukiainen & Granqvist, 2016).

In sum, extant research has uncovered a range of group dynamics in spaces and depicted various mechanisms by which actors structure fields in spaces or try to transitions from a scattered group into a unified coalition with shared goals and agendas. At the same time, there is little dialogue between the different streams, and not many studies have explored how engaged actors capitalize on spaces to legitimate a new technology as policy concerns change and develop over time.

2.5. Structure and scope of the study

The above presented theories and concepts come together in the following visualization of the structure and scope of this study. Figure 1 summarizes the key concepts, the intersections between different theories and how these relate to the two research questions of this study.

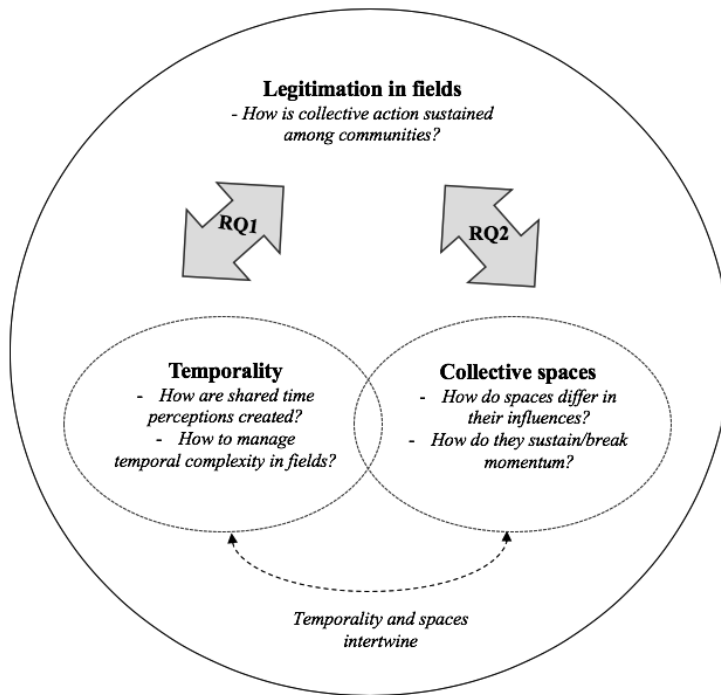


Figure 1. Structure and scope of study: temporality and collective spaces in legitimating emerging fields

3. Empirical setting, data and methods

In this section I will present the empirical context of the study and reflect back on the data collection process, namely how it unfolded over the course of and in between the individual sub-studies. I also provide a summary of different data sources and their roles in crafting understanding on the case. Finally, I will shortly describe my generic methodological approach.

3.1. Solar energy in Finland – a brief history of global and local developments

Solar energy is a new renewable energy technology that produces electricity and heat from the sun through two main technologies – solar photovoltaics (PV), generally known as solar panels, and solar thermal collectors. I address the two technologies together in this research, under the generic ‘solar energy’ category, as they are commonly treated together also in social and political discussion.

Solar energy is to date considered a spreadhead technology in the transition of the energy domain from centralized production based on non-renewable energy sources and dominated by electric utilities towards an increasingly decentralized system, where property owners start to produce energy and where production is based on new renewables, including solar, wind and heat pumps. Hence, while solar is also produced in large power plants, it has spread widely as a decentralized technology. In the latter case the adoption of feed-in-tariff policies support the technology by giving renewable energy sources priority in the electric grid and allowing the small-scale producer to sell back excess electricity to the electric grid (Bohnsack et al., 2015).

Solar energy has a fairly long global history, with initial interest having increased for the first time during the two oil crises, that triggered a global search for alternative energy sources (Bohnsack et al., 2015). The key measures in evaluating energy alternatives lies in their cost-competitiveness and ability to generate sufficient energy to households and the industry. Hence, interest in solar energy has fluctuated according to expected profitability as opposed to other sources, with changes in oil prices being a central point of comparison. Further on, developments have depended on government commitments and political decisions to invest in solar energy.

A study by Bohnsack et al. (2015) divides global industry development into three phases. The first phase emerged from the 1980s, in the aftermath of the oil crises, and is characterized as innovation-seeking; with countries like France, the US and Japan investing in research and development to improve technical performance. The second phase in 1990-2004 was led by countries including Germany, U.S. and Japan. It was triggered by the first Gulf War that raised concerns for energy independence and by the emergence of climate change as a major global worry (ibid.). For instance, Germany initiated a program aimed at installing solar panels on 1000 roofs in this time, marking the start of the country's commitment to developing the local market (Jacobsson & Lauber, 2006). The period from the 1990s until the early 2000s is also depicted as a time where solar went through a major political break-through in the European Union and established as a mature industry, with nearly all European Union countries introducing a feed-in-tariff scheme for solar (Georgallis et al., 2018). Finally, the third phase in 2005-2012 is characterized by Chinese involvement in the market, which brought about rapid price decreases in solar PV and a mass market with expanding capacity. During this last period, solar technology has emerged as a major option for distributed energy, with many more countries joining in and continuing investments (Bohnsack, Pinkse, & Waelpoel, 2015; Solar Power Europe, 2015). To date, solar energy is the most rapidly expanding distributed energy source (International Energy Agency, 2018b). Energy experts foresee a bright future for solar e.g. due to its sheer amount on earth's surface and adaptability to different settings.

In the Finnish setting, interest in solar energy has fluctuated according to global developments (Berninger et al., 2017). Initial networks started to form in early 1980s, with the founding of a local industry association and first businesses and the emergence of scientific interest locally. Prior research and the informants of this study illustrate the early period until the 1990s as a time, where Finland was among the pioneering countries in terms of innovation and share of global markets (Pesonen, 1997; Virtanen, 2018). After the start, further initiatives have followed in accordance with global trends. In these actors have tried to attract resources to the field and align behind shared goals – with the ultimate aim of legitimating the technology towards policy-makers and innovation bodies that control resources and to the society at large. However, as described in detail in the introductory part, industry development and legitimation have been tremendously sluggish. Symbolic of this, the informants of this study illustrated Finland as “a developing country in solar energy” and as “an island

that is completely unaware of what is happening globally”. Also, interviewees from companies pointed out that “a mere reference to [solar as a local business] is slightly insulting” and called themselves “born-global” in order to take distance from the local setting. As another key feature, actors have been dispersed and dis-coordinated in their collective efforts to legitimate the field; an issue that continued to persist until after the end of the data collection period. Reflective of this, the local industry association is to date an ideological group of solar enthusiasts. As there is no active advocacy coalition devoted to solar, in particular, political lobbying is organized under an association that promotes renewable energy as a group. Experts also state that interest in solar energy is again diminishing towards the end of the 2010s, as other renewables like wind power are becoming increasingly competitive.

A look into solar energy in other northern settings shows that developments in Finland have been particularly cumbersome also in contrast to countries with similar conditions. In the Nordics, Denmark is known as a pioneering market in solar heat, and both Denmark and Sweden have established support schemes for solar energy (Lipp, 2007; Solangi, Islam, Saidur, Rahim, & Fayaz, 2011). Informants from my case also referred to these countries as benchmarks that they looked up to, in the intent to learn from these cases. Also countries like U.K. and Canada have subsidized solar, and research documents these markets as having undergone market booms (Smith et al., 2014). Some studies report cases of survival in unfriendly environments, such as in the Netherlands, where advocates have managed to secure important resources despite the unfavorable context (Verhees et al., 2013). In sum, Finland stands out as one of the few countries in Europe with particularly weak advocacy for solar and a lack of policy support and concrete targets to increase the share of solar energy, i.e. a case where legitimation has been particularly challenging.

Understanding the empirical context as a sustainability transition. A stream of empirical research, referred to as the sustainability transitions literature, takes interest in how new sustainable solutions emerge to replace old technologies, such as in the case of renewable energy, electric vehicles or sustainable food and agriculture (Garud & Gehman, 2012; Geels, 2002; Zietsma et al., 2018). Research in this stream explores how novel issues disrupt large socio-technical systems and how these transition towards increased sustainability. Conceptualizations emphasize that new energy technologies are fiercely counteracted by established institutions and technologies that are already profitable and that hold disproportionate power compared to emerging solutions and industries (Smith et al., 2014; Verhees et al., 2013). In particular, energy incumbents and policy actors with long-standing ties to old industries are understood as forming a regime that slows down the adoption of novel solutions (Garud & Gehman, 2012; Geels, 2002; Zietsma et al., 2018).

