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A Smarter World: An Examination of International Living Lab Partnerships

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ABSTRACT

This thesis is based on a case study of Smart City World Labs (SCWL), a living lab partnership and innovation brokerage project involving actors from the Nordics and Singapore. At its heart, it is an analysis of how complex internal and external factors have shaped and changed the project over the course of its lifetime, from its conception in the latter half of 2015 to the present (September 2018). Focusing in on this single case study, the thesis relies heavily on interviews with the various partners in the project and a range of project documents – including project applications and evaluations, securing deep insight into the inner workings of the project throughout its lifetime. By understanding this innovative approach to export promotion, the thesis seeks to learn the ground rules and basic reasonings surrounding the project's adaptations in the hopes that these lessons can be learned for the future.

Structuring the analysis around three key perspectives – purpose, organization and process, the thesis seeks to understand the underlying reasons for several major shifts in the project as it developed from one phase to the next. Over the course of the thesis process it became increasingly clear that there were major challenges to the project in both Denmark and Singapore and that the project faced an extremely steep learning curve. However, by using the first phase as a testing ground for their model and learning from the barriers and challenges set before the project, SCWL has been able to develop what they hope to be a replicable model for innovation brokerage through living labs. While there are still some questions as to how successfully that model might adapt to a new geographic and cultural context, the project has been able to secure tangible results in Singapore.

There are a lot of factors that go into the shaping of a successful international innovation brokerage project and there are a variety of ways in which adversity and a learning-oriented approach can help to reveal those factors. This is at the core of the thesis. Understanding the intricacy of a large transorganizational partnership such as SCWL, with its many important stakeholders, and the immense challenges of bringing together people from across sectors, industries and nationalities in the pursuit of spreading smart and sustainable technologies will prove key to resolving the challenges of the future and will require study and investment in order to determine the most efficient and impactful path forward. This is ultimately the objective of the thesis before you.

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INTRODUCTION

"Our vision is for Singapore to be a Smart Nation – A nation where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all. We should see it in our daily living where networks of sensors and smart devices enable us to live sustainably and comfortably. We should see it in our communities where technology will enable more people to connect to one another more easily and intensely. We should see it in our future where we can create possibilities for ourselves beyond what we imagined possible."

- Prime Minister of Singapore, Lee Hsien Loong, November 2014 (Loong, 2014)

The creation of an intelligent and efficient urban system taking into account sustainable practices and the community it is inhabited by has become an ever larger part of international discourse, culminating in the addition of Sustainable Development Goal 10, aimed at creating "Sustainable Cities and Communities", to the United Nation's Sustainable Development Goals formulated to replace the earlier Millennium Development Goals (UNDP, 2018). The quote above illustrates Singapore's commitment to pursuing a smart and sustainable urban environment and was, in many ways, the starting point for the Smart City World Labs project at the heart of this thesis.

Smart City World Labs (SCWL) is an initiative aimed at establishing a framework for strategic collaboration between living labs and innovation hubs in Singapore and Denmark. The aim of the project has been to build a new model for increasing the export of Nordic urban solutions as well as increasing cross-border innovation and improving the interconnectivity of smart city efforts on a global scale. Singapore was chosen as the pilot country because of its stated ambition to become the world's first *"Smart Nation"*. The underlying approach has been to provide Nordic companies that are already developing, testing and showcasing innovative solutions in Danish living labs and innovation environments with a bridge to similar environments and setups abroad. This would allow them to customize their products and services to meet the needs of a specific market as well as provide introductions for these solutions to buyers and trading partners through the right channels. A key aspect of the project has been that this adaptation of solutions happens in close collaboration with local partners and projects and is thereby based on the articulated needs of the market, which provide a valuable stamp of approval early in the company lifecycle in a foreign market context (Quercus Group, 2015b).

The initiative originally targeted start-ups and SMEs (Small- and Medium-Sized Enterprises) as a key source of some of the most innovative solutions for solving urgent challenges facing cities around the world – in the hopes of promoting an international outlook. However, the lack of a clear performance record in real world deployment and limited market access hampered their options to scale and extract more value from the innovation to realize their full market potential. By creating a platform for international living lab collaboration, SCWL aimed at breaking down the classic barriers for SMEs to go beyond their home markets. SCWL's approach is based on fostering close relations between living labs, innovation environments and key stakeholders and through these narrow in on the specific interests, projects, tenders and challenges that are interested in receiving Nordic companies to test and adapt their solutions, with the aim of introducing them to projects and concrete business opportunities in Singapore (SCWL, 2017a).

This has resulted in a multiphase project, the first of which has already concluded and the second of which is currently nearing its end. The first of these phases involved developing a complex organizational framework which could incorporate all the project partners and establishing contacts and connections in Singapore while developing this new export model. The second phase has focused on establishing a proof-of-concept for the actual operationalization of the export mechanism. To achieve this, the project is expanding on the Danish side of the project to encompass living labs and solution providers from across the Nordic region while identifying specific challenges in Singapore alongside Singaporean challenge providers for the European solution providers to resolve (SCWL, 2017a).

SCWL is a project ultimately aimed at the creation of a global network of living labs and smart cities who through their interactions enable the easy transfer of smart and sustainable urban solutions from one city to another, serving as test-bed, development center and marketplace to SMEs and start-ups on a global basis. The project thereby touches on the UN's Sustainable Development Goals in the form of the 10th and 17th goals – Sustainable Cities and Communities and Partnerships for Development respectively (UNDP, 2018). However, the starting point of the project is grounded in the need to demonstrate the viability of this model, and as such the transfer of Nordic solutions to Singapore, two highly developed states – though from vastly different socio-cultural, economic and geographical contexts – which should illustrate the potential of SCWL (Quercus Group, 2015b).

The Smart City World Labs case was chosen as the focus of this thesis based on access and project complexity. With the author having both interned and worked at Quercus Group, was has been relatively simple to secure access to significant data sources for the case and to gain a complex understanding of the case. Beyond these practical considerations, the complex interactions and relationships as well as the international nature of this project makes it an ideal focus for a thesis. By bringing together stakeholders from across half a dozen nations and a wide variety of sectors, this project can merge the intricacies of an international business project between Singapore and Denmark with the challenges of coordinating an international transorganizational partnership network with a diverse and shifting partner consortium.

THESIS DELIMINATION AND PROBLEM STATEMENT

This thesis seeks to illuminate how an international transorganizational project like Smart City World Labs is shaped, changes and develops over the course of its early lifetime from pre-conception through to the second phase of the project, as it moves beyond the pilot stage. By understanding how multiple independent organizations can successfully cooperate in the formation and growth of a single major project like SCWL, this thesis should help to create a better understanding of how projects involving multiple impactful actors can join their efforts in a synergetic approach. This thesis will thus focus first and foremost on the SCWL project as the unit and focus of analysis, with the contextual setting of the project as a Nordic-Singaporean Living Lab partnership serving to illuminate the international dimensions of the project. This means that the internal processes and decision-making systems alongside the interactions between organizational stakeholders play a central role in the thesis, with an emphasis on how these internal processes have played a role in shaping the project as a whole.

At its heart, this thesis seeks to deal with the complex interactions between stakeholders and actors through a major project's life cycle, from conception and pre-development, through modelling and pilot phases before ending with the project preparing to scale up its activities and learn from the mistakes and successes of previous phases. SCWL deals specifically with the transfer of knowledge and the internationalization of corporations within various urban sector industries, but the lessons learned, and processes identified through the thesis process should give an indication of what challenges other projects might encounter. Understanding the interactions of independent organizations when they create joint projects is a generalizable occurrence wherefrom knowledge and understanding should prove valuable.

OBJECTIVE AND RESEARCH QUESTION

This thesis seeks to analyze and discuss the development of the Smart City World Labs project through a longitudinal perspective. By understanding how and why the project was originally conceived, why and how certain actors and organizational structures were introduced to the project and what processes developed during the first and second phases of the project it should be possible to establish an understanding of why certain decisions were taken during the project. This would outline the key factors and learnings from SCWL and allow for an analysis of how the project shifts and changes from phase to phase. The second phase, when the project moves from proof-of-concept to becoming an actual vehicle for the export of solutions to Singapore, thus creates an opening for the thesis to examine and explain how SCWL has been shaped by decisions taken during previous steps in the project process. This piece of research is important because of the light it shines on the vital importance of decisions taken early in the project processes and the challenging nature of creating large trans-organizational projects across borders and sectors. It is for these reasons that the thesis will attempt to answer the research question: *What has been the underlying reasoning behind SCWL's numerous adaptations from its conception and initial implementation through the subsequent phases of the project?*

THESIS STRUCTURE

The structure of this thesis centers on a steady progression of chapters building one on the other. The first part to follow this introduction is a methodology section where the research philosophy, research design, data collection and data analysis are all examined. This is followed by a theoretical framework and literature review, which outlines the role played by each theory addressed in the thesis and how they fit within the analytical framework. This is followed by a section detailing the research context, outlining key concepts and their theoretical basis. The actual case study follows, outlining the staged development of SCWL from the project's conception through to its second phase. This is followed by tripartite analysis, examining the project's purpose, organization and process over the course of the project lifespan aimed at analyzing the changes and adaptations in the project. This is followed by a section discussing and answering the research questions before summarizing the findings of the thesis and examining the practical and academic implications of the thesis.

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METHODOLOGY

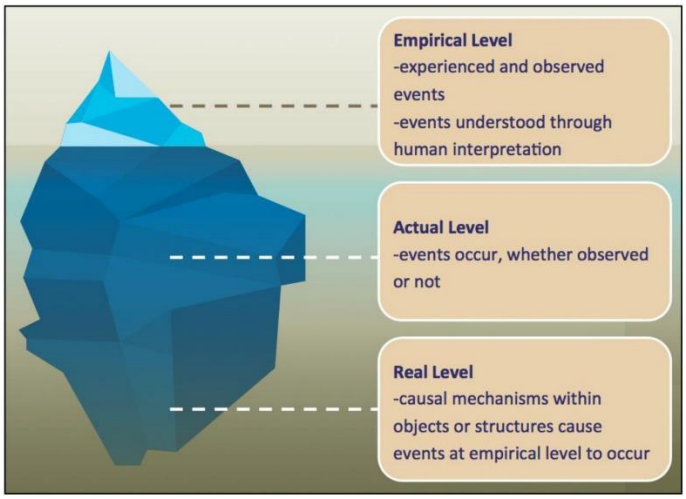
RESEARCH PHILOSOPHY

This thesis builds on a **critical realist** (CR) philosophy of science and as such serves as the foundation for the research purpose, approach, strategy and design of the thesis. Using a critical realist approach here ensures that the research done for thesis properly illuminates the complexities of the project, understanding the multiple layers of reality which slowly come into view the further you dig into the project.

Methodological Choices	
Research Philosophy	Critical Realism
Research Purpose	Explanatory
Research Approach	Abductive
Research Strategy	Intrinsic Single Case Study
Research Method	Primarily Qualitative
Data Collection	Semi-Structured Interviews & Project Documents
Data Analysis	Thematic Analysis

Emerging in the context of the post-positivist crises in the natural and social sciences in the 1970s and 1980s, critical realism represents a broad paradigm set out by social theorists and researchers trying to develop a proper post-positivist social science. Critical realism situates itself as an alternate paradigm both to scientific forms of positivism concerned with establishing a law-like understanding of the forms of the world; and also, to the strong interpretivist or postmodern turn which denied explanations in favor of interpretation, with a focus on hermeneutics and description at the cost of causation (Fletcher, 2017).

One of the most important tenets of critical realism is that ontology (i.e. the nature of reality) is not reducible to epistemology (i.e. our knowledge of reality). Human knowledge therefore captures only a small part of a broader reality. In this respect, critical realism deviates from both positivism and constructivism. Bhaskar (Bhaskar, 1998) critiqued positivism for promoting “the epistemic fallacy”: the problematic reduction of ontology to epistemology, or the limitation of ‘reality’ to what can be empirically proven. The same critique applies to constructivist perspectives that view reality as entirely constructed through and within human knowledge or discourse. Despite the seeming opposition between the constructivist and positivist perspectives, it is argued that each reduces reality to human knowledge, whether that knowledge acts as lens or container for reality (Fletcher, 2017).