Conceptualizations of sustainability transition can bring further insight into the empirical context of the study. First, prior studies in similar contexts point out that key actors need to develop ‘niches’ for new solutions – understood as protected spaces that shield a new technology from mainstream selection pressures (Schot & Geels, 2008; Smith & Raven, 2012). Hence, one important issue is, how actors and different settings can bring about protection to emerging solutions. Secondly, the sustainability transitions perspective emphasizes the interface between niche actors that are devoted to new solutions and regime actors that take part in their development, yet have an interest in sustaining the status quo (Kemp, Schot, & Hoogma, 1998; Smith, 2007). Niche-regime interactions are central, as sustainability-driven actors still need to work together with incumbent firms and governments to improve and mainstream new technologies. Hence, the context of a transition implies heightened interest in how niche actors can best collaborate with the mainstream to enable a transition

and how they can destabilize regimes – as a prerequisite of novel solutions spreading to the mainstream (Raven, 2006; Turnheim & Geels, 2012).

3.3. Data collection

The data collection for this thesis took place in 2012-2016 and unfolded as a collaborative effort between the researchers who are involved in the individual sub-studies. We collected a large data set that consists of different qualitative data sources. The data includes 51 interviews with key actors and organizations in the field, more than 200 hours of observations at conferences, multi-stakeholder project meetings and other collaborations, a large archive of reports on for instance experiments, workshops, political statements and strategies (3000 pages) and 3400 news items from two key newspapers in Finland during 1973-2015. We followed an iterative and grounded method in generating the data, meaning that data collection overlapped analysis (deMarrais & Lapan, 2004; Glaser & Strauss, 2009; Strauss & Corbin, 1994; Suddaby, 2006). This allowed us to base decisions on additional data collection on the deepening analytical insight among research team members. We exchanged thoughts on central themes and findings among the research team members throughout the whole process by gathering together at regular intervals. The collection of different sources also overlapped in time, and we could thus adjust data collection depending also on the type of evidence that was needed at a time to complement our understanding of the case (Corley & Gioia, 2004; Glaser & Strauss, 2009). Hence, the additional data became more and more focused over the course of the process. Table 1 presents the different sources of data and their roles in this research.

Table 1. Data sources and their roles in this research

	Interviews	News and media coverage	Reports, policy documents and other archival data	Seminars and project meetings	Written materials on conferences and workshops	Social media coverage and emailing lists
Data items	51	3400	40	200 h	150	3+3
Pages	-1000	-4500	3000	100	4200	-1000 +-500
Timing	2012-2016	1973-2015	1973-2015	2011-2016	2011-2016	2013-2015
Description of the data	All key stakeholders: scientists, entrepreneurs, industry organizations, innovation intermediaries, NGOs, policy bodies, technology companies, established industries incl. utilities and construction, municipalities, consultants and financiers	News stories and public opinion expressions reflecting the perceptions and attitudes on solar energy	Reports of initiatives, policy statements, summaries on workshops, research results of experiments, cluster and industry reports, project-internal memos, government decisions and energy policy and climate change strategy reports	Interactions at 16 technology conferences, seminars and workshops and at a university-led multi-stakeholder project (8 months); 20 hours of audio and video-recordings	Presentation slides conference programs, press releases, marketing materials	Following three active groups on Facebook focusing on solar energy and three emailing lists of research and development program groups forging policy change
Type of information provided	Development of solar over time, personal views and opinions, experiences in local initiatives	Key events and opinions, initiative outcomes and experiences	Actors' perspectives, and the content and outcomes of initiatives, policy decisions	Presentations o, discussions and interactions between actors; efforts to collaborate	Presentations	Political debates
Quality of evidence Sub-study 1	+++	+++	+++	++	++	++
Quality of evidence Sub-study 2				+++	+++	
Quality of evidence Sub-study 3	++			+++	+++	
Quality of evidence Sub-study 4	++		+++			
Characteristics and limitations	Personalized and informal stories; post-hoc rationalization	Real-time, mediated, formal stories; emphasis on events of high public interest	Real-time personalized views and mediated stories	Real-time formal interactions between key constituents	Real-time formal representations targeting a particular audience	Real-time informal interactions between enthusiasts and lay people

Interviews. The core data of this research consists of 51 interviews covering all the key actors and organizations relating to the nascent field, including early enthusiasts and activists, technology companies, established industries with a stake in the field such as electric utilities and the building and construction sector, the scientific establishment, government and policy bodies, consultants and financiers, innovation intermediaries, municipalities, and NGOs. Interviewing various stakeholder groups with different perspectives towards the field allowed us to avoid convergent sense-making, and gave us a comprehensive understanding of the field (Eisenhardt & Graebner, 2007). The interviewees were selected based on the experience that I gathered in conducting observations at conferences and other settings as well as by studying documents and reports to identify further informants. We also followed snowball sampling during the interviews.

The interviews were conducted during 2012-2015, and lasted 66 minutes on average. I participated in 30 interviews myself. We followed the format of a semi-structured interview with the main questions relating to the informants' perceptions on local initiatives and legitimacy, how the field had changed over time globally and in the local setting, and the dynamics between different constituents. The interviews were recorded and transcribed resulting in approx. 1000 pages of transcriptions single-spaced. Three interviews were not recorded but carefully documented through written notes. The semi-structured format allowed us to adjust the questions to each informant, and to consider the distinct ways in which they had been engaged with the field. Thus, the interviews were significant in gaining access to the personalized views of particular actors and communities and understanding on how certain actors had engaged with and experienced specific settings and situations. The interviews also granted us access to historical developments and thus complemented the archives on the history of the field.

Observations. We also conducted observations at 17 conferences and workshops in 2012-2015 that brought together key constituents for joint agenda creation (approx. 60 hours), including technology conferences, group meeting for political lobbying and other types of get-togethers. I participated in ten events myself. In addition, I conducted participatory observations over a multi-stakeholder research project on solar energy for a time of eight months. I took part in project meetings and seminars in 2014-2015 (approx. 100 hours), where I engaged directly with key stakeholders from companies, innovation and funding bodies, scientists etc. I also engaged with numerous informal chats with the key constituents in this time. These observations have been documented in detailed field-notes (Emerson, 2011), and video and audio recordings of these settings. The observation data had a role in providing understanding on the micro-dynamics between actors, as they unfolded in real time, and developing fine-grained insight into actor's approaches in legitimation in different settings. The real-time data brought to light new aspects that were not visible in the interviews or documents, such insight into the interpersonal culture in the field and how actors related to each other as well as the overall atmosphere and motivational state of different actors. Understanding on how certain issues were expressed in a face-to-face setting also via non-verbal behavior and gestures brought additional comprehension on the interview data and was helpful also for the purpose of data triangulation.

Archival data. We also collected an extensive archive of documents and reports on local legitimation efforts covering all major experiments, technology programs, and other initiatives during our period of interest. This amounted to 40 data items and 3000 pages of materials for analysis. This archival data gave us access to actors' perceptions and initiatives as they unfolded (Lofland & Lofland, 1995), and enabled us to trace changes in perceptions over time and immediate responses to

the conducted initiatives. We also collected archival data related to the technology conferences, and internal memos and preparation documents related to the multi-stakeholder project for furthering home markets. In 2013-2015 we followed three emailing lists among enthusiasts and people wishing to influence policy and three groups on social media related to solar energy and energy policy.

Finally, to capture the media coverage of solar energy in our investigation period, we collected news stories from two major newspapers in 1997-2015 leading to 3400 news items and 4500 pages of materials. We used the search words “solar” and “photovoltaics” allowing us to collect all articles that related to the technology. The newspapers included Helsingin Sanomat, which is the largest daily newspaper in the country, and Kauppalehti, one of the leading daily newspapers with a focus on business news. The news stories served as a further access point into real-time perceptions on the emerging technology and local initiatives.