In contrast, critical realism treats the world as theory-laden, but not theory-determined while not denying that there is a real social world we can attempt to understand or access through philosophy and social interactions. However, some knowledge can still be closer to reality than other knowledge (Danermark, Ekström, Jakobsen, & Karlsson, 2002). In critical realist ontology, reality is stratified into three levels. The first is the empirical level, the realm of events as we experience them. At this level, events or objects can be measured empirically and are often explained through "common sense", but these events are always mediated through the filter of human experience and interpretation. This is the transitive level of reality, where social ideas, meanings, decisions, and actions occur and can be causal. The middle level consists of the actual. At this level, there is no filter of human experience and events occur whether or not they are experienced or interpreted. These true occurrences are often different from what is observed at the empirical level. Finally, the third level is the real. At this level causal structures, or 'causal mechanisms,' exist. These are the inherent properties in an object or structure that act as causal forces to produce events (i.e. those appearing at the empirical level). It is the primary goal of CR to explain social events through reference to these causal mechanisms and the effects they can have throughout the three-layered 'iceberg' of reality (Fletcher, 2017).

Critical Realism is used in this thesis to explain the way in which the empirical observations and information collected for the thesis are influenced and impacted by multiple series of interpretations, in the form of an interviewee's interpretation of the events they are describing or documenting, in the interpretation of the thesis author of this information, and the readers interpretation of what is written in this thesis. However, it also explains that there are actual events occurring in the case study which have not been interpreted or experienced, and as such are not included in the thesis despite their occurrence – these events having had a causal impact on the course of events presented in the thesis, at the empirical level. In essence, there are events outside the knowledge or understanding of the author which could have an impact on the thesis, but which remain unknown and thus unaddressed.

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RESEARCH DESIGN

RESEARCH PURPOSE

The research purpose of this thesis is of an **explanatory** nature and as such seeks to understand the causal relations behind the SCWL project through a longitudinal lens. The research conducted for this thesis seeks to test and understand the complex internal relations of an international transorganizational partnership like SCWL in order to better understand how projects like it, involving multiple independent international partners, can create synergetic results. By understanding these processes and how they are impacted by their participants it might be possible to further understand best and worst practices in projects such as this (Given, 2008). An explanatory research purpose was chosen for the thesis because it would allow the author to better understand and explain the complex interactions in transorganizational partnerships like SCWL. The goal here is to better understand how such projects function.

RESEARCH APPROACH

The research approach of this thesis is **abductive**, building from an empirical starting point with the SCWL project, and from there expanding ever further into different theoretical realms – looping back and forth between deductive and inductive approaches. As such, it starts from the particularity of SCWL and seeks to expand into a more generalizable understanding of the complex interactions of international transorganizational partnerships. Abductive reasoning, also referred to as abductive approach is set to address weaknesses associated with deductive and inductive approaches. Specifically, deductive reasoning is criticized for its lack of clarity in terms of how to select theory to be tested via formulating hypotheses. Inductive reasoning, on other hand, is criticized because no amount of empirical data will necessarily enable theory-building. Abductive reasoning, as a third alternative, overcomes these weaknesses via adopting an iterative approach, switching back and forth between the two and approaching the research from multiple perspectives. When using an abductive approach, the research process starts with surprising facts or 'puzzles' and the research process is devoted their explanation. These puzzles emerge when a researcher encounters an empirical phenomenon that cannot be explained by the existing range of theories or in the current literature (Saunders, Lewis, & Thornhill, 2012).

This abductive approach is used in the thesis to ensure an iterative process, in which every aspect of research is examined from multiple perspectives, creating a better understanding of the empirical and

theoretical aspects of the thesis. Here the puzzle under examination relates to how many actors can come together and work in a coordinated and aligned manner. It seeks to understand how and why projects adapt and change over the course of their lifetime, exploring this first from a deductive approach, before shifting to an inductive approach, and back again. In the process, this allows for multiple perspectives on any single section of the thesis and helps to understand the deeper empirical layers of reality.

RESEARCH STRATEGY

The research strategy which has been undertaken for this thesis is the **single intrinsic case study** of Smart City World Labs. The case was chosen as part of an information-based selection to maximize the utility of a single case, with an expectation that important information would be readily available for the thesis (Flyvbjerg, 2006). A case study is an empirical observation investigating a real-life problem, in this case the project of SCWL. Using a case study research strategy for this thesis was thought to be the best possible research strategy in this case due to the way in which the case study is able to provide real-world insight and complexity to the theoretical concepts outlined in the thesis (Yin, 2009). This case in particular can be characterized as an intrinsic case study as outlined by (Stake, 2010), meaning that it is focused first and foremost on better understanding the case itself, rather than focusing on establishing generalizable lessons or drawing focus to a particular issue. The purpose is thus not to come to understand some abstract phenomenon, but the specific SCWL case.

This methodology is used because of SCWL relatively unique and innovative approach to innovation brokerage which mean that the case is difficult to draw parallels to. Given the deep insight and access secured for this thesis, the bulk of the thesis is thus aimed primarily at better contextualizing and understanding the exact way in which SCWL and its stakeholder network adapted and changed over its lifetime, rather than drawing parallels to projects that only share broad similarities to SCWL.

RESEARCH METHODS

This thesis primarily utilizes **qualitative** research methods to properly secure an understanding of the complex internal processes which shaped SCWL and how these processes shifted and adapted according to partner-identified challenges. Qualitative research methods are a set of scientific methods of observation to gather non-numerical data, instead referring to the meanings, concepts, definitions, characteristics, metaphors, symbols, and description of things. The advantage of using qualitative

methods is that they generate rich and detailed data that leave the participants' perspectives intact and provide multiple contexts for understanding the phenomenon under study. In this way, qualitative research can be used to vividly demonstrate phenomena or to conduct cross-case comparisons and analysis of individuals or groups. However, most of the limitations you find in using qualitative research techniques also reflect their inherent strengths. For example, the small sample sizes help to investigate research problems in a comprehensive and in-depth manner, but this small sample size weakens the opportunities to draw useful generalizations from the findings (Saunders, Lewis, & Thornhill, 2012).

The reasoning behind using primarily qualitative research methods instead of quantitative or more mixed research methods is directly linked to what sort of information is directly relevant to the thesis and what information was available to the author of this thesis. With the focus on project adaptations and internal processes, there are only a few ways in which quantitative methods can expand on the major revelations to the thesis. Quantitative issues – such as financial changes or macro-scale issues are not the focus of examination in this thesis, with the focus instead being on determining what challenges, on a subjective or micro level, were faced by SCWL in the eyes of the partners of the project as well as how they reacted to these challenges. This is only possible through in-depth interviews with the participating parties in these deliberations. With the research strategy being a single case study, there also wasn't any great need to quantify the relatively few interactions under examination. For all these reasons, this thesis is primarily reliant on qualitative research methods.

DATA COLLECTION

In alignment with the decision to use qualitative research methods, this thesis relies primarily on **semi-structured in-depth interviews** and various **project documents**. As advocated by (Saunders, Lewis, & Thornhill, 2012), both primary and secondary data have been used to enable reliable research. The primary data, in this case, refers to the information that was collected in the form of interviews with the partners of the SCWL project. This is supplemented by various available sources of secondary data in the form of project documents such as the project's own evaluation of SCWL, various applications for financing, a series of presentations and interviews with Singaporean actors. In addition, various supplementary sources of data, often of a secondary or tertiary nature, are used to round out the gaps left

in the data collection. (Yin, 2009) argues that, for case study research, interviews are one of the significant sources of collecting primary data – which is a primary reason for its use in this thesis.

This thesis is written based on six detailed interviews with members of the project consortium, specifically two Quercus Group partners who have been closely involved for the duration of the project, the project leader from Gate21 and later Climate-KIC, the representative and current project leader from DTU, the key representative from Climate-KIC and the Danish ambassador to Singapore. Beyond these key interviews, the thesis uses project applications to Industriens Fond and Climate-KIC in order to secure a clear understanding of precisely how the project developed from the beginning of phase one through phase two, alongside SCWL's own evaluation of the first project phase – which was written on the basis of a series of interviews with a variety of key stakeholders in the project and various other information collected by the SCWL consortium. These sources were chosen because of the critical role of the project consortium in understanding how and why SCWL has adapted to challenges during its lifetime. To secure ethical conduct during the research process and thesis formulation, every interview transcript has been provided and signed off on by the interviewees, alongside offering anonymization of their responses and continuous contact and clearance of document usage with key partners in the project.

There are several factors to keep aware of when dealing with the data collection phase of this thesis. First, it relies almost exclusively on information provided by the project partners in SCWL. This means that the information provided will have an internal bias, likely in favor of the project. This means that the interviews and project documents must be viewed through a critical lens, questioning the reliability of the sources and considering the purpose of the source being used. This is particularly relevant when dealing with project documents dealing with external actors, for example in financial applications and marketing material, where there is a clear interest in projecting a saleable image. While inaccurate or incorrect information is unlikely, there will be a clear slant to the sources (Saunders, Lewis, & Thornhill, 2012).

DATA ANALYSIS

This thesis utilizes a **thematic analysis** approach to the data collected for research. As such, it emphasizes the uncovering of themes and patterns within the collected data, as it seeks to clarify the most important aspects of the data. To understand these themes, the analysis moves beyond the specific written

word and explores both the explicit and implicit ideas within the data based on detailed readings of the sources, as candidate thematic similarities are identified. Based on these themes or ideas, codes are developed to represent the identified themes and are applied to summarize raw data. These codes are in turn linked together in overarching themes and worked to cover the data collection as best possible. This is followed by defining what each theme is, which aspects of data are being captured, and what is interesting about the themes – as a comprehensive understanding of each theme is developed. By the end of this process, a few key themes should have proven themselves more integral than others – on the backs of which the data can be summarized. There are some weaknesses to this approach which must be considered when analyzing the data in this thesis. First, given the interpretative nature of the approach, nuanced data may be missed if it does not fall clearly into one of the themes identified. This is joined by the risk that the discovery and verification of themes and codes may mesh together, weakening the individual steps of the process while also making it difficult to maintain a continuity of data from individual sources due to the meshed together nature of the analysis (Guest, MacQueen, & Namey, 2012).

This approach to data analysis was chosen because of the integral role played by distinct qualitative data, where identifying overarching themes would allow for the linking of sources across theories and perspectives, a critical need for the thesis due to its usage of multiple diverse theories which connect to vastly different themes, despite often coming from the same source or sources. Furthermore, it has allowed for the categorization of key themes into three broad topics – Purpose, Organization and Process. This data analysis approach has been demonstrated below.

Data Analysis Steps	**Purpose**	**Organization**	**Process**
Specific	*"These Danish living labs are then connected with similar living labs in Singapore."* - NSR, QG	*"Now once those relationships are established, what does it take to maintain them? Who should be accompanying them – Academia? Technical? Business?"* - TS, Gate21	*"With a new partner constellation, the project has been more focused in its approach."* - BTYF, QG
Code	Living Labs	Relationships	Partners
Theme	Model	Stakeholder Engagement	Major Changes
Topics	Purpose	Organization	Process

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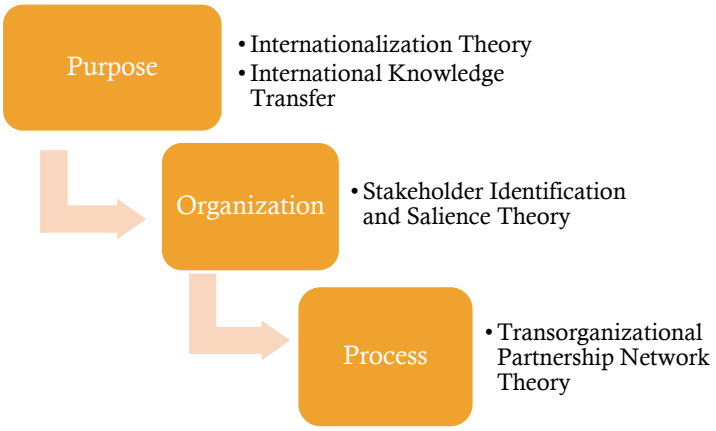
LITERATURE REVIEW

THEORETICAL FRAMEWORK



There are three overarching themes which need to be illuminated if the workings of SCWL are to be properly understood. The first of these relates to the purpose of SCWL, namely supporting the internationalization of SMEs by assisting them in transferring smart city solutions to Singapore. At the heart of this process is the transfer of knowledge and know-how from the Nordics to Singapore using open innovation systems such as urban living labs, demand-driven exports and innovation brokerage. This leads to the second factor, namely the structuring SCWL with focus on SCWL's stakeholders and their salience to the project to understand who is important to the project and how. The third and final theme related to how SCWL, as a transorganizational partnership network, functions and what processes it goes through. By examining the purpose, organization and process of SCWL, this thesis can illuminate how SCWL enables, supports and strengthens the transfer of smart city solutions to Singapore.