3.4. Summary of analytical process

The data collection unfolded in three phases, each of them characterized by distinct influences on my understanding of the case. The first phase took place in 2012-2014 and revolved around *getting acquainted* with the emerging field through two particular empirical settings; technology conferences that gathered together diverse actors in 2011-2015 and building demonstration projects that had been organized since the 1980s and covered the whole investigation period. We carried out observations at conferences, conducted 14 initial interviews among actors engaged with the two settings and collected related archival data. Thus, the first phase brought about fine-grained understanding on micro-interactions in these specific and limited contexts.

The second phase in 2014-2015 brought about a shift in my perspective – from an outsider to *becoming personally engaged* with the field. In this time I participated as a researcher in a multi-stakeholder project aimed at creating home markets for solar energy and gathering together 50 organizations in the industry and the innovation eco-system. I carried out participatory observations over eight months in the project, collaborating directly with field members and carrying out practically oriented research tasks. Hence, I became increasingly intertwined with the field e.g. through stepping up as a presenter at industry events myself and taking part in numerous meetings and informal chats. This contributed to deepening and personalized insight into the case related both to the field at large and to specific contexts.

Finally, the third phase of data collection in 2015-2016 focused on *expanding data and distancing* from the context. The main intent in this was to gain comprehensive understanding from various settings. We completed the interview data to encompass all key actors in the field. We also collected a large archive of news stories and reports going back to historical developments. The final phase was functional in terms of detaching from participatory interactions with specific contexts and, thus, the object phenomenon and developing understanding on a more generic analytical level. All in all, the three phases of data collection were complementary to each other in bringing in additional analytical understanding. The early participatory methods were useful especially in identifying the object phenomena and research questions of the subsequent sub-studies that I initiated later on during the research process.

The adopted methods are explained in detail in the sub-studies of the thesis. Overall, this research is a grounded and exploratory study that aims to provide detailed understanding of field emergence and change (Strauss & Corbin, 1994). The analyses unfolded inductively, meaning that we allowed

central themes and theoretical concepts to emerge from the data rather than relying heavily on existing theory and analytical conceptualizations in theory development (Corbin & Strauss, 1990; Flick, 2009). Hence, the analytical process was iterative and tightly linked to data. In the grounded theory approach the researcher continuously compares data and theory and allows the research focus and research question to change when necessary (Glaser & Strauss, 2009). The underlying idea is to confront unique situations and draw generalizable theories from them. The grounded approach is suited to study social processes, where previous research is lacking in breadth and depth, and where new points of view appear promising (Flick, 2009).

The individual analyses of the sub-studies developed as we first identified the key phenomenon and addressed the question of “what is this a case of?” – through immersion in the empirical context (Granqvist, Kallio, & Nissilä, 2017). After this, we recognized central concepts and themes in the data and delineated them to more generic dimensions and patterns. We wrote theoretical memos throughout the research process and focused on relating key constructs to each other (Corbin & Strauss, 1990). All of the sub-studies analyse developments over time. Hence, a key issue in data analysis was to track how novelty emerged and how it accumulated into patterns and outcomes over the course of events and interactions. In one sub-study we also used a computer-based qualitative data management program to support analysis.

Philosophical underpinnings. The study represents the interpretive tradition of social science, where human and social reality are regarded as socially constructed (Denzin & Lincoln, 2005; Morgan & Smircich, 1980). Thus, I was interested to understand social and subjective interpretations and meanings that actors gave to situations. This is in contrast to research that seeks to explain an empirical phenomenon by defining dependent and independent variables and that regards reality as objective and waiting to be detected by the researcher (ibid.). Instead, I was curious to recognize and bring insight into the subjective and situational reality of the research setting – assuming that my own interpretations would influence theory building. These premises pose less rigorous demands on the concept of theory compared to the objectivist epistemological tradition. In the interpretive approach, new knowledge is in itself regarded as an “interpretations of interpretations, where the observer has a privileged voice” (Denzin & Lincoln, 2005: 17). Thus, a central task of theory is to make sense out of a local situation.

4. Summaries of the essays

Essay 1: When the time never comes – temporality and legitimacy in nascent fields

In this study we explore the role that shared perceptions of temporality play in legitimating a nascent field and creating concerted collective action for field emergence. Scholars have addressed legitimacy in nascent fields from multiple perspectives, such as the role of societal values (e.g. Garud, Gehman, & Karnøe, 2010; Patala, Korpivaara, Jalkala, Kuitunen, & Soppe, 2017), and the emergence and mobilization of collective meanings (Aldrich & Fiol, 1994; Lawrence, Hardy, & Phillips, 2002). In addition, an emerging body of research has begun to address the interplay of temporality and institutions (e.g. Slawinski & Bansal, 2012; Reinecke & Ansari, 2015). However, studies have yet to develop an empirically founded understanding of the varying ways in which temporality and legitimacy are intertwined in such contexts.

We conduct a grounded, longitudinal study of initiatives aimed at legitimating solar energy in the North in 1973-2015. The analysis is based on 51 interviews with key actors in the field, more than 200 hours of observations at conferences and other multi-stakeholder settings, 3400 news stories and 3000 pages of archives including planning and evaluation reports of initiatives, policy statements and the like. Our analysis of the data is inductive and we follow a modification of the Gioia-method (Gioia & Thomas, 1996; Gioia, Corley & Hamilton, 2012).

We develop a framework for understanding the temporal foundations of sustained illegitimacy in nascent fields. We find that legitimation in temporal terms is apparent in their momentum, and that illegitimacy is produced by two types of asynchronicity that reduce momentum – asynchronicity in the perceived rhythm of local field development as reflected against the rhythm of an acute global challenge, and the asynchronous timing of engagement among participating communities. The latter form of asynchronicity has two different sources, namely diverging timeframes between the participating communities and clashing perceptions of unfolding field development either as part of a stagnant cycle or as a linear and forward-moving trajectory. Perceptions of stagnation versus linearity originate from varying lengths of exposure to the field among the communities.

Our main contribution is to studies on temporality and institutions. Whereas prior studies have characterized momentum as one aspect in institutional change (Granqvist and Gustafsson, 2016), we add that momentum is a key temporal manifestation of legitimacy in nascent fields, and recognize sources of hampered momentum. In particular, we point to asynchronicity between local and global developments as an explicating factor for a persistent lack of local engagement. We also point to hypes as cyclical and repetitive phenomena. Whereas previous studies have addressed single hypes (e.g. Garud et al. 2014), we depict how an early hype disappointment cycle raises the stakes for legitimation at a later point, leading to a recurring hype disappointment dynamic. This occurs as key actors lose their confidence in field development.

Essay 2: Creating expectations for solar technology over multiple field-configuring-events: a narrative perspective

In this article we study how actors construct shared expectations over a series of technology conferences. We build on the sociology of expectations literature, which addresses the role of expectations in technology-driven fields. Studies in this stream refer to shared expectations as prospective structures that have a performative character (Borup et al., 2006; Brown & Michael, 2003; Lente, 1993). Expectations bring actors together by providing common meaning and purpose, by reducing the perceived uncertainty of decision-making, and by attracting resources such as financing and political support for institutional and regulatory change (van Lente, 1993). However, prior studies have not addressed the role of organized field-level events like conferences in collectively constructing shared expectations. Here, we draw from the field-configuring events (FCE) literature that takes interest in the role of organized social gatherings, like conferences and seminars, in institutional change (Garud, 2008; Lampel & Meyer, 2008).

The empirical context of the study lies in a sequence of ten solar technology conferences in Finland, in 2010-2013. The conferences were organized by a government-affiliated innovation intermediary, in the intent to integrate disparate actors into a shared discussion and forge new connections between them. The data consists of observations and detailed field-notes taken of presentations and discussions at six conferences, and the in-print presentations slides shown during

speeches at the ten events (approx. 1250 slides) and distributed brochures. We study the construction of expectations through narratives and carry out an “analysis of narratives” (Polkinghorne, 1988), proceeding from the emic perspectives of single narrators to forming common “narrative themes” across actors. We focus on how the narration develops over time and how new narrative themes emerge.

We find that the conference sequence strengthened the advocacy in two main ways. First, it served in constructing six “narrative themes” that articulated a future promise for the field and had a role as common reference points for diverse actors. The narratives were flexible in a way that they allowed a broad spectrum of actors to be connected to them and individual actors to promote their specific expectations and agendas within the narratives. Second, the construction of expectations evolved as an exploration of multiple complementary narratives for the field’s future, leading to an enlargement of the “discursive space” for the technology over time. The narrators started off with a narrow storyline that gradually spread into several parallel narratives, as more actors joined the conferences and new topics were introduced.

Whereas prior studies have emphasized the importance of aligning visions and expectations (Konrad, 2006; van Lente, 1993), we emphasize that the multiplication of visions and expectations over time can be central as well. Furthermore, compared to previous accounts on arenas of expectations (Bakker et al., 2011) or field-configuring events (Garud, 2008) as sites of contestation between alternative technological variations, we find that the organized events had a unifying impact across diverse interest and agendas. In these two ways, the conferences served as a resource in community building.

Essay 3: Conferences as sequential arenas for creating new sustainable fields

In this study I apply the field-configuring events (FCEs) literature (Garud, 2008; Lampel & Meyer, 2008) to a novel empirical context – the creation of “sustainable niches” for an emerging technology. Research on field-configuring events has deemed conferences important in the emergence of fields and the change of institutions (Oliver and Montgomery, 2008; Garud, 2008). Yet little is still known about how they serve as sites for deliberately creating “sustainable niches”. These are understood as spaces that protect sustainable technologies from mainstream selection pressures (Geels, 2002), and as “sources of novelty” within self-sustaining socio-technical dynamics” (Garud and Gehman, 2012). The term stems from the sustainability transitions literature, which is a stream of empirical studies with an interest in how established socio-technical systems, like energy production, transition towards increased sustainability (Geels, 2002; Geels & Schot, 2007).

The empirical context of the study lies in the same conference sequence as in the prior essay, yet with one additional conference added to the data set. On top of the observations and archival data used also in essay number two, I also use 13 interviews carried out with conference participants and organizers and additional archival data, such as learning documents, summaries of workshops and news stories on the conferences. In the analysis I focus on two aspects of niche creation, presented as fundamental in the sustainability transitions literature: activities that promote the new technology directly and raise its status through the creation of expectations, learning and networking and activities that relate to the “disruption” of established industries and the contestation of policies that sustain the current system.

The findings depict that the conferences acted as fertile sites for deliberately forging the emerging sustainable field. They triggered patterns that promoted the new technology, that then, served as stepping stones for “disruptive change” and political contestation. These outcomes emerged via gradual and, in part, unexpected chain effects. For instance, policy-focused actors strengthened their ties and formed lobbies by leveraging the presence of reputable large companies and other established actors that contributed to legitimacy. The conference organizers used the conferences as subtle policy tools in intentionally forging institutional change. Different organizations were engaged in organizing tasks, and they coordinated their efforts in an informal structure that emerged behind the scenes of the conferences. In this, the organizers divided tasks in the intent to create continuity and ensure that another party would “pick up” on the next important issue, relating to field emergence, and that was beyond the role that other organizing parties had in the innovation system.

These findings contribute to studies on field-configuring events. Prior studies have found that conferences can trigger interactions that create institutional change, such as consensus for one approach over another leading to institutional closure (Garud, 2008), or the establishment of a new field (Oliver and Montgomery, 2008). As opposed to this focus on stochastic emergence of novelty, my findings highlight the role of conferences in intentionally promoting policy-laden fields. Hence, conferences may provide a space for organizers to deliberately “set the scene” for policy change.

Essay 4: Demonstration buildings as protected spaces for clean energy solutions – the case of solar building integration in Finland

In this article we explore the role of demonstration projects in forging the mainstreaming of solar energy. Literature on technology experiments has found that demonstrations serve in the diffusion of cleaner production solutions (Bai, Qiao, Yao, Guo, & Xie, 2014). Yet at the same time building demonstration projects, in particular, have been detected to often remain isolated and fail in spreading solutions to the mainstream (Hal, 2000). We examine, whether they can, nonetheless, have an impact for technologies that struggle to find other ways into mainstream markets. Like in the previous study, we build on the concept of “sustainable niches” as presented in the sustainability transitions literature (Geels, 2002; Schot & Geels, 2008) and set out to investigate, what is the potential of demonstration programs as spaces that protect the emerging sustainable technology from mainstream selection pressures.

Our empirical setting covers three solar demonstration sequences carried out in Finland from the 1980s until the 2010s. The case stands as an example of an emerging sustainable technology desperately seeking legitimacy in a particularly harsh context. The empirical data consists of documents on the projects and interviews carried out with the main participants. We focus on three processes deemed important for “protection” in the sustainable niche perspective (Schot & Geels, 2008): the creation of visions and expectations, networking and learning and study the cumulative effects of the demonstrations on these processes. Hence, we analyze the transfer of lessons from earlier to subsequent projects and pay attention to how the programs contribute to mainstreaming over time.

We find that experimentation outcomes are central to whether a technology gains in legitimacy, as perceived by funding bodies and other external audiences. Multiple early experiments in our case suffered from an unfavorable timing vis-à-vis existing know-how and political support. In specific, the advanced nature and technical impediments of the projects created discontinuity in funding and a

lack of knowledge transfer from one project to another. On the contrary, more recent demonstrations in the 2010s delivered successful results and had an immediate positive impact on legitimacy by committing funding bodies to the technology. Despite the challenges of the early projects, however, they still served in building up a domestic expert base and a community devoted to bringing solar energy to Finland. They also served in the construction of expectations that were realistic and relevant in the local setting. Demonstrations have a role in the local embedding of a new technology especially when other channels of mainstreaming are missing.

We conclude from this empirical case study that attention needs to be devoted to the transfer of lessons from one demonstration to the next one. Otherwise, and especially in unfriendly environments, the developed knowledge is easily dissipated or lost to competing countries. Thus, there is a need to organize a sequence of demonstrations up until commercialization.

5. Discussion

In this study, I was interested in the ways by which disparate actors try to legitimate a nascent field and how legitimation processes develop over time. In particular, my aim was to understand legitimation in coalition-building, in the face of scattered interests and perceptions, and the emergence of concerted collective action or the lack thereof. In this I chose to focus on two particular topics, namely the role of temporality, as the first theme, and the role of collective spaces, as the second theme. In the following, I will discuss the findings of this dissertation and formulate my contributions to prior literature. I will then present the limitations of the study and propose areas for further research.

5.1 Legitimation as a continuous negotiation of temporal experience across groups

The emergence of new fields depends on legitimation processes, as driven forth by initial engaged actors (David et al., 2013; Deephouse & Suchman, 2008). Prior research states that, to attract resources, early actors need to align a new issue with the interests and practices of different communities (Maguire et al., 2004; Rao, 1998; Zietsma & Lawrence, 2010), and studies have explored such processes with a focus on for instance the construction of shared values (Garud, Gehman, et al., 2010b; Patala et al., 2017) and meanings and discourses (Lawrence & Phillips, 2004; Weber et al., 2008) Weber et al., 2008). Some recent studies also address how temporality may influence field emergence or mobilize actors behind shared goals (Granqvist & Gustafsson, 2016; Zietsma et al., 2018). Yet altogether, scholarly understanding in this domain is scarce, and especially conceptualizations on the role of time perceptions in complex multi-actor settings still lack analytical depth.