These three sections are interrelated on several different levels and outline the chronological, methodological and managerial development of the SCWL project through its lifetime. The first section, outlining the purpose of the project, is also the point of genesis for the entire project. It explains why the project exists at all, what function it fulfills in the complex world of innovative urban development projects and how the project has changed over time. The second section, the one relating the organization of SCWL, is the next perspective on the project, establishing how precisely an organization such as SCWL is constructed. It is here that relevant stakeholders and actors become important, bringing their own capabilities to the table while giving shape to the project. The third section, related to process, illustrates how the purpose and organization of SCWL shape not only the processes of the project but

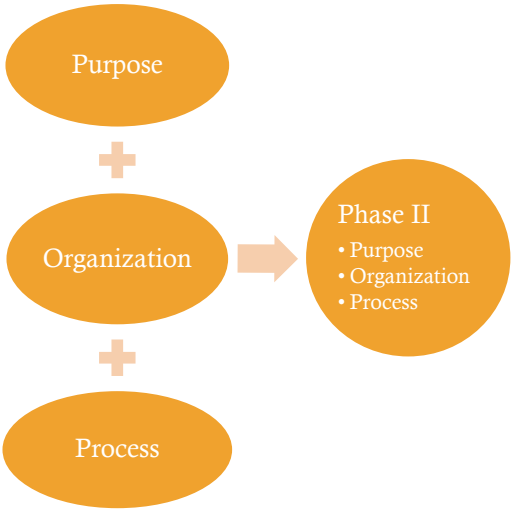
also how precisely it accomplishes the goals set out for the project. It is the step where the project's purpose, channeled through its organizational framework, is processed.

The first step of this theoretical framework relies on two key theories. The first of these is internationalization theory, which details the process by which companies move from their home markets to international markets. This theory, or rather set of theories, illustrates the core purpose of SCWL, namely supporting the internationalization of Nordic SMEs onto a global stage, in this case by bringing them to the Singaporean market. The second theory which helps to explain the purpose of SCWL relates to international knowledge transfer theory, providing another perspective of SCWL's purpose by reframing it from a corporate focus to a knowledge focus. Rather than looking at the activities SCWL supports through the companies it supports, it instead examines the solutions – the products, services and technologies – which are transferred from the Nordics to Singapore. This dualistic view on SCWL's purpose allows for a more accurate and targeted examination of SCWL and its activities.

The second step of the theoretical framework is focused on the use of stakeholder identification and salience theory to clarify the key actors in the SCWL project, determining the role they play in the project, the resources and capabilities they bring to bear and establishing why precisely they are important to the project. The second segment relates more directly to the actual organizational framework of the SCWL project. In this section stakeholders are identified, their salience to the project is analyzed and the importance of these stakeholder relationships are clarified. Finally, the importance of these relationships is detailed.

The third step of the theoretical framework relates to the processes of SCWL wherein the iterative processes of SCWL are illuminated and patterns are identified, examined and analyzed to better understand the processes by which SCWL is governed. This step relies heavily on understanding SCWL through a transorganizational partnership network lens, a theoretical construct that details and explains the multi-organizational construction of SCWL and the implications of such a setup. The different patterns that mark these processes and the specific sorts of ties that bind together the project are illuminated during this step.

All three steps of the theoretical framework have changed over the course of the project's lifetime, in effect turning the framework into an iterative process which could in theory be completed at the end of



every phase of the SCWL project as it developed. Identifying the successes and failures of the previous phase while determining how the project adapted and developed to mitigate these challenges, taking into account the disparate goals of the project's participants while coupling it to the ultimate goal of SCWL to develop a global network of Urban Living Labs, exchanging smart and sustainable solutions to urban challenges across borders and continents, are all critical to understanding the core focus of this thesis. All three themes will provide a separate perspective to the changes and adaptations of SCWL, illustrating the diverse ways in which it changed and providing a multiplicity of viewpoints for those changes – creating a better understanding of the processes and reasonings behind the project's development over the course of its lifetime.

PURPOSE

The purpose of SCWL has two major dimensions to it, dealing with the internationalization of Danish SMEs and start-ups while ensuring the transfer of actual Danish urban solutions to Singapore. This two-fold purpose thus requires two separate theoretical approaches, outlined below, relating to the internationalization of firms and the transfer of knowledge on an international scale. Internationalization theory's definition and development are examined before going into the innovation-based internationalization school of thought and its complexities to illuminate the internationalization process that SCWL is meant to strengthen. This is followed by an examination of the international knowledge transfer processes in relation to sustainable urbanization to understand what precisely the transfer of smart urban solutions from Denmark to Singapore entails.

INTERNATIONALIZATION THEORY

Even though the term internationalization has been used extensively, few real attempts have been made to provide an operational definition of its meaning. (Welch & Luostarinen, 1988, s. 36) have described internationalization as *"…the process of increasing involvement in international operations"* –

considering both the inward and outward growth of international companies. (Welch & Luostarinen, 1988)'s definition has been recognized by others (Young, 1990) for its use as both a working explanation which is concise and readily interpretable as well as sufficiently holistic to take account of the multiple factors associated with international expansion. The internationalization process has been comprehensively reviewed in business literature with (Welch & Luostarinen, 1988, s. 43) concluding that "*…there is a wide range of potential paths any firm might take in internationalization"*. A wide array of approaches and perspectives have contributed to the contemporary understanding of firm internationalization including models of an economic, econometric, organizational, marketing and managerial nature which have been formulated to help explain the structural and behavioral issues underpinning internationalization theory. However, one approach has developed a somewhat more significant body of literature about internationalization – that of export development. Given that export activities of the firm perpetually change, the mode of export behavior, quite naturally, tends to be under constant development with many studies having adopted this frame of reference in studying firms' dynamic and evolutionary processes of internationalization (Albaum, Strandskov, Duerr, & Dowd, 1989).

Significant research has examined the way in which corporations progress along the internationalization continuum, suggesting that a sequence of discrete stages exist which follow a stepwise process exemplifying the evolution of international involvement. Implicit to each set of stages is the notion that fairly stable periods exist in which firms consolidate and generate an appropriate resource base to respond to fortuitous environmental conditions which allow them to proceed to the next internationalization stage (Morgan & Katsikeas, 1997). This is exemplified in the innovation adoption approach which describes the selection of an innovation as the most acceptable alternative, among a series of options, at any given point in time. The utilization of the innovation adoption framework in export decision making was first considered by (Simmonds & Smith, 1968) but significant advances were later made in (Bilkey & Tesar, 1977). These authors concluded that the process of export development was depicted by several distinct stages and that various factors affected decision making at each stage. (Bilkey & Tesar, 1977) conceptualized the process of export development based on firms' increasing involvement in exporting to more distant markets. Their model was composed of six export development stages with the extremes

ranging from businesses whose management had no interest in exporting to those whose management explored the feasibility of exporting to perpetually greater psychologically more distant countries.

In (Reid, 1981) the author set out an explicit innovation adoption sequence of exporting, thereby continuing the development of the innovation-based internationalization school of thought. He conceived innovation to follow the stages of a firm's growth in export awareness; export intention; export trial; export evaluation; and export acceptance. In this context, export adoption was believed to require a favorable management attitude to exporting, an available foreign market opportunity and the presence of spare resource capacity within the firm. (Lim, Sharkey, & Kim, 1991) expanded on the work of (Reid, 1981) and identified four levels of export innovation, these being: export awareness; export interest; export intention and export adoption. Strong evidence to support this framework was found which suggested that innovation adoption does have considerable applicability in the context of export decision making. These taxonomies possess a common theme in that they attempt to introduce a classification of export behaviors which generate heterogeneous profiles of firms that reflect different degrees of development along a reference line of internationalization. The innovation-related internationalization taxonomies confirm the fundamental tenet that a firm's internationalization is largely attributed to two key elements: the amount of knowledge the firm possesses, particularly experiential knowledge; and uncertainty regarding the decision to internationalize (Morgan & Katsikeas, 1997). However, there are reasons to believe that the incremental internationalization thesis fails to fully explain the nature and character of corporate international involvement.

Firstly, (Millington & Bayliss, 1990) paid specific attention to the role of strategic planning in the process of internationalization and found that the incremental stepwise development of firms was the exception rather than the rule. They concluded that, in the early part of international involvement, firms rely on market experience and thereby make incremental adjustments. However, as the degree of international experience increases, planning systems are implemented which formalize strategic analysis and information search. International involvement continues to increase to the extent that experience may be translated across different markets and between various product groups, thus, enabling firms to leapfrog the incremental process within markets (Morgan & Katsikeas, 1997). Secondly, an important issue of intra-stage evolution is not considered within these models. Referred to as "micro-internationalization"

by (Dalli, 1994), this issue can have significant implications for the development of small and medium-sized firms because several subtle changes regarding systems, procedures and other internal and external phenomena may influence their outlook on exporting.

Third, it is largely considered that firms advance along the path of internationalization rather than the reverse. Some international firms may encounter the situation where the aggregate disadvantages of international involvement outweigh the potential advantages of such a strategy. Given this scenario, it is possible that firms may undergo a process of "de-internationalization" and thereby reverse the sequence of international expansion through divestment and other similar tactics (Welch & Luostarinen, 1988). Despite the issues surrounding the incremental internationalization thesis, it has been suggested that the concept of a sequential process of international involvement does not imply that such a transition is either consistent or uniform and it is likely that some general evolutionary pattern of international involvement can be pursued which could be irregular and ad hoc (Morgan & Katsikeas, 1997).

INTERNATIONAL KNOWLEDGE TRANSFER

The role of international knowledge transfer processes in driving urban sustainability innovation and practice has been recognized and highlighted as one of the main features of the global urban sustainability movement by (Joss, 2015, s. 153), amongst others, who defined concept of international knowledge transfer as *"the central movement - ranging from master planning to development, and from co-financing to providing accreditation - of foreign actors in the design and implementation of eco-city initiatives, and the resulting transfer and exchange of conceptual and empirical knowledge, expertise and practice"*. On the basis of an analysis of 178 sustainable city initiatives across the globe, (Joss, Cowley, & Tomozeiu, 2013) summarized five major types of organizations involved in international cooperation and knowledge transfers, including (1) research organizations; (2) consultancy firms in various field; (3) governmental organizations, often in the form of bilateral governmental arrangements; (4) international governmental or quasi-governmental bodies; and (5) non-governmental organizations, with consultancy firms having been identified as the most often involved actor in international knowledge transfer.

The nature of international policy and knowledge transfer has proven to vary from case to case depending on their partners' categories, as do the motives behind their active engagements. Establishing a bilateral or multilateral partnership in urban sustainability-related projects seem to be mutually beneficial given:

cities that initiate sustainability/eco-city agendas are often able to attract financial and technical support from powerful and knowledgeable partners as well as to advertise its attractiveness for international business and investment; international corporations are provided spaces for open innovation, where they can test new products or ideas that could further open up new markets; governments gain the possibility of fostering bilateral development and trade relations; and international organizations benefit from real practices to evaluate and develop urban sustainability standards and to influence policy and practice on the ground (Joss, 2015; Cheshmehzangi, Xie, & Tan-Mullins, 2018).

Despite these merits, the integration of global forces creates undesired yet intrinsic problems to sustainable city development. On one hand, the globalization and marketisation of smart/sustainable/eco-city innovation can be argued to risk subordinating local concerns and features to foreign interests and could even lead to deviation from the inherent concepts and principles of the approach as foreign consultants, engineers, and architects might tend to value economic profits more than performance in ecological and carbon concerns such as the carbon reduction, sustainable transportation promotion, circular economies and ecological treatment of water and waste (Joss, 2015). Moreover, the disregard for local context could create and reinforce premium "ecological enclaves" that privilege socially elite consumers, and thus exacerbate social justice and inclusion issues. On the other hand, "imported" urban sustainability ideas, policies, and planning methods are often confronted with a transformation and adaptation process before being employed in the local context. Despite the credibility of the original ideas, the translation and reinterpretation to some extent affects the smooth implementation of the plans and ideas. However, if a project succeeds in mastering this acclimatization process and avoids the pitfall so of a purely economic focus there will often be a great deal of potential to projects of an international scale (de Jong, Stout, & Sun, 2017).