This study depicts how legitimation unfolds as a production of time constructs that change and develop over time and influence group dynamics in a nascent field. The study shows how actors capitalize on temporality as they legitimate a rising issue and how, equally, their understandings of time form a backdrop in evaluating arguments for a novel field and taking decisions to engage or withdraw from participation. The findings point to shared temporal perceptions as a source of togetherness, in the face of scattered interests and views, and show how these can draw in resources like new actors and possibilities for technology development. For instance, disparate actors may mobilize behind shared visions of the future that are generic and, thus, serve as reference points to

diverse interests, and other widely acknowledged experiences of time. As some examples, understandings like “the inevitability of finding alternatives to oil”, “the urgency of climate change” and the promise of “rapidly growing global markets” have created temporary momentum in the studied context and strengthened the advocacy for certain periods. This adds to scholarly understanding on how diverse actors align behind shared interests and courses of action (Mair & Hehenberger, 2014; Weber et al., 2008; Wry et al., 2011). While this literature has made multiple important contributions related to developing collective action in the context of conflicting goals and interests, thorough explorations of the temporal perspective have been missing.

Simultaneously, especially the longitudinal studies of this thesis bring to light how the legitimation process has halted time and again. There have been repetitive break-downs in mobilizing collective action, with the generic outcome of stalled emergence and a failure of the engaged groups to transition into a unified “coalition of believers” (Suchman, 1995) with internally coherent goals, efforts and perceptions. As one explaining factor behind this dynamic, this study discovered that challenges in managing “temporal complexity” (Garud et al., 2013: 793), i.e. coordinating the “multiple temporal rhythms and experiences [that come together]” in the emergence of new innovations and fields, can hamper legitimation. Related to this, my study detected two forms of asynchronicity that curb momentum, namely asynchronicity in the perceived rhythm of local field development as reflected against the rhythm of an unfolding global challenge that urges local interest in a new issue, and asynchronicity in the timing of engagement among participating communities. The latter stems from two sources, namely divergence in the adopted time-frames between groups and different lengths of exposure to the field as per community, leading to early actors perceiving new initiatives as part of a stagnant cycle and late-moving groups regarding them as a forward-moving trajectory. These reasons explain, how shared time perceptions dissipate and lose their vitality as different communities fail to attach to them in a sustained manner. These findings provide a contribution to existing studies on innovation processes that have introduced and touched upon the notion of asynchronies during innovations processes, yet not explored this concept empirically (Garud & Gehman, 2012; Garud et al., 2013). This research produces an in-depth empirical investigation of the various forms of asynchronicity in nascent fields and sheds light on how these emerge and accumulate over a long investigation period. Also, as a contrast to prior studies that have depicted shared time constructs as enduring and influential in the sense that, once established, they start to sustain collective action and harness common goals (Granqvist & Gustafsson, 2016; Yakura, 2002), this study points to them as fragile and prone to lose their significance; especially due to challenges in the temporal alignment of different groups.

Moreover, the findings point to legitimation processes as a continuous negotiation of temporal experience across groups of actors. A focus on an ongoing negotiation stresses that legitimation rests on an element of alertness with regards to how others regard time and on fine-tuning initiatives also in accordance with other temporal aspects of the innovation, such as the rhythms and repetitive patterns that relate to the infrastructure and institutions around it. As a metaphor, one could think of this as an orchestration of different temporalities into a harmonious whole – a temporal symphony of novelty emergence, so to speak – where mutually-reinforcing timings, matching rhythms and overlapping time perspectives integrate over time and come together in a way that forms a desirable whole. A symphony is, by definition, a balanced, pleasing and suitable arrangement of parts. It may start with only a few matching elements, with new instruments, tones and rhythms being introduced gradually and with care, building up the unique character of a new piece. Once a recognizable musical

body emerges, it would then come to resonate in a larger audience. Commonly, further disruptive parts come in later; and as the piece begins to shine clearly, they represent less of a threat to its internal cohesion.

My study depicts a case where multiple constituents of the innovation system have been continuously in discordance with the developing piece. As some examples, these include the early pioneers who predicted optimistically in the early 1980s that the technology was on the verge of a break-through and thus engaged in high-stake technological experiments that resulted in failures. The key financiers, in return, were present-focused in their time orientations and based their evaluations of solar on the initiatives of the day. Thus, they concluded that the technology was completely immature for the northern setting, and this perception continued to persist long after the first coalition-building efforts. As another example, politicians forecasted in the 1990s that forest-based biofuels would be a sustainable solution for Finland to bring down emissions in future, i.e. a fuel source that is today considered problematic and comparable to fossil fuels in its effects on the climate. They held trajectory-based views of constructing the local energy domain and ignored ideas of parallel investments in multiple developing technological paths. Hence, after multiple bets placed on the wrong horse and several decades of continued disharmony across communities and other elements of the innovation, nearly all engaged actors were taken by surprise as the global break-through of solar energy emerged in the 2010s. The global boom spurred renewed interest, yet it came with a sense of despair and perceptions that it would be impossible to catch up with rapidly developing markets from a laggard position.

These findings also provide new viewpoints to the discussion of legitimacy building as unfolding either according to an inside-out or an outside-in strategy (Human & Provan, 2000). Extant research has pointed out the perils of seeking legitimacy from the outside (Granqvist & Laurila, 2011; Lounsbury, 2003), and incumbents have even been found to suck up the resources devoted to a new category and its entrepreneurs (Zietsma et al., 2018). The study finds further proof for why it may be legitimacy enhancing to form a strong core to a new issue first, before seeking legitimacy from the mainstream, i.e. from actors that are related to the established energy regime. In my case, the incorporation of mainstream actors increased temporal complexity in the new field and strengthened present-driven and trajectory-based perspectives, among a coalition that was dispersed to begin with. These included ideas on taking investment decisions based predominantly on the costs of the day and controlling the future through day by day calculations and a present that is considered robust, rather than continuously changing.

As another contribution to studies on legitimacy building, the study implies an event-based and qualitative understanding of time, where understandings like “the right time to include outside actors” are complex and experience-based and depend on how actors attune to the different elements of the innovation. This contrasts with extant research that approaches legitimacy-building as manageable, in the sense that e.g. the construct of inside-legitimacy is thought to emerge at a definable, measurable point in time (Human & Provan, 2000). Extant research also presents legitimacy building as unfolding according to a sequence model – on a chronological timeline – where the occurrence of one issue after the other creates a final outcome (Lounsbury, 2003; Navis & Glynn, 2010), and does not take specific interest in how time influences legitimation, like the timing and rhythms of initiatives. As opposed to this, this study emphasizes that legitimation is difficult to control, due to the unpredictable nature of group processes and stochastic occurrences in the external environment. This also means

that concepts like “the right time” flee from objective definition. Rather, qualitative experiences of kairos outweigh ideas of the existence of an optimal approach.

Contribution to studies on temporality in management and organizations. Moreover, the findings also contribute to prior research that addresses time as strategic and reflecting strong intentionality (Granqvist & Gustafsson, 2016) or as structural and influenced by the temporal patterns and rhythms of the institutional environment (Garud et al., 2013; Orlikowski & Yates, 2002). The research results emphasize that actors have strategically pursued favorable temporal understandings, yet due to unexpected developments in the environment and unintended outcomes of the legitimation initiatives, the pursued understandings were not always reached at the field-level. Instead, many initiatives ended up producing the exact opposite outcome compared to their original intention. Hence, I outline an understanding of time as strategic, yet emphasize the unpredictability of collective time perceptions.

My study also sheds light on factors that influence actors’ ability to craft positive expectations, form an optimistic relationship to the future and keep imagining positive outcomes. The findings show how repetitive setbacks among initial actors, such as compromised experiment outcomes and early experiences of being at the forefront of global development with lacking support and acknowledgement from the institutional environment, can significantly inhibit positive future imagination. The study shows in particular, how recurring negative experiences interlink with perceptions of time as cyclical and stagnating and lead to actors falling victim to early unfortunate outcomes. This was visible in actors’ lowering capability to relate optimistically to the future and regard oneself as an active agent with resources to influence upcoming outcomes – as they accumulated personal setbacks over time. Hence, the study implies that positive experiences are central in crafting forward-movement and continuity which, in turn, sustain legitimation processes by providing emotional fuel to it and protecting early actors from pioneer burnout (Rao, 2004). These findings contribute to studies that uncover reasons behind actors’ agency and imaginaries of the future (Garud, Gehman, et al., 2010; Garud, Kumaraswamy, et al., 2010; Kaplan & Orlikowski, 2013). Studies have found that freedom in interpreting the past and choosing what moments of the past to mobilize is important (Kaplan & Orlikowski, 2013). This research adds to this understanding by showing that some amount of favorable experiences is needed, as a source of temporal experiences that provide mental energy for future imaginaries. Also, the findings provide a contribution to research on expectations in legitimacy building (Garud, Schildt, et al., 2014). Prior research takes the articulation of expectations as given, without an interest in issues that enable positive articulations. The findings add to this stream by pointing to forward-movement and continuity as central temporal experiences and resources in articulating positive expectations.