ORGANIZATION

In order to understand the organizational structure of SCWL, there are certain key aspects of stakeholder theory that can shed light on SCWL's organization and the most salient actors within that framework. Thus, this thesis relies first on identifying the vast number of stakeholders involved in the project to identify the most important actors in the project and to understand which are salient to the project. Beyond this, the thesis will seek to categorize and typify them to better understand how they fit into the

organizational network of SCWL. Ultimately, the goal of these theories, building on the complex stakeholder literature, is to better understand how SCWL is put together and what the implications of this stakeholder construction might be for the project, and the thesis.

STAKEHOLDER THEORY

One of the most common and general definitions of stakeholders was provided in (Freeman, 1984, s. 25) which describes stakeholders as "*those groups and individuals who can affect or be affected by the actions connected to value creation and trade."* While this definition is necessary to explain the concept of stakeholders, it should be noted that the common unit of analysis for stakeholder theory is not often the organization itself but rather the relationships between an organization and its stakeholders (Freeman et al., 2010). A review of stakeholder literature from the past decades reveals that many different versions of stakeholder theory have been developed. Donaldson and Preston (1995) categorized and labeled these different versions into four main typologies - namely as descriptive/empirical stakeholder theory, instrumental stakeholder theory, and normative stakeholder theory.

Adapted from **(Hörisch, Freeman, & Schaltegger, 2014)**

Type	Focus
Descriptive/empirical stakeholder theory	Description of how companies are managed; identification of relevant stakeholders
Instrumental stakeholder theory	Effects of stakeholder management on the achievement of corporate objectives
Normative stakeholder theory	Discussion of the purpose of business; moral justifications of stakeholder theory
Integrative stakeholder theory	Considers the descriptive, instrumental and normative aspects of stakeholder theory to be inextricably linked

Focusing on the relationship between stakeholders creates a completely different framing to a management approach and a wider range of considered decisions than focusing on how to influence others. This focus on managing stakeholder relationships is sometimes criticized for being a prescription to treat all stakeholders equally (Gioia, 1999). However, managing stakeholder relationships does not necessarily imply that all stakeholders must be treated equally, regardless of the specific circumstances. In contrast, the organizational leadership should try to identify which stakeholders are involved in a certain business activity since, the success of a business often depends on the input of stakeholders and top management thus a commitment to their well-being (Philips, Freeman, & Wicks, 2003). This relates to another core element of stakeholder theory, namely generating mutual interests between different

stakeholders rather than focusing on trade-offs. Based on these mutual interests, stakeholder theory aims at creating value for all stakeholders involved (Freeman, Harrison, Wicks, Parmar, & de Colle, 2010). (Key, 1999) criticize this view by arguing that trade-offs always exist, and it is thus impossible to systematically overcome them. However, the gravity of sustainability-related problems, such as climate change, suggests that simply acknowledging the systematic existence of numerous trade-offs is unlikely to solve the relevant challenges of sustainable management (Hörisch, Freeman, & Schaltegger, 2014).

When it comes to identifying and categorizing stakeholders (Mitchell, Agle, & Wood, 1997) provide a comprehensive typology of stakeholders based on the assumption that there are three attributes by which stakeholders can be identified: 1) the stakeholder's power to influence the organization, 2) the legitimacy of the stakeholder's relationship with the organization, and 3) the urgency of the stakeholder's claim on the organization. However, to understand a dynamic theory of stakeholder identification and salience there are several additional implications to power, legitimacy, and urgency which must be accounted for, namely that 1) stakeholder attributes are variable, not steady state; 2) stakeholder attributes are socially constructed, not objective reality; and 3) consciousness and willful exercise may or may not be present.

Adapted from **(Mitchell, Agle, & Wood, 1997)**

Attribute	Definition
Power	A party to a relationship has power, to the extent it has or can gain access to coercive, utilitarian, or normative means, to impose its will in the relationship.
Legitimacy	A generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions.
Urgency	The stakeholder views the issue as important or critical while at the same time believing the issue to be time sensitive, demanding immediate attention.

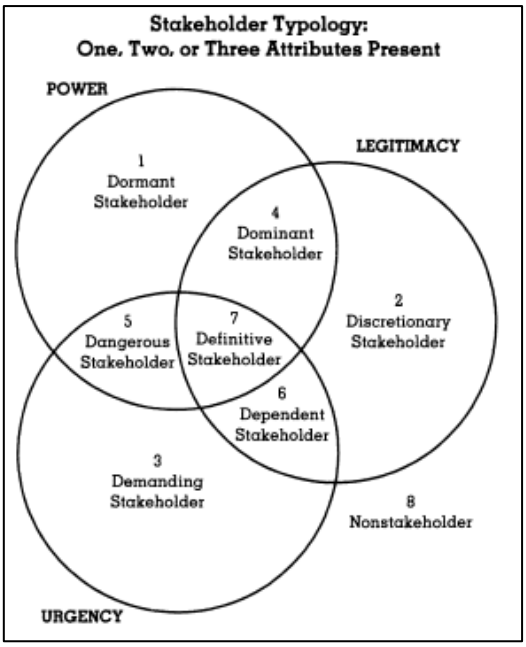
Thus, with respect to power, for example, access to the means of influencing another entity's behavior is a variable. Power may be coercive, utilitarian, or normative qualitatively different types that may exist independently or in combination. Each type of power may range from nonexistent to complete. Power is transitory – it can be acquired as well as lost. Additionally, possession of power does not necessarily imply its actual or intended use, nor does possession of power imply consciousness of such possession by the possessor or "correct" perception of objective reality by the perceivers. An entity may possess power to impose its will upon a firm, but unless it is aware of its power and willing to exercise it on the firm, it is not a stakeholder with

high salience for managers. Rather, latent power exists in stakeholder relationships, and the exercise of stakeholder power is triggered by conditions that are manifest in the other two attributes of the relationship: legitimacy and urgency. That is, power by itself does not guarantee high salience in a stakeholder-manager relationship. Power gains authority through legitimacy, and it gains exercise through urgency (Mitchell, Agle, & Wood, 1997).

Legitimacy, like power, is a variable rather than a steady state – a dynamic attribute of the stakeholder-manager relationship which may be present or absent. If it is present, it is based on a generalized virtue that is perceived for or attributed to a stakeholder at one or more social levels of analysis. Claimants may or may not correctly perceive the legitimacy of their claims; likewise, managers may have perceptions of stakeholder legitimacy that are at variance with the stakeholder's own perception. Also, like the power attribute, legitimacy's contribution to stakeholder salience depends on interaction with the other two attributes: power and urgency. Legitimacy gains rights through power and voice through urgency (Mitchell, Agle, & Wood, 1997).

Finally, urgency is not a constant attribute but can vary across stakeholder-manager relationships or within a single relationship across time. As is true of power and legitimacy, urgency is a socially constructed perceptual phenomenon and may be perceived correctly or falsely by the stakeholder, the managers, or others in the firm's environment. Urgency by itself is not enough to guarantee high salience in the stakeholder-manager relationship. However, when it is combined with at least one of the other attributes, urgency will change the relationship and cause it to increase in salience to the firm's managers. Specifically, in combination with legitimacy, urgency promotes access to decision-making channels, and in combination with power, it encourages one-sided stakeholder action. In combination with both, urgency triggers reciprocal acknowledgment and action between stakeholders and managers (Mitchell, Agle, & Wood, 1997).

Adapted from (Mitchell, Agle, & Wood, 1997)



Adapted from **(Mitchell, Agle, & Wood, 1997)**

Stakeholder Type	Definition
Dormant Stakeholder	The relevant attribute of a dormant stakeholder is power. Dormant stakeholders possess power to impose their will on a firm, but by not having a legitimate relationship or an urgent claim, their power remains unused.
Discretionary Stakeholder	Discretionary stakeholders possess the attribute of legitimacy, but they have no power to influence the firm and no urgent claims. The key point regarding discretionary stakeholders is that, absent power and urgent claims, there is absolutely no pressure on managers to engage in an active relationship with such a stakeholder, although managers can choose to do so.
Demanding Stakeholder	Demanding stakeholders, those with urgent claims but having neither power nor legitimacy. They are irksome but not dangerous, bothersome but not warranting more than passing management attention, if any at all. Where stakeholders are unable or unwilling to acquire either the power or the legitimacy necessary to move their claim into a more salient status, the "noise" of urgency is insufficient to project a stakeholder claim beyond latency
Dominant Stakeholder	In the situation where stakeholders are both powerful and legitimate, their influence in the firm is assured, since by possessing power with legitimacy, they form the "dominant coalition" in the enterprise, though without any present urgency. Dominant stakeholders will have some formal mechanism in place that acknowledges the importance of their relationship with the firm.
Dangerous Stakeholder	Where urgency and power characterize a stakeholder who lacks legitimacy, that stakeholder will be coercive and possibly violent, making the stakeholder "dangerous," literally, to the firm. "Coercion" is suggested as a descriptor because the use of coercive power often accompanies illegitimate status.
Dependent Stakeholder	Stakeholders who lack power but who have urgent legitimate claims can be described as "dependent," because these stakeholders depend upon others (other stakeholders or the organization's managers) for the power necessary to carry out their will. Because power in this relationship is not reciprocal, its exercise is governed either through the advocacy or guardianship of other stakeholders, or through the guidance of internal management values.
Definitive Stakeholder	A stakeholder exhibiting both power and legitimacy already will be a member of a firm's dominant coalition. When such a stakeholder's claim is urgent, managers have a clear and immediate mandate to attend to and give priority to that stakeholder's claim. The most common occurrence is likely to be the movement of a dominant stakeholder into the "definitive" category
Non-Stakeholders	Non-Stakeholders exhibit none of the three attributes, and as such fall outside the categorization as stakeholder for the firm.

PROCESS

The process of SCWL serves to illustrate the processes by which decisions and developments occur in the project, focusing on how the interactions between and within groups of stakeholders shape the further development of SCWL as the project develops from its pre-project phase, through the first phase and into the formulation of the second phase and during the second phase. In the case of this thesis, it relies heavily on the literature written about transorganizational partnership networks, giving insight into the iterative nature of the project processes and the various types of ties that bind SCWL together.

TRANS-ORGANIZATIONAL PARTNERSHIP NETWORK THEORY

According to *Complexity theory*, because the future is unknowable, in any given situation we can only learn from the results that emerge from interactions within that context. This necessitates a shift in thinking about how to design, develop, and lead loosely coupled networks and transorganizational partnership (Stacey, 1996). Since it is ever-changing, context preempts what can be known objectively about how to preplan a network's future development. This is the biggest contributions complexity theory provides to the construction or workings of transorganizational systems. Since the anticipated partners, interactions that will occur, or resources that will be allocated to the system are all yet to occur, the foresight of how well they will work together can only be approximated. Therefore, looking at the emergent patterns of behavior tends to be more effective at predicting what work must be done and how to do it (Shaw, 2002; Stacey, 1996; Holland, 1998).

In transorganizational systems, multiple partners come together to form the network, however, each comes with their own unique history, culture, and viewpoint (Hofstede, 2003). Consequently, from the perspective of complexity theory, while a collective of people involved in the same project or platform may have a similar frame of reference for interpreting what something is, the multiple parties will still make sense of these components based on their own history and understanding of those components, with a resultant divergence in their interpretations. This sense-making process suggests that the creation of future networks based on past experiences can have significant benefits because there is both a real and potential need in transorganizational work for the integration of disparate views on how to develop the network, address power and conflict as well as synthesize the output of multiple dynamic interactions among participants that exert meaningful influence. Therefore, having already gone through the process

of aligning interpretations and expectations once, it should be easier to reintegrate with past partners – requiring less readjustment on all sides (Worley & Mirvis, 2013).

Thus, a complexity perspective suggests that there are no definitive boundaries within a transorganizational network. Since there are no absolute boundaries of dynamic interactions, what possibilities are included or excluded for consideration can vary widely but are basically a matter of negotiated choices stemming from the impact of ongoing dialogues between partners in the network (Holland, 1998). This perpetual process of negotiated choices ultimately determines the course of transorganizational design at any given time. That is not to say that there are not purposeful design criteria, however, the transactional exchange among the parties of the network itself produces new possibilities for impacting subsequent choices of those criteria. Ignoring these emerging design criteria presents a clear peril, as they have the potential to support or undermine the macrostructure of the network (Shaw, 2002).

Defining transorganizational networks as emergent phenomenon without a precise structure and future that can be predetermined is also one of the major challenges facing those engaged in transorganizational work. Each party's role evolves along with the network itself, in the process shaping and creating new contexts wherein the intended design criteria and work of the network can be accomplished in a way that the dynamic patterns will support (Worley & Mirvis, 2013). These supportable contexts act as attractor patterns – the most repeatable patterns of order in dynamic interactions and structures we can see in complex environments – like transorganizational networks, which keep the network relatively stable (Holland, 1998). This is the space in which a network can settle down and operate, though it is necessary, as indicated above, to not characterize it as, or rely on its, permanence. As network partners come to agreement on mission, vision, roles, and responsibilities, how to expend and leverage resources, the strategy to be pursued, and the design criteria of the network itself, they move through the transorganizational development stages of identification, convention, organization, and evaluation. They are essentially creating the attractor patterns or how the transorganizational network will predominantly behave. How these design elements synthesize together compose the basic principles of the network, and thus the predominant pattern of dynamics. The attractor pattern provides the core strength of the network's operations and transactions, supporting its participants with a basic confidence in how the

transorganizational partnership will work. The paradox is that while the attractor patterns provides order and stability, they are constantly under perpetual construction and change, only one potential evolution away from a radical shift – which can be either for the benefit or detriment of the network as a whole. This suggests that the processes of leading planned change, impacting the network's performance and effectiveness, and facilitating better collaborative outcomes is never ending. The practice of transorganizational development and building the complex responsive processes of an organization is itself a complex responsive process capability (Worley & Mirvis, 2013).

Furthermore, when a significant shift occurs in the attractor pattern as a result of some dynamic impact on the network, such as a leadership transition or shift in resource allocations, the turbulence that is created by these actions may provide the richest opportunity for creativity and further development of the network (Wheatley, 1999). The previously discernible patterns potentially give way to innovation and possible breakthroughs in how to improve the network's mission, vision, strategy, or structure. Thus, helping the network to regain stability would not necessarily be the goal of transorganizational development at these times of disruption. Instead, the partners and leadership might better serve the network by using these transition functions in its current context as the basis for interventions in order to explore different future possibilities for the network's next state of being in the emerging context (Holland, 1998). Knowing that a predominant attractor pattern will emerge offers the reassurance necessary to the organization development practitioner that there is an opportunity to explore new possibilities amid disruption. Therefore, the participants in the network must be capable of aiding network partners and participants in changing their perceptions of disruption from one of seeing problems to one of perceiving disruptions as positive opportunities for innovation. This may help leaders of networks to understand that effectively dealing with shifting dynamics in creative and innovative ways is an increasingly important leadership quality and boon to the network's future (Worley & Mirvis, 2013).

In organizational network theory, the central theme is ordinarily on how the micro processes in developing relations between actors drive the development of the macro structures of a network. In a dynamic approach, this macro structure in turn feeds back into the choices made in and for relations with others. The unit of analysis may be individuals, different clusters or the whole network. To characterize network theory and clarify prior conceptualizations of networks and social ties, (Borgatti, Brass, &

Halgin, 2014) set forth a theoretical framework which differentiates between state-type and event-type ties. State-type ties include similarities and social relations, while event-type ties include interactions and flows.

State-type networks are based on similarities and social relations. Ties based on similarities of any description, any shared membership, shared location, or shared groups can be used to study the underlying social network structure. Ties that are defined through social relations build on a different set of assumptions. Ties correspond to predefined social relations such as family member or colleague at the individual level. When analyzing such state-based networks, roles and positions are based on the degree to which members of a network are directly tied to each other. Their ties might be based on functional criteria such as for example organizational members working in similar departments, in related fields or within comparable working methodologies (Moser, Groenewegen, & Ferguson, 2017).

Event-based networks, on the other hand, are measured by the interactions and flows that can be observed. Interactions could be observed for example through e-mail or in a forum-based discussion. Other data that serve as input for social network analysis are often framed as co-appearance of social entities at the same event. Flows, as the second type of event-based ties in social networks, concern the information that flows through these social ties. For example, information, money, goods or services that flow between two colleagues may constitute a tie (Moser, Groenewegen, & Ferguson, 2017).

An important stream of organizational network literature is concerned with network topology, meaning the position that people and groups occupy within a network. Here, a decisive factor is the *proximity* between units of analysis in a network. In such studies, certain meaning aspects like knowledge base or professional background may be taken as proximity in a cultural or meaning sense (Lipparini, Lorenzoni, & Ferriani, 2013; Uzzi & Spire, 2005). While the intensity and proximity of social ties are important factors for organizational studies, they capture readily observable and/or reportable characteristics of actors as a basis for ties. In addition, these ties can be described by actors and observers in an explicit way. The interrelation between tacit and explicit ties play an important role in illustrating the importance, or lack of importance, of a relationship (Moser, Groenewegen, & Ferguson, 2017).

(Borgatti, Brass, & Halgin, 2014) categorize affective or perceptual relations as state-type social relations; indicating that such ties are continuous over time and represent states rather than instances of

social interaction. Affective relations are concerned with the disposition, positive or negative, of one unit towards another. Such relations are closely interwoven with more explicit relationships and influence how successful such relationship can be. However, meaning, as a flow of implicit and tacit relations, must be conceptualized in a dynamic way. Such meaning may change over time, "flowing" through the network. Thus, tacit meaning is more layered and complex than a state-type relation; it should capture the different tacit dimensions that are inherent to a relationship. In that sense, meaning is distinct from a state-type social relation. Another factor that overlaps with tacit meaning is tie strength. A common measure of tie strength is a combination of duration, frequency, and emotional closeness. Emotional closeness might refer to some parts of tacit meaning, for example, intent, feeling, and signification.

One of the central themes in organizational studies is knowledge and knowledge sharing. Closely related to other important fields such as creativity, innovation, and strategy, it has received ample scholarly attention. Knowledge and thus knowledge sharing are closely related to meaning and have been embraced by network scholars. Essentially, knowledge sharing could be defined as the provision or receipt of information, know-how, and feedback, thus relying on an underlying relational mechanism (Moser, Groenewegen, & Ferguson, 2017).

RESEARCH CONTEXT

The purpose of this chapter is to outline the context in which SCWL is located. There are thus two key concepts which must be understood if the project is to be properly understood. The first of these is the concept of Smart and Sustainable Cities, which delineates the sectoral focus of the project. The second of these concepts are urban living labs which serve as the primary sites and participant in the SCWL project, performing test bed operations, acting as show rooms and helping to remove of entry barriers for SMEs and startups making the leap from Denmark to Singapore. SCWL is built on these two concepts and is heavily structured around them, making it vital that they are properly understood.

SMART AND SUSTAINABLE CITIES

A sustainable city is a vision of the future urban landscape, shared by its government, businesses, educational institutions and citizens, in an effort to provide better quality of life in the present while maintaining and expanding the possibilities of well-being and prosperity for the future. As stated by

(Mori & Yamashita, 2015) a sustainable city is a city which can generate the maximum socioeconomic benefits for its population without losing the environmental and equity parameters when measured by appropriate indicators. Concepts linked to environmental protection as key characteristics of cities have given rise to initiatives such as the green city, eco-city, low-carbon city and smart city, evolving towards more integrated approaches to sustainability (Trindade, et al., 2017). During the last decade, a new form of city concept has been rapidly gaining high popularity - that of the smart city concept. In this concept, a smart city can be defined as seeking to achieve the goal of sustainability with the support of modern technologies (Lara, Costa, Furlani, & Yigitcanlar, 2016; Yigitcanlar, 2016). However, while modern technologies can bring numerous benefits to cities, their implementation as an end in and of itself is not enough to make it a sustainable city. There must be a connection to between the sustainable and technological for it to classify as a smart city (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017). The lack of conceptual consensus and the difficulty of defining something as holistic and fluid as a smart and sustainable city appears in the scientific literature, which has been unable to establish a comprehensive approach that deals with the urban scale in the many dimensions of sustainability. These characteristics make the assessment of smart and sustainable cities a permanent and ever shifting challenge (Maiello, Battaglia, Daddi, & Frey, 2011; Trindade, et al., 2017; Chang, Sabatini-Marques, de Costa, Selig, & Yigitcanlar, 2018).

There are, however, a reasonable variety of approaches of assessment models, frameworks, indexes and monitoring and evaluation tools which deal with smart and sustainable cities or assessments of urban smartness and sustainability in the academic literature. There is a need for multidimensional assessments when working with different typologies of cities, such as smart, sustainable or competitive as shown in (Monfaredzadeh & Berardi, 2015). Comparisons of assessment models of sustainable cities and smart cities have shown that urban sustainability assessment systems are more complete for the natural environment, built environment, water and waste management and energy categories, while smart cities frameworks best cover economic issues. Nonetheless, aspects related to environment and energy are undersized in smart cities frameworks and environmental indicators are lacking, even though the reduction of greenhouse gas and energy consumption are central to the smart city agenda (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017).

URBAN LIVING LABS

The term *urban living lab* or *living lab* refers to a variety of local experimental projects of a participatory nature. It is often used interchangeably with the terms "testing ground", "hatchery", "incubator", "testbed", "hub", "city laboratory", "urban lab", or "field lab". In fact, the European Network of Living Labs (ENoLL) define (urban) living labs (ULL) as: *"…User-centered, open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real life communities and settings*" (ENoLL, 2018). When trying to define the key characteristics of urban living labs (Steen & van Bueren, 2017) identified nine across four dimensions: 1) aim 2) activities, 3) participants, and 4) context. Thus, when discussing the *aims* of an ULL, they can be said to be aimed at innovation, aimed at formal learning for replication, and, in the case of an *urban* living labs, aimed at increasing urban sustainability. The *activities* of an ULL can include: development (all phases of the product development process), co-creation, and iteration (feedback, evaluation, and improvement). Third, *participants* in an ULL can, and should, include public actors, private actors, users and knowledge institutes alongside all actors who have decision-making powers over the ULL. Finally, the *context* of a ULL is the real-life use context of innovation. In many urban living labs, this is a territory or a space-bound place within the cityscape where innovative solutions can be tested and displayed outside factory conditions.

In the case of ULL, as discussed above, it is the focus on the creation of a new learning arena that marks out this particular type of governance innovation from other kinds of urban experimentation. Co-created by research organizations, public institutions, the private sector and community actors in what is often referred to as a 'triple' or 'quadruple' helix mode, ULL are seen as a means through which to gain experience, demonstrate, and test ideas, and co-develop new skills and actionable knowledge that is explicitly captured and used to inform the process of creating urban sustainability. If governing urban sustainability used to be a matter of the development of urban plans and strategy, often informed by processes of environmental assessment and public consultation, ULL in common with other forms of experimentation involve a more interventionist, incremental and 'learning by doing' governing approach in which urban sustainability is developed rather than pre-given. Seeing ULL not only as discrete arenas for research and development, but as part of a broader shift in the ways in which society responds to

urban sustainability challenges requires a more explicit engagement with the ways in which they form part of the shifting governance landscape (Bulkeley, et al., 2016).

CASE STUDY: SMART CITY WORLD LABS

Smart City World Labs is made up of a series of phases, which are funded separately and can also be considered as individual project in and of themselves. The phases build on the same relationships, concepts, models and structures as those that precede them but see some significant shifts from phase to phase. The pre-project phase, as it is termed in this thesis, covers the period from the delivery of a report by Quercus Group on behalf of the Danish Embassy in Singapore on the 21st of August 2015 to the Kickoff event for the first phase on the 18th of May 2016. Phase I then lasts from the 18th of May 2016 till the end of 2017, on the 31st of December. Phase II follows this, lasting from 1st of January to 31st of December 2018. An application phase is set to follow this, with work begun on it in early 2018, which should – if all goes according to plan – end in late 2018 and set the stage for a Phase III beginning in 2019 (Quercus Group, 2018; Fjældhøj, 2018).