5.2. Conceptualizing sustainable development as “patience” – a temporal ontological perspective to field emergence

My study also offers contributions to studies on temporality and sustainable development. Recent research has initiated an academic discussion on the philosophy of time in sustainable development (Kim, Bansal, & Haugh, 2018). According to its original definition, sustainable development points to catering for the needs of the present without compromising the needs of future generations (WCED, 1987: 43). Sustainable development has been long considered an inter-temporal trade-off between the short-term and the long-term, creating the need for organizations to juxtapose between the two.

Hence, researchers have plagued the dangers of short-termism, connected to the capitalistic logic and the greediness of the market for fast profits (Berg Johansen & De Cock, 2017), and uncovered time perspectives and orientations that can counteract the short-term approach (Reinecke & Ansari, 2015; Slawinski & Bansal, 2015). More recent research has introduced a complementary time perspective that can further sustainable development. In their paper on Fairtrade tea producers, Kim et al. (2018) suggest that the construct of the ‘long present’ is useful for understanding and enabling sustainability. The long present refers to an understanding of time where actors see duration in the present and connections between processes, allowing them to engage with incremental actions. It is different from the original conceptualization of sustainability as an inter-temporal trade-off, especially because it does not indicate creating an instant and dramatic shift but focuses on making small and connected improvements that accumulate into bigger outcomes over time.

The findings of my study contribute to the emerging discussion on philosophy of time and sustainability. In specific, I lay out three time constructs that stand out as significant for enabling sustainability, based on my case. Firstly, my study shows that one important perspective in enabling sustainable development is the perception of the *present as changing*, rather than robust or a proxy of the future. As a simplification of my case, the debate between the different communities has been a temporal ontological battle between two dichotomic perspectives – one that takes interest in the costs of the day and mature profitable solutions, and another one that is oriented towards the future and envisions how costs change and technologies develop. The case shows that a present as changing perspective is interlinked with the approach of making small incremental investments in new technologies, in the hope that small investments can gradually accumulate into something larger. This is important in a case where a nascent sustainable technology seeks to emerge in a strongly institutionalized setting dominated by old established technologies and the industry and policy actors connected to them. To further illuminate this, I bring to light a case where discussions have stagnated for decades around actors calculating the cost efficiency of the day, debating alternative calculations and comparing technologies to each other. This dynamic and its focus on daily costs has brought development into a grid-lock - with different communities entering a conflict over an optimal solution. Symbolic of this, some field members voiced disbelief in the amount of time used for cost comparison and wondered if one could instead use the same resources to make small investments in solar to see how these can gradually open up markets and bring down costs. The case points to how perceptions of a robust present and related calculative activities narrow down investment decisions to be based only on current status and guide actors attention away from and hamper their awareness of “emergence” as a cognitive construct, i.e. considerations of situations where one can witness “much coming from little” (Holland, 1998). Equally, perceiving the present as changing can direct attention in an opposite way – favoring the adoption of new sustainable solutions.

Secondly, my study depicts a connection between *parallelism* of investments and sustainable development. Following an approach where investments are made in multiple parallel trajectories is important especially in the context of energy, as in many regions energy provision cannot rely on a single fuel source. For instance, the expansion of new renewable energy technologies requires investments in multiple renewable technologies, and the availability of base power from non-renewable sources for times where renewables are not available. Hence, solar energy can only be one complementary source among others, especially in Northern latitudes. The same complementary logic applies to other energy sources. For instance, nuclear power has its benefits as a carbon-free technology, yet it cannot be used in off-grid settings and also requires advanced technological know-

how that may not be available in all parts of the world and displays some challenges related to safety, along with a lowering long-term trend in cost-competitiveness. My case shows how developments in solar energy have stagnated due to trajectory-based perspectives, that lean on following established investments paths with long historical roots. Trajectory-based thinking is connected to long-standing disciplinary thought in engineering and economics and interlinked ideas of defining an optimal technology based on current costs and existing infrastructure. It is thus largely institutionalized in these disciplines. In contrast to this, parallelism aligns with the definition of energy provision as a wicked problem of public governance, i.e. a problem that is ill-defined with no clear solutions available and with the definition of a solution escaping the objective scientific method (Rittel & Webber, 1973). The idea is to take interest in different investment paths both in relation to each other and in relation to long-term macro-economic trends, such as technology advancement in other related fields or global trends in environmental policy. Hence, thinking along the lines of parallel investments puts emphasis on feed-back loops between paths and on the conjoint non-linear outcomes of multiple parallel paths. Additionally, it urges considerations of longer slices of time when evaluating costs, i.e. going back in history and envisioning the future to detect trends rather than snapshot views. These aspects provide “temporal space” in anticipating sustainable development, especially because they urge understandings that, even if sustainability is brought about at an unbearably slow pace, there is still an undercurrent of certainty and inevitability to the process.

Third, my study points out the importance of a specific form of *kairos* in sustainable development, namely a perspective where actors take “the right measure at the right time” – regarded from the perspective of key actors with critical resources. This form of *kairos* represents a temporal relational perspective to enabling sustainability and focuses on relating carefully with the temporal experiences of others and persuading others by choosing a proper time of action or planning actions in accordance with the concerns of key groups at a time. This perspective is crucial, because complex sustainability challenges are seldom solved by single organizations alone. Instead, collective action is needed among multiple constituents. My case shows, how actors have many times pursued initiatives in accordance with unfolding trends in technology development and the institutional environment. However, the initiatives have still failed to secure resources from key actors, for instance as these have lacked a recognition of the trends as important at the time and, hence, regarded poor experiment outcomes as single events and signs of failure, rather than obstacles on an inevitably unfolding developmental path. Another reason for unsuccessful temporal relating lies in key actors not being able to position the local industry on a chronology of global industry development over time - in a way that would place the local industry in a favorable light. This outcome is connected to the present as robust perspective, where actors regard also the solar energy industry as static and do not come to think of the possibility of change in it; i.e. see emergence within the emergence of the new industry. The temporal relational perspective highlights that groups are convinced by different things over different time periods and takes note of temporal patterns and structures in the institutional environment that affect the time perceptions of key groups. As examples of the latter, economic downturns or periods where fossil fuel costs are low may lower interest in new alternative options, especially among more conservative audiences.

Building on these three time constructs, I introduce a perspective that considers sustainable development as patience. Patience is in itself a temporal construct referring to a willingness to give time for something to happen. The perception of the present as changing is connected to patience, because it fuels engagement with small day by day actions and satisfaction with gradual progress. It

also interlinks with persistence in anticipating and envisioning emergence – even when nothing in the environment signals it and when large-scale change is urgently needed. Parallelism intertwines with patience as it strengthens certainty and inevitability, as a result of seeing how multiple parallel paths – considered in broader slices of time – can bring about sustainability. Certainty in turn enhances gratification with small advancements. The construct of *kairos* as a temporal relational perspective implies patience with regards to the experiences of others, in particular actors whose attention is not directed towards change, unfolding long-term trends or sustainability. It highlights the importance of delicate action and respect for the experiences of others, even when these may be radically different from what one desires.