PRE-PROJECT

Smart City World Labs was the result of a series of events in late 2015, which laid the groundwork for the project. On the 21st of August 2015, the private consultancy company Quercus Group produced a report on behalf of the Danish Embassy in Singapore titled "Co-Creating the Cities of Tomorrow" which analyzed the potential for Danish smart city solutions in the Singaporean market (Quercus Group, 2015a). This report produced a series of findings and recommendations, particularly related to the large Singaporean interest in Danish smart city solutions – as well as the presence of multiple significant urban living lab projects in Singapore. Based on these finding, Quercus Group and the Danish Embassy decided to move forward with a project aimed at supporting the export of Danish solutions to Singapore using Danish and Singaporean living labs – in effect creating a launch and landing pad through these living labs. At Quercus Group, an opportunity to secure funding from the Danish foundation, Industriens Fond, for the potential project was identified the same day as the report was delivered to the Danish Embassy – with a deadline one month later, on the 21st of September 2015 (Fjældhøj, 2018).

This relatively short application period meant that there was a great deal of pressure to secure the requisite partners for the consortia – with only limited opportunities to make sure everyone was on the same page and in alignment with each other. Perhaps most problematic was the initial lack of a Singaporean partner to the project – though that would be resolved soon after the project kick-off (Fjældhøj, 2018). It was during this application period that two Danish living lab actors, Gate21 and DTU (Danish Technical University), were invited to join the project consortium. Gate21 is helix cluster organization aimed at promoting the transition to green technologies and tying the various sectors of Greater Copenhagen (municipalities, corporations and knowledge institutions) together. They own and operate several major living labs in the Greater Copenhagen area. DTU is the premier technical university in Denmark, has access and contact to some of the most innovative technical solutions available in Denmark and operates several living labs. These four actors, Quercus Group, the Danish Embassy, Gate21 and DTU, would form the central partner constellation for the pre-project phase and the first phase of the project – with each bringing something to the table (Quercus Group, 2018).

However, while the application eventually secured pre-approval on the 22nd of December, it would only be more than four months before SCWL held its official kick-off event and the project leader, from Gate21, and the representative from DTU began work on the project (Fjældhøj, 2018; Sichelkow, 2018; Dahlstrøm, 2018). This delay was the result of hesitancy on the part of Industriens Fond, who work extensively with supporting the internationalization of Danish SMEs, and was due to worries about the willingness of SMEs to participate in the project – as a result, Industriens Fond asked for a minimum of forty signed letters of intent from Danish companies before they would release funding for the project. This process was challenging, particularly given the sprawling and opaque Danish innovation and export systems which the project consortium needed to understand to identify relevant SMEs to invite to the project. The end of this process, which lasted from January to mid-April of 2016, and the securing of the requisite letters of intent led to the release of funds in late April – followed by a major kickoff event with 25 companies as well as interested organizations from both Denmark and Singapore on the 18th of May – marking the start of the first SCWL phase (Fjældhøj, 2018; Quercus Group, 2018).

The SCWL project was originally envisioned in three broad phases: (1) an initial pilot phase meant to support the development of a sustainable business model and the export platform; (2) an implementation

and scaling phase in which the final model developed in the initial phase was implemented on a larger scale in the first (Singaporean) market and the implementation of the project in new urban markets; and (3) which would see the project continue scaling and expanding to ever more markets while turning it into a self-sustaining organization. The central mindset behind the project, from the beginning, was to utilize the urban living labs in various cities as a network of smart city solutions exchanges – where solutions developed in any one city could be transferred with relative ease to another, adapted to the new context and locality in the open innovation environments of the local living labs before being implemented in the new city. This would allow the rapid spread of various smart and sustainable urban solutions from one city to another, allowing them to learn and adapt what works best from one city to the next – one of the greatest challenges facing urban environments the world over (Quercus Group, 2018).

PHASE I

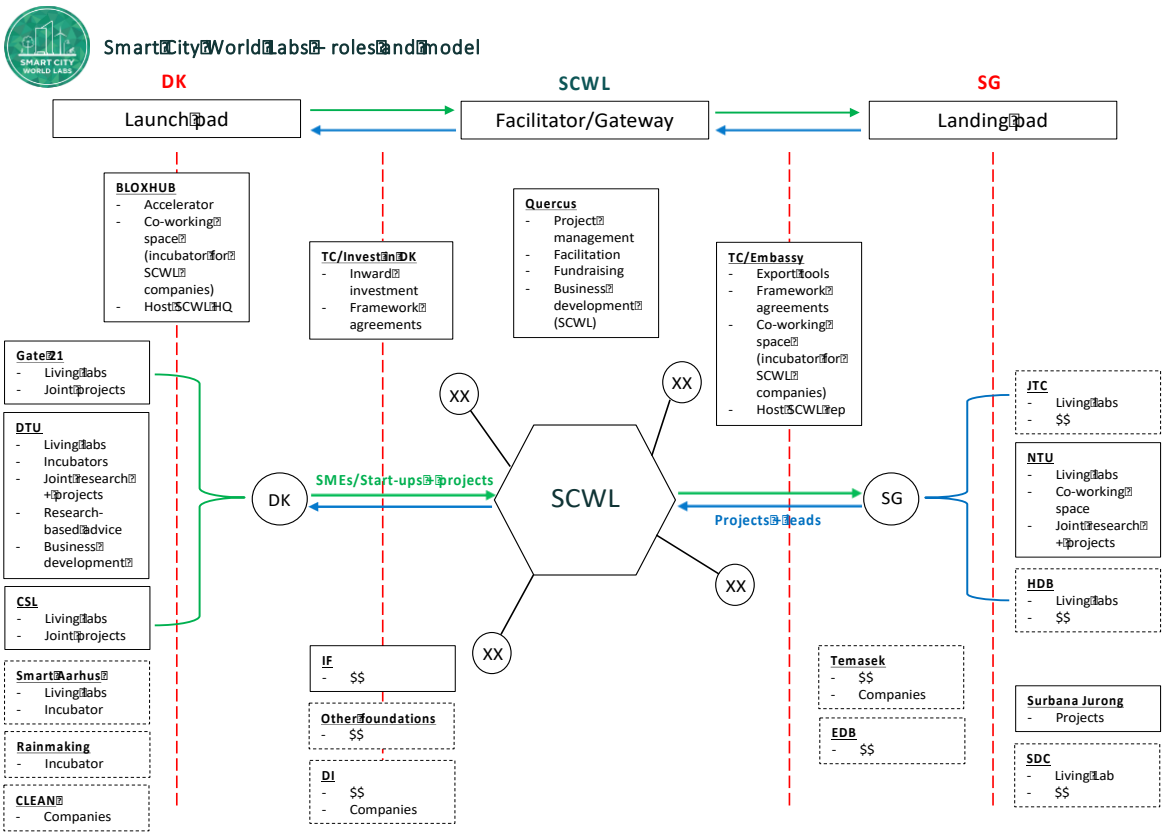
The first phase of SCWL was constructed around a series of seven work packages designed to support the development of a sustainable business model using living lab partnerships. This first phase of the project was therefore first and foremost a development and piloting phase, focused on the establishment of strong relationships between Danish and Singaporean actors as well as the formalization of this partnership. The project's budget was based around these points, and as such did not include financing for the actual operationalization of Danish companies to Singapore nor was there enough financing to support the presence of a local entity in Singapore or anything more than basic on-the-ground support for the companies once they had been brought to Singapore (Fjældhøj, 2018).

Work Package One:	Preparation Phase
Work Package Two:	Development of Living Lab Export Model
Work Package Three:	Pilot Phase – Test of Export Model
Work Package Four:	Development of Sustainable Business Model
Work Package Five:	Formalization of Wider National Living Lab Platform
Work Package Six:	Knowledge Sharing
Work Package Seven:	Evaluation

Once Phase I was launched in mid-May 2016, the initial focus was to secure at least one Singaporean partner as soon as possible. This was accomplished quite swiftly, with Singapore's Nanyang Technical

University (NTU) joining the project as a partner and living lab operator. They would in time be joined by a second major Singaporean partner, though playing a more peripheral role, in the form of the major Singaporean consultancy Surbana Jurong – a corporation working with major urban infrastructure projects on a global scale and employing in excess of 40,000 (Fjældhøj, 2018). The first year of the project focused largely on building the vital relationships that would come to serve SCWL in the future, while expanding, developing and defining the business model of SCWL and working to establish alignment. Throughout this period, the project consortium sought to expand exposure to the project in both Singapore and Denmark, running multiple stories and appearing on Singaporean television to promote the project. These efforts would secure two minor partners for the consortium, in the form of the Danish organization BloxHub – an urban innovation hub based out of Copenhagen – and Copenhagen Solutions lab – a Living Lab owned and operated by Copenhagen Municipality (Quercus Group, 2018).

The model below illustrates the form SCWL had taken by the end of Phase I, illustrating how the various stakeholders relate to the project (SCWL, 2017a). The model shows the complex nature of the partner



consortium and the numerous stakeholders involved in the project. It is by leveraging the capabilities of each of these partners in the form of know-how, relationships, reputation and various other resources, that SCWL functions. The business model that was eventually developed at the end of Phase I focused on building a launching pad for Danish companies in Denmark, relying on Danish living labs and incubators, before transferring the companies to Singapore with SCWL functioning as facilitator in this process and the Singaporean living labs as the landing pad for the Danish companies. From there the Danish companies would be drawn into specific projects run by Singaporean actors on location. By leveraging pre-existing living labs, incubators and export structures, SCWL was able to develop and test a functional model with surprising rapidity. The consortium was also able to build up significant relationships with important public and private actors in Singapore through near-bimonthly visits from Denmark and constant communication with the Singaporean actors (Sichelkow, 2018).

The main challenge in this first phase came when the SCWL consortium sought to support the operationalization of companies to Singapore in the last year of the project. Having already spent half of the first year set aside for the project on securing corporate interest in the project and requiring an additional year to properly establish the requisite partnerships and relationships in Singapore in order to build the landing pad in Singapore, the consortium ran into a major financial bottleneck when it came time to bring the Danish companies to Singapore. This was for the simple reason that the project was not budgeted to support these types of activities, meaning that the process was extremely reliant on the willingness of the Danish corporations to invest the requisite time and resources in the process. The inability to apply for funds in Singapore – the result of lacking a local entity with which to apply for financial support – meant that SCWL was forced to a near standstill once the Danish companies had established contacts and built interest in Singapore. Without funds to support prototyping in Singapore or to the various other processes which required a greater level of investment than was directly available to the very small corporations participating in SCWL, there was little that could be done to demonstrate the project further (Fjældhøj, 2018).

The last half year of the first phase of SCWL was thus spent searching for new financial sources, in hopes of securing the money that would be needed to demonstrate the operational viability of the project, expanding and deepening relations in Singapore, continuing the development of the business model and

evaluating the project's first phase (Dahlstrøm, 2018). It was these processes that would build the foundation for the second phase and help strengthen and clarify the project. One major challenge that continued to haunt the first phase of the project was its wide-open scope, approaches and objectives (Rottbøll, 2018). The first phase was, more than anything else, a period of experimentation and development – marked by continual explorations of the potential behind the SCWL living lab approach – with the result that there was a significant degree of disagreement over what the end form of SCWL would take amongst the partners in the consortium (Fjældhøj, 2018). However, this last half year of Phase I allowed a detailed examination of the business model, the project consortium and the export approach undertaken in SCWL which would result in a greatly strengthened and clarified project during the coming second phase of SCWL (Sichelkow, 2018).

All that said, over the course of SCWL's first phase the project had actually succeeded in developing a functional living-lab based export model and had established living lab partnerships in Singapore within the fields of water, waste, energy and mobility – but not in the lighting sector, which had been one of the sectors originally identified to have potential – and the business model continued to be refined and developed as the consortium searched for a sustainable model for the project both financially and as an approach (Rottbøll, 2018). Over the course of Phase I of SCWL, the project engaged more than 50 Danish in the project while dialogues and relationships were established with over 30 different organizations, institutions and corporations in Singapore. This had, by the end of 2017, resulted in 12 of the Danish companies becoming involved in concrete project activities, including financing, participation in projects, tests in Danish and Singaporean living labs and the like. Out of these 12 companies, three were involved in actual projects in Singapore while two established concrete dialogues to become suppliers to the living lab owners in Singapore. The seven other corporations participated in various project activities, including trips to Singapore, but did not get to the point of project participation or the subcontractor agreements. However, given the limited time frame and financial resources available by the end of the first phase – it was believed that a second phase would allow for significant and early operationalization (Quercus Group, 2018).

The evaluation at the end of Phase I identified a series of learnings from the project process, which would prove vital to the coming phases of the project. First and foremost, was the fact that SCWL's role as

facilitator and curator of solutions had been vital to ensuring the relative success of the project. Secondly, it was vital that a comprehensive understanding of both markets was established in SCWL – with a proper understanding of local business methods, capabilities, mindsets and cultural norms proving themselves incredibly valuable. A third learning was that the two-year period for Phase I was simply not long enough, with the pilot testing having been limited to only the second of the two years of the project – the first having been spent building relationships, developing Singaporean ownership of the SCWL approach and clarifying the project's priorities. This, in addition to the determination that start-ups and smaller SMEs generally lacked the resources and capabilities to fully follow through on the demands of the project, meant that the project would likely need to target somewhat larger companies in future phases – in effect requiring a clearer and more extensive screening process than previously utilized. Additional learnings included the need for a strong urban living lab environment in the landing-pad, the importance of DTU as an endorser of the project to help build trust and legitimacy with Singaporean actors, the need for boots-on-the-ground in the form of a local presence and the need to develop a sustainable business model – which had not proven feasible by the end of Phase I of the project (Quercus Group, 2018).

PHASE II

By the time the first phase of SCWL ended in late 2017, it had undergone several changes, particularly in the last half year of the first phase. Phase II of SCWL would thus see many of these changes implemented and, in many ways, would come to function as an extension of the first phase rather than a separate phase entirely – in effect serving as a proof-of-concept or pilot phase for the project consortium during the yearlong second phase. By demonstrating the developed concept in this shorter phase, the project would have a much stronger footing once the much larger Phase III was applied for in late 2018 (Fjældhøj, 2018). There were four incredibly important changes to occur in Phase II: (1) the restructuring of the partner constellation within the consortium, (2) the replacement of Industriens Fond as funder with Climate-KIC, (3) the implementation of a challenge-based approach to the project and (4) the dedication of significant resources to train and support Nordic companies prior to their transfer to Singapore (SCWL, 2017b).

The restructuring of the partner constellation within the consortium had significant consequences for the second phase and included several major changes. First and foremost, the former project lead in SCWL

– Gate21 – withdrew from the project after determining that the objectives, aims and approaches that had been identified for SCWL by the end of the first phase were incompatible with the organization's own objectives. The project lead eventually recommended that Gate21 leave the consortium and internationalization as a general approach (Sichelkow, 2018). DTU took up the post of project lead to replace Gate21 and would come to play a key role in not only maintaining the relationship with NTU, but also expanding and strengthening the launching pad for Nordic companies in Denmark. The Embassy also stepped back from the project, reducing their participation in the project consortium – though remaining a partner – while still supporting and hosting select events in Singapore – most prominently a number of events during the project's major workshop in Singapore in June of 2018 (Vizard, 2018).

With the end of Phase I of the SCWL project, the funding from Industriens Fond also ran out. The result was that as the first phase neared its end and the financial means available to supporting project activities ran out, the partner consortium was on the look-out for a new funder for the project. It was in this context that a representative from Climate-KIC contacted the project partners and informed them that Climate-KIC would be interested in exploring scaling the SCWL methodology – providing the financing for the project to continue long enough to demonstrate its viability for a larger third phase, and paving the road to Climate-KIC joining the project as a partner in this third phase – with another funder taking over the financing of the project (Vangsbo, 2018). Climate-KIC becoming the funder of SCWL led to several critical changes to the project, however, to understand these changes Climate-KIC as an organization must be understood. Climate-KIC is the largest public-private partnership in the EU focused on climate innovation – supported by the European Institute of Innovation and Technology – and as such securing the participation of the organization's Nordic Office meant that SCWL would have to expand its European reach to include corporations from all Nordic countries – greatly expanding the pool of innovative companies. The second change was the explicit need for the project to support climate innovation to fit the Climate-KIC profile – requiring some retooling and redefining of the SCWL project (SCWL, 2017b).

The implementation of a challenge-based approach to what would come to be termed "innovation brokerage" in the SCWL project was a major change in the entire approach to knowledge sharing and solutions provisioning previously undertaken by the SCWL and marks the greatest contribution to the

SCWL project by the Singaporean partners in the project (Fjældhøj, 2018). The central idea behind this approach was to shift the starting point for innovative solutions brokerage from a supply-led/push export promotion effort, i.e. pushing Danish solutions into the Singaporean market and then finding a buyer for it once there, to a demand-led/pull export approach where pre-selected Singaporean challenge-owners and the SCWL partner consortium would cooperate to create clearly defined challenges for Nordic companies to provide solutions to (SCWL, 2017b; Vangsbo, 2018). Phase II of SCWL would compromise three challenges: 1) zero-energy buildings and urban food production on behalf of Surbana Jurong – a project partner and one of the largest urban infrastructure consulting companies in the world, 2) longer-lasting energy systems for automated guided vehicles on behalf of PSA unboXed – the corporate venture capital arm of one of the world's leading port groups PSA, and 3) reduction in water and waste intensity and higher renewable energy adoption on behalf of NTU EcoCampus – NTU's flagship program for sustainable on-campus solutions (SCWL, 2018).

This approach has its strengths (greater clarity, increased speed and certainty of the utility of proposed solutions) and weaknesses (loss of solutions to challenges that are left unaddressed, far smaller pool of companies who can be targeted and loss of initiative from the push-side), but the most important factor in utilizing this approach was that it allowed the SCWL to clearly demonstrate its utility towards a few critical Singaporean actors (SCWL, 2017b). A major challenge facing the SCWL project throughout the first and second phases related to a Singaporean reticence towards taking a risky first-mover approach to innovative solutions – instead being far more comfortable with an early-adopter approach (Sichelkow, 2018; Fjældhøj, 2018; Vizard, 2018). This has meant the Singaporean actors have been hesitant towards the idea of investing their own resources in SCWL before it had proven itself successful. Following the central June 2018 workshop, multiple Singaporean actors would go on to express interest in significantly increasing their contribution to the project – proposing adding Singaporean financial resources to the project (Fjældhøj, 2018).

Further, to ensure that the companies SCWL dispatches to Singapore would actually be able to function there, the second phase of the project included considerable resources for the curation, training and support of the participating companies – in effect expanding and strengthening the launching pad of the project in Denmark. This process would be initiated following an initial winnowing down of companies

from 8-10 to 6, two aimed at each challenge, during a series of virtual pitches to the Singaporean challenge owners. The six selected companies were then put through an intensive training and acclimatization process under the auspices of the DTU Management department, run by DTU. This series of lectures and lessons would serve as both a refresher course on corporate internationalization challenges and seek to impart and understanding of the Singaporean market and the challenges involved in doing business in Singapore. The benefits of an adaptive training process tailored to the companies and to the Singaporean market would be a great benefit for the companies, not only directly related to the project but also more generally in their internationalization efforts beyond this point and would greatly improve the probability of a successful export process (Dahlstrøm, 2018).

A key factor to understanding the greater success of the SCWL operationalization in the second phase lies in understanding that the size and maturity of the companies involved in Phase II was different from the companies who had participated in Phase I. In the first phase, SCWL really focused on very small companies – and particularly from the startup segment – which had quite significant consequences near the end of that phase, namely that several of the participating companies were forced to bow out when they were offered contracts because they simply weren't ready yet. Furthermore, the pressures of exporting to a market as far from Denmark as Singapore placed an extraordinary drain on the time and resources of the participating companies. Finally, the lack of financial means available to these companies meant that they did not present a sustainable foundation on which to build a self-financing platform. This led to a redefinition of the corporate target group for SCWL, specifically regarding the size and maturity of the companies involved. The companies targeted still belonged in the SME segment, but were no longer startups – having had more time to mature – and a somewhat larger size to better cope with the demands of exporting to Singapore (Fjældhøj, 2018; Rottbøll, 2018; Quercus Group, 2018).

However, while many of the recommendations outlined in the evaluation of Phase I were implemented in the second phase, there was one key recommendation that was left unimplemented. This recommendation centered on establishing a local presence in Singapore directly affiliated with the SCWL project. This would include a physical person, able to conduct day-to-day interactions and contacts, as well as a legal entity which would be able to apply for funding from Singaporean sources. The effects of such an entity would drastic, greatly improving the speed at which interactions between Singaporean and

Nordic actors could be undertaken, helping to further localize the project – creating a sense of shared ownership in Singapore, improve SCWL's capabilities in identifying new and interesting opportunities in the Singaporean market and much more. The reason given for SCWL not implementing this feature was quite simply a matter of time constraints and limitations in financial resources, with plans to establish a local presence as soon as possible in the coming phases and expansions of SCWL to new markets (Dahlstrøm, 2018; Fjældhøj, 2018; Rottbøll, 2018; Vangsbo, 2018; Sichelkow, 2018; Quercus Group, 2018).

ANALYSIS

As has been outlined previously, this section seeks to combine an examination of SCWL changing and developing purpose, organization and process from conception, through implementation, development and transformation between the pre-project, first phase and second phase of SCWL. This is done through the paradigm of examining how these three major themes have shifted over the course of the project lifetime. To accomplish this, the analysis has been partitioned into three separate sections dealing with the shifting purpose, changing organization and developing processes of SCWL. To analyze the purpose, the first section will examine how SCWL's purpose as an international broker of innovative solutions through living labs developed over the course of the three separate phases outlined previously. This is followed by an analysis of the shifting and changing partnership and stakeholder constellation that has influenced SCWL in so many ways. Finally, the actual process by which SCWL constantly adapted and changed in response to internal and external stimuli will be outlined and analyzed to better understand how SCWL became the project it is today.

DEVELOPING AN INTERNATIONAL INNOVATION BROKERAGE FRAMEWORK

This section, analyzing the purpose of SCWL, relies on three separate sub-sections – explaining the role of urban living labs in SCWL, how SCWL functions through the paradigm of internationalization theory and how knowledge transfer occurs in SCWL. The objective of this section is to explain how SCWL developed a functioning international innovation brokerage framework structured around these three factors. By uniting urban living labs with the internationalization of companies – which in turn result in

the transfer of knowledge, this section explains how SCWL was shaped and formed through its various phases by the interests and focuses of the various partners in the project.

CONNECTING LIVING LABS

When SCWL was originally conceived of, it was constructed on the basis of findings from the Quercus Group report delivered in August 2015 which highlighted the presence of a considerable number of living lab actors in Singapore – mirrored by Denmark's own considerable living lab resources (Fjældhøj, 2018; Quercus Group, 2015a). With the concept of connecting urban living labs as the foundational concept of SCWL, it was thus vital that living lab actors were drawn into the project as quickly as possible. Having started with only the Danish Embassy and Quercus Group, the project consortium thus expanded quite rapidly to include several living lab actors – specifically DTU and Gate21 – in Denmark while contacts were established in Singapore. However, the concept of utilizing living labs as a launching pad for innovative solutions was a very new one and the project's framework and structure remained in considerable flux in this period (Fjældhøj, 2018).

It was only once the first phase of SCWL came under way that the project was able to secure living lab participation in Singapore, with NTU joining the partner consortium and SCWL securing access to living labs run by Singapore's Housing Development Board, Jurong Town Corporation and Sentosa Development Corporation as well as a series of infrastructure project run by Surbana Jurong. By securing access to these living labs and projects, SCWL was able to develop the landing pad for the solutions they hoped to transfer and created greater interest in Denmark. This allowed SCWL to expand its access to Danish living labs and incubators to include Copenhagen Solutions Lab, Smart Aarhus, Rainmaking and CLEAN. By building these contacts to Danish and Singaporean living labs, incubators and project owners, SCWL was able to begin building the wider network through which they would move Danish companies in the later stages of the first phase of SCWL, and particularly in the second phase of SCWL (SCWL, 2017a).

By the second phase of SCWL, the partnership consortium had decided to narrow their focus to a few very concrete challenges held by three individual challenge owners, two of them with previous affiliations to SCWL and a new living lab actor – the two old actors being Surbana Jurong and NTU, while the new actor was PSA unboXed (SCWL, 2018). On the Danish side, there was also a narrowing

of direct participation as Gate21 departed the project and DTU became the primary Danish living lab actor. Furthermore, the expansion of the project to include companies from across the Nordics, meant that once selected, the companies would need to be organized centrally and given focused guidance – all of which would fall under DTU's purview during the second phase of SCWL (Dahlstrøm, 2018; Vangsbo, 2018; SCWL, 2017b). Thus, while the relationships with other living lab actors were retained, they would not play a significant role in the second phase of SCWL (Fjældhøj, 2018; Dahlstrøm, 2018).