Conceptualizing sustainable development as patience and as resting on the three constructs – i.e. present as changing, parallel investments and *kairos* as a temporal relational construct – is somewhat commensurable with the systems perspective to sustainability challenges (Garud & Gehman, 2012). This is an approach that takes interest in how large-scale macro-economic systems transition towards sustainability with interest in feed-back loops between different levels of action and different change processes in the long term (Geels, 2002). However, whereas the systems perspective is based in engineering and is rather technocratic as a conceptualization, I focus on a view with an emphasized human component and emphasis on how actors regard temporality with regards to complex socio-economic systems. My perspective stems from a context where a new technology seeks to emerge in a particularly harsh setting. Hence, there is a heightened need to envision change and emergence in the lack thereof and to consider the temporal relational perspective of actions, that is bearing in mind the temporal experiences of groups that control key resources. Activities that relate delicately to the perspectives of others and aim for small advances are central as a means to build legitimacy for a new technology on a small-scale at first – to avoid circumstances where it is easy to marginalize a new technology based on institutionalized temporal norms and practices. Harsh contexts contain a major additional challenge for actors to engage in ways that can buffer the regime from fiercely striking back and challenges related to positive imagination. They may also contain a paradox, where actors are encouraged to engage with and settle for subtle advancements that come about slowly, even when this is in direct conflict with the pace and scale that would be needed to tackle a grand challenge like climate change. The three identified time constructs are one means to overcome such challenges.

The sustainable development as patience perspective is different from the traditional idea of sustainable development as a trade-off between the present and future, namely because it does not indicate a fast shift but emphasizes gradual change created through small actions. Additionally, it also differs from the long present approach that is suited to understand sustainability under extreme poverty and resource constraints, where people struggle to meet their basic daily needs (Kim et al., 2018). In contrast, my study depicts a case where established technologies create the opportunity to keep exploiting the old and provide a point of comparison that disfavors emerging solutions. Hence, sustainability is brought about by gradually building up the acceptance of new technologies, while phasing out the established energy institution. While incremental action is needed also in this context, it is rooted in ideas of foresight and the prevention of scarcity in the long term – rather than dealing with acute shortages. In addition, incremental action is one means to bring in stability to legitimacy building and avoid hyped expectations that can lead to disappointments.

5.3 Collective spaces and political entrainment

As the second topic of this study, I provide contributions to research on collective spaces. Prior studies in the neo-institutional stream have uncovered, how spaces promote the emergence of new issues and serve as sites where diverse actors align behind shared courses of action. Spaces like field-configuring events (Lampel & Meyer, 2008), interstitial spaces (Furnari, 2014), experimental spaces (Cartel et al., 2018) and institutional projects (Tukiainen & Granqvist, 2016) are understood as unique contexts that forge uncommon interactions that are not normally available and that exist for a limited time. However, the different conceptualizations of collective spaces remain separate from each other with little dialogue between literature streams. Also, while studies have explored spaces in policy change (Hardy & Maguire, 2010; Schüßler et al., 2014), there is still limited understanding on their role in legitimation vis-à-vis changing policy concerns over time.

This study presents a case where unexpected developments in the global business environment have unleashed resources to the new technology and brought about collective spaces as sporadic windows of opportunity for issue emergence. Much of the legitimation over the spaces has focused on presenting the technology as suited for solving a social challenge at hand that had triggered the discussions on alternative energy in the first place. The research shows that in these efforts actors have focused on enforcing timings and rhythms of developing the new innovation that would relate meaningfully to unfolding social and environmental challenges and to policy cycles. For instance, actors designed early pilots to demonstrate the maturity of the new technology and to prove that it was suited to tackle acute resource shortages related to the oil crises. Later on, the conferences were used to prove the temporal fit between the local solar industry and the global market boom by depicting solar as an industry policy topic and showing that there were credible businesses locally who invested in the field. Overall, the collective spaces have had a function as subtle policy tools, where seemingly non-political members have aimed to influence political perception. It is thus possible to conceptualize the spaces as sites of ‘political entrainment’, i.e. deliberate efforts to present a new issue as timely and as unfolding at a rhythm that makes it worthy of pursuit through government policy (modified from Granqvist & Gustafsson, 2016: 2012). Political entrainment can be understood as a particular form of temporal institutional work (ibid.); one that aims at policy change and that has specific importance in fields that depend on government support. Hence, whereas prior studies have explored how spaces can bring about policy change (Hardy & Maguire, 2010; Schussler et al., 2014), this research points to political entrainment as an enduring feature of collective spaces in the face of changing policy concerns over time.

As an outcome of the introductory part, I recognize four basic types of collective spaces, each of them characterized by a certain influence on coordination between different communities (table 2). Hence, I provide an integrated framework for conceptualizing how spaces differ from each other and a first step in creating dialogue between the different concepts. First, I distinguish between spaces that are interactionally open and focus on broad consensus among diverse actors and those that limit participation and thus strengthen limited agendas of sub-groups. Second, I differentiate between spaces where actors construct expectations and visions through negotiation and knowledge exchange and that orient towards the future and spaces where new solutions are tested and assessments created on their state-of-the-art. Hence, the latter type focuses on snapshot views of acute status and on crafting presence for the new issue. Against these starting points, the four types of coordination in spaces include (1) uniting disparate actors and communities behind shared narratives of the future (2) strengthening oppositional future-driven agendas of sub-groups (3) urging immediate commitments

and timeliness across diverse actors and (3) urging immediate commitments and timeliness between an in-group that executes an experiment and an out-group that assesses it.

	<p>Developing broad and inclusive agendas; harmonizing perceptions and interests across communities</p> <ul style="list-style-type: none"> - through interactional openness 	<p>Strengthening oppositional agendas of sub-groups</p> <ul style="list-style-type: none"> - through limitations to participation
<p>Constructing the future</p> <ul style="list-style-type: none"> - through articulating ideas, generating visions, extending time-frames, and breaking free from regular timing norms 	<p><i>Uniting diverse communities behind shared narratives of the future</i></p>	<p><i>Strengthening a future-driven temporal agenda of a sub-group (e.g. by borrowing legitimacy from the mainstream)</i></p>
<p>Crafting presence</p> <ul style="list-style-type: none"> - through testing and experimenting, finding functionable solutions and creating snapshot views of timeliness 	<p><i>Urging immediate commitment and timeliness across diverse communities</i></p>	<p><i>Urging immediate commitment and timeliness across an in-group that executes an experiment as opposed to an out-group that evaluates it</i></p>

Table 2. Four basic types of coordination in collective spaces

My findings related to open spaces that focus on negotiation show, how technology conferences can serve as a site where actors develop multiple complementary narratives on visions and expectations in the field (sub-study 2). Such generic narratives of the future may act as mutual reference points to diverse actors and interests and thereby strengthen the emerging advocacy in a field. Hence, conferences can be platforms for enlarging the narrative space of a new issue over time and connecting a growing set of actors to it. These findings also hint that conferences are settings, where actors come to engage with the future, extend their regular time-frames and break free from the temporal norms that they are otherwise embedded in. Hence, as settings that are detached from organizations' day by day activities, spaces can trigger imaginations into the future.

Secondly, my research on limited and future-oriented spaces explores interactions between central actors in the field that engage directly and exclusively with solar energy and mainstream actors

from the energy regime and the building sector with diverse reasons for participating in the field (sub-study 3). I depict, how mainstream actors came to join the field over a conference sequence bringing legitimacy to the new issue and how central actors gained from their presence in an indirect way, as they strengthened their networks and future-driven agenda by collaborating and planning actions at the backstage of conferences. In this way key actors can find new ways to destabilize the same established industries from the presence of which they gain. I uncover as well, how conference organizers coordinated their efforts in the backstage and used the spaces as subtle policy tools that allowed them to delicately extend their regular authority and engage with political activity e.g. through staging acute policy issues at conferences.

Third, I point out the type of a collective space that is interactionally open and focuses on experimenting and developing functionable solutions, i.e. crafting presence. As a practical example of this type, I conducted eight months of participatory observations at an institutional project that gathered together 50 organizations from different sectors. In this setting, I observed how actors urged immediate commitments across diverse actors, as they organized around practical tasks like bringing solar energy to apartment buildings, developing financial instruments for companies and bringing about policy change. Based on the theory review and my empirical experience from this context, my case points to open and presence-oriented interactions as a distinctive type of a collective space.

Finally, I explored interactions over spaces that limit participation and that take interest in testing and experimenting. The studies on building demonstration projects depict, how selected in-groups of experts have been given resources to experiment with the new technology in an isolated setting and how, in turn, out-groups have assessed the outcomes (sub-studies 1 and 4). The research shows that experiments are central for creating understanding on the timeliness and maturity of a new technology from a local standpoint – especially for out-groups who lack specified technical expertise on which to base assessments. Direct involvement in successful experiments has a high potential to create immediate commitments among actors with key resources, and equally, involvement in demonstrations with impediments can create enduring delegitimizing influences and a withdrawal of resources. The findings point to the central role of early experiments in legitimation, as early failures in particular are prone to generate a negative stigma that persists, even when other markets close by demonstrate that the technology is advancing. At the same time, however, even challenging demonstrations can mobilize oppositional agendas, such as in the case of a community of experts that committed to bringing solar energy to Finland already as an outcome of early demonstration projects.

Recognizing different types of spaces and how they differ in their influences on coordination can shed further light on the legitimation process over time. It also allows one to consider to what extent different types of spaces suit a particular institutional environment. My research presents an extreme case where resources have been given irregularly and only for short periods. Consequently, actors have experienced urgency in showing that the technology is feasible and mature, before the window of opportunity closes, signifying intensified stakes for legitimation. This is in stark contrast to contexts where external support is more continuing and established (Hardy & Maguire, 2010; Schussler et al., 2014). I find that neither the collective spaces that have been high risk and focused on experimentation nor the ones that have been open and integrative and aimed at constructing the future, have sustained legitimation processes particularly well in the sporadic context. Experimentation as a present crafting activity, in particular, has brought about highly influential and performative perceptions that have affected resources, legitimacy and interest given to the field. This has been the case especially in early development stages where actors have had limited knowledge

of the technology's potential. Hence, the early phases of the solar field have been characterized by irregularity of resources and attention and courageous efforts to prove that the technology was advancing. At later stages, as the field had moved beyond the experimentation phase and as solar broke through as a global business, activities started to focus on purporting the business potential and showing that there were significant business players engaged with solar energy. Hence, the collective spaces became more open. While the integration of mainstream actors created legitimacy, it also strengthened mainstream standpoints within the new field and agendas that focus on mature technologies. Thus, as an accumulative outcome of interactions over time, alternative future-driven agendas have not gained much ground via this context. This also allows one to hypothesize, whether more shielded spaces, where oppositional actors strengthen alternative networks detached from mainstream pressures, would be likelier to sustain legitimation in harsh settings. These considerations contribute to the discussion on spaces as embedded in their institutional environments (Dille & Söderlund, 2011; Schübler et al., 2014; Tukiainen & Granqvist, 2016), and offer initial thoughts on how to explore the accumulated influences of different types of collective spaces over time (Schussler et al., 2014) – a topic pointed out as significant by earlier research.

Finally, this research provides insight into how spaces contribute to hype and disappointment, in particular, a hype disappointment cycle becoming a recurring issue in a field. I find that, throughout the period of four decades, the spaces have had illusionary influences on the state-of-the-art of the nascent field. Their emergence has been coupled with heightened and at times inflated expectations, as actors have faced unique and fleeting opportunities to promote the new technology. Also, the spaces have at times forged artificial and even unrealistic collaborations between constituents whose interests are in a fundamental conflict, such as between actors devoted to renewables and energy incumbents. In this sense, the collective spaces appear as social bubbles, where people with similar interests and representing diverse organizations and sectors come together for a surpassing moment in time. They have provided actors with opportunities to construct expectations and experience excitement among like-minded others – detached from daily routines and the realities of their organizations. Also, as enthusiasm has been followed by dying momentum, the initial actors have lost a part of their commitment and diverted towards cynicism and indifferent attitudes. Hence, this research shows how spaces can bring about a recurring hype disappointment cycle that is likely to happen, especially, when resources are sporadic and easily discontinued. This adds to studies that uncover how spaces embed in their institutional environment (Dille & Söderlund, 2011; Schübler et al., 2014; Tukiainen & Granqvist, 2016).

5.4 Limitations and further research

In this study I have theorized legitimation processes in a nascent solar energy field, in particular, the role of temporality and collective spaces in bringing about and sustaining legitimation initiatives among distinct communities. The research presents a particularly harsh context, where actors have struggled to align behind mutual commitments and courses of action – despite repetitive efforts to do so – and where key policy actors and innovation funding bodies have remained skeptical of the technology's potential over decades. I believe that the conceptualizations of this thesis, including the different forms of asynchronicity and the effects of collective spaces on coordination, have implications beyond this case. They may be applicable to other cases where new issues emerge or fail to do so – especially in multi-actor settings characterized by complexity and an unpredictable

institutional environment. However, given the focus of the study on stalled emergence, it is important to investigate contexts of successful emergence – stemming from grass-root interactions, where actors achieve legitimacy both within the field and outside it. Studies could explore shared time constructs and types of collective spaces that have sustained momentum over time. Further on, it would be fruitful to investigate time and collective spaces in contexts that have recovered from early failures and turned initial disappointments to their advantage and caught up with developments from laggard positions.

I have focused in this research on collective action, temporality and spaces, meaning that other central themes are outside the scope of this study. In this dissertation the ‘harshness’ of the context is understood as a product of a sporadic innovation eco-system, as the first issue, and how communities in the field have tried to build momentum, as the second issue – with the outcome being a lack of a unified and simultaneous commitment to the technology among different communities. This in turn may have reflected back on the attitudes of out-groups like key policy-makers and innovation funding bodies who provide resources. I acknowledge, however, that there are other significant reasons for why new energy technologies struggle to attract a unified representative body and gain in legitimacy. For instance, previous studies have pointed to the role of power relations and vested interests in the energy sector, in particular, how energy incumbents strategically delay adopting new technologies and environmental concerns like climate change (Russo, 2001; Turnheim & Geels, 2012). In addition, studies have also uncovered the role of institutionalized temporal structures and the established value calculus of the energy regime as sources of unobtrusive and semi-intentional maintenance (Zietsma et al., 2018). Furthermore, energy systems do depend on cultural, historical and geographical issues (Smith, Voß, & Grin, 2010; Walker et al., 2014). Finland has a long tradition in nuclear and biofuels, a high demand for energy in its key industries and a Northern location with strong over-the-year fluctuations in the availability of solar energy (Berninger et al., 2017; Heiskanen et al., 2017; Nissilä & Lovio, 2011). While similar issues exist – to varying levels – also in markets where solar and renewables have undergone a break-through or advanced significantly faster compared to Finland, this research recognizes that they are not without influence on how actors perceive the attractiveness of solar energy.

While these important topics have been addressed by other scholars, I have in this research zoomed into collective action among engaged communities over time. The research sheds light on the role of temporality and spaces in a failed effort to sustain momentum in an emerging field. Thus, I provide a new explanation that is related to, yet distinct from, prior explanations like the one on unequal power among new and old technologies. My explanation does not suggest that solar energy has struggled for the sole reason of initial actors planning initiatives in sub-optimal ways, nor does it exclude the role of power or geographical considerations. In contrast, this research addresses the “when” and “how fast” parts of how new technologies emerge. In particular, it suggests that due to continued challenges in managing conflicting time perceptions in the field and discordance between communities and other elements of the innovation, established industries and energy players may dominate the debate longer – leading to the “when” becoming delayed and the “how fast” becoming slower. As this happens, a nascent field can find itself in a situation, where actors conclude that it is too late, altogether, to pursue field emergence locally.

While there are boundary conditions to this research, it still provides new concepts and theorization on new technologies struggling in harsh contexts. I believe that recognizing different forms of asynchronicities as well as the existence of different types of collective spaces can have

implications for understanding novelty beyond this case, or the energy context. My study invites further research that creates dialogue between the different streams that address collective spaces and research on the influences of varying spaces over time. More research is also needed to inform how collective spaces, as temporary and unusual contexts, intertwine with actors' understandings of time during issue emergence. Finally, I also introduce a new conceptualization of time in bringing about sustainable development – namely the perspective of sustainable development as “patience”. I foresee new exciting research on philosophy of time and sustainability, with nuanced and sophisticated implications for promoting sustainability in different empirical contexts.

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