INTERNATIONALIZING NORDIC COMPANIES THROUGH LIVING LABS

At the heart of SCWL is the project's aim of becoming an international platform for the internationalization of innovative solutions and corporations to provide access to the best possible solutions to cities around the world – beginning with Singapore. To accomplish this, SCWL had to develop a model whereby they could support the export of Danish and Nordic companies. To establish a proper understanding of the role SCWL plays in the internationalization of the participating companies, it is thus necessary to identify the various ways in which SCWL provokes changes to the participating companies' internationalization efforts.

The first element of internationalization that should therefore be analyzed are the four levels or stages of export innovation detailed by (Lim, Sharkey, & Kim, 1991) as: export awareness – becoming aware of an import need in a foreign market, export interest – becoming interested in doing business in foreign markets, export intention – becoming willing to export to a foreign market, and finally export adoption – whether the company actually exports solutions to a foreign market. If a company goes through all four of these stages, then it can be considered to have entered the first rung of internationalization – exports. In the context of SCWL, the question is thus whether the project was able to help the participating companies pass through any of the four levels of export innovation and how influential their intervention in the process was for the companies. Given the major shifts from phase to phase, it makes sense to view each phase as a separate effort and to make note of which partners played key roles at specific points in the process, giving a clearer idea of where the competencies and focuses of the individual actors lay.

Improving the export awareness of the participating companies has been a cornerstone of SCWL since its conception. Building awareness around the potential of Singapore as a market has been a critical piece of SCWL's strategy from the beginning and was characterized by a series of articles meant to build buzz

around the project while SCWL also establishing direct communications with any companies that seemed in some way relevant to the project. The second phase saw SCWL grow much more targeted in its approach, identifying potential matches to specific challenges in Singapore and as a result what little effort there was to generate public interest was refocused on the selective recruitment of companies. It was a matter of determining what companies might be relevant and then making them aware of the market potential of Singapore by highlighting the specific challenges outlined in the second phase (Fjældhøj, 2018). SCWL was lucky in that it was able to build on the numerous contacts of their various partner organizations – with particularly DTU and Gate21 playing a key role in recruiting companies and selling them on the prospect of internationalizing to Singapore. In fact, one of the key ideas behind SCWL is that by exposing companies in early phases of their development to the potential of international markets it might lead to a fundamental reshaping of priorities and focuses, leading to Nordic companies of the future having a more international approach to how they do business (Sichelkow, 2018).

Building sufficient export interest amongst the startups and small companies involved in SCWL was a key task of SCWL. This can be seen in the four months used to secure letters of interest from Danish companies prior to phase one and the various events meant to boost the appeal of Singapore as a market for the small companies and startups that were targeted by SCWL as early as possible. While building export interest seems to have been one of the lesser tasks involved in supporting the companies' internationalization, the lack of a proper sorting of the companies to identify which would be able to go all the way during the first phase would set the stage for greater failures in the next two stages of internationalization process in the first phase (Vizard, 2018; Fjældhøj, 2018). It would be this gap that a lot of resources were dedicated to plugging in the second phase, with a much more careful curation of companies both prior to building their export interest and after the interest had been established – primarily through a much sharper recruitment mechanism and a series of preliminary virtual pitches which allowed the SCWL consortium and Singaporean challenge owners to evaluate which companies and solutions they believed would be relevant (Dahlstrøm, 2018).

A major challenge for SCWL lay in securing the export intentions of the participating companies, particularly in the first phase when there remained a good deal of uncertainty about the viability of the living lab model being tested by SCWL (Fjældhøj, 2018). That said, there were extensive efforts,

particularly in Singapore, to create opportunities for the companies to attempt to secure during the first phase. There were numerous events, meetings with Singaporean actors and presentations of opportunities in the Singaporean market. However, it is in this stage in particular that SCWL ran into major difficulties surrounding their limited curation of the participating companies which meant that many of the companies quite simply weren't ready to move beyond this point (Vizard, 2018; Dahlstrøm, 2018). There were some significant opportunities presented and several offers made by Singaporean actors, but none of them were willing to move beyond this point – resulting in a significant setback for SCWL. Much of this was resolved in the second phase of SCWL with its far greater focus on curation and preparation of the companies going to Singapore. This has meant that there has been a great deal more forward progress in the operationalization of phase two than in the previous phase (Fjældhøj, 2018).

None of the participating companies in either phase actually reached the export adoption stage, which was the result of miscalculations in previous stages as well as resource and time limitations in the first phase – while the second phase simply hasn't reached this point just yet, though there are several indications that it is well within reach. Discussion of the export adoption stage is thus only really relevant to phase one, where the key issues focus on the lack of resources, experience and time of startups and small enterprises as well as a lack of financing on SCWL's part to support the companies once they sought to operationalize the relationships they had begun building (Fjældhøj, 2018).

As stated by (Morgan & Katsikeas, 1997), innovation-related internationalization taxonomies largely attribute firm internationalization to two key elements: the amount of knowledge the firm possesses, particularly experiential knowledge; and uncertainty regarding the decision to internationalize. Both of these elements are in low supply amongst the participating companies in SCWL given that they are startups or small companies and as such have had little time to build knowledge and resources nor are likely to view internationalization as the most important task immediately facing them (Dahlstrøm, 2018). As such, SCWL has been forced to invest considerable efforts and resources in building this knowledge for themselves, so that they can share their experience with the participating companies – helping to improve their knowledge levels while also reducing their uncertainty towards internationalization by demystifying the process. This is again a process that has been under development for an extended period – greatly improving both within and between phases of the project (Fjældhøj,

2018). This also plays into the proposition set forth by (Millington & Bayliss, 1990), that firms build on their market experience – though in this case SCWL serves as a substitute for the internationalizing companies, supporting and guiding their entry into the Singaporean market and thus shielding the participating companies from a whole host of challenges they might otherwise encounter (Vizard, 2018; Vangsbo, 2018).

The issue of micro-internationalization, outlined by (Dalli, 1994), does have some implications for SCWL – though primarily in the second phase. Here, the SCWL project shifts and changes the systems and structures of the participating companies to improve the likelihood of their success once they actually begin exporting to Singapore. This is mostly done during the training set up with DTU Management in preparation for the actual company visits to Singapore (Dahlstrøm, 2018; SCWL, 2017b). While these efforts are meant to help push the companies into a position wherefrom they can successfully internationalize – it is possible to view this through the lens of (Welch & Luostarinen, 1988)'s de-internationalization concept. In the first phase of SCWL, there are several instances that might be referred to in such a way – most prominently where a participating company actually secured a major contract but proved unready to cope with what was being asked of them (Fjældhøj, 2018).

In summary, SCWL is a project which leverages its own capabilities and resources to support the internationalization of the participating companies. There has been some trouble surrounding an inability to leverage enough resources, particularly financial and time related resources, but most of these issues were either resolved or at the very least significantly mitigated during the transition to the second phase of SCWL. More than anything else, the first phase should be characterized as a learning period in which participating companies were involved with the aim of establishing a successful model – changing and adapting in response to failures in the operationalization of exports to Singapore.

TRANSFERING INNOVATIVE SOLUTIONS

While a great deal of SCWL's focus has been on supporting the internationalization of Nordic companies to Singapore, the actual purpose of this entire process is securing the transfer of knowledge, innovation and solutions based on the Nordic approach to smart city development to Singapore. The vehicles of this transfer are the companies, supported by the living labs and SCWL, but the objective of the project is to promote the spread of technologies and innovations based on the Nordic model (Quercus Group, 2015b;

SCWL, 2017b). In fact, the role of such international knowledge transfer processes in driving urban sustainability innovation and practice has been recognized and highlighted as one of the main features of the global urban sustainability movement for decades (Joss, 2015).

On the basis of the definition set out by (Joss, 2015), that international knowledge transfer in a smart city context relates to the participation of foreign actors in the design and implementation of smart city initiatives, and the resulting transfer and exchange of conceptual and empirical knowledge, expertise and practice. (Joss, Cowley, & Tomozeiu, 2013) further detailed the five major types of organizations involved in such international cooperation, including (1) research organizations; (2) consultancy firms in various field; (3) governmental organizations, often in the form of bilateral governmental arrangements; (4) international governmental or quasi-governmental bodies; and (5) non-governmental organizations. In this section, the thesis will analyze how SCWL supports and engages in the international transfer of knowledge and seek to understand the opportunities and challenges the project faces in its aim of transferring innovative solutions to Singapore.

When examining the list of major types of organizations involved in international knowledge transfers it quickly becomes clear that there are several of these types of organizations involved in SCWL. First and foremost, you have two instrumental research organizations in the form of DTU and NTU who, beyond their participation in SCWL, also have a pre-existing bilateral innovation and knowledge sharing partnership which has played an instrumental role in the establishment and furthering of the key relationships in SCWL between the Danish and Singaporean actors (Vizard, 2018). Beyond that, Quercus Group is a consultancy involved in projects such as SCWL and various other sustainability focused transorganizational partnerships, while Surbana Jurong is a large infrastructure consultancy deeply involved in smart city projects like SCWL. These consultancies teach and learn from each other, adapting and developing new methodologies and models which can and will be used in the future, thereby further strengthening the knowledge transfer potential of SCWL as a whole (Fjældhøj, 2018; Rottbøll, 2018). Beyond that are public-private semi-research organizations such as Gate21 and Climate-KIC, neither of whom fully fall into any of the categories listed but rather straddle several categories – bringing knowledge and experience beyond what is readily available to the other partners in the project (Vangsbo, 2018; Sichelkow, 2018). Finally, there is the Danish Embassy in Singapore, which has helped open doors

for SCWL with various government institutions in Singapore, including various town corporations and development boards. These governmental contacts, which are only really possible to establish with the backing of the Danish government, have played a vital role in legitimizing the SCWL and creating interest and willingness to participate on the Singaporean side (Vizard, 2018; Fjældhøj, 2018). This particular constellation of partners, bringing widely different approaches to the world and their activities, has been a key strength of the SCWL and proved vital in creating what success it has enjoyed so far.

When trying to classify SCWL as a sort of international knowledge transfer system, as outlined by (Cheshmehzangi, Xie, & Tan-Mullins, 2018) it soon becomes clear that it is structured along multilateral lines, with many important partners all contributing resources, time and expertise to promote the project. This played an important role in securing the support and financing from first Industriens Fond (Vizard, 2018) and later Climate-KIC (Vangsbo, 2018) – and with the continued success of the project during the second phase it has become clear that there is now a Singaporean interest in investing in the project. Having overcome the Singaporean reluctance to act as first-mover, they have convinced them to push forward with the project despite their common preference for early adoption (Fjældhøj, 2018). Given the time and resources required, SCWL could come to attract financial and technical support form new knowledgeable partners and could come to form a key pillar of smart city exchanges of innovations and solutions – opening further international markets and attracting greater interest from external actors.

However, there are also considerable dangers and challenges facing SCWL. First, SCWL is reliant on the good will and willingness to participate of both the Singaporean government and Singaporean research institutions who serve as gatekeepers to the Singaporean market. Without the access provided by DTU and the Danish Embassy, SCWL would likely have floundered while attempting to construct the crucial partnerships it built early in the first phase and continued developing thereafter (Fjældhøj, 2018). Further, SCWL is extremely reliant on the personal relationships and networks of the individual representatives from the various partners for its success – there are no easy replacements now that these relationships have been established (Sichelkow, 2018). Third, the project is reliant in the long run on building and securing wider interest in the SCWL model of innovation brokerage, particularly as it looks to expand and thrive in new markets where the specific cultural compositions and social dynamics may function quite differently from in Singapore or Denmark (Rottbøll, 2018). There are numerous other

challenges, including the necessity of creating a sustainable financial model in order to turn the project into a platform, the need to secure local buy-in to the project to give it a firm grounding and build local ownership and much more (Quercus Group, 2018), but on a general basis SCWL seems to have found a grip on these challenges.

THE SHIFTING SCWL PARTNERSHIP AND STAKEHOLDER CONSTELLATION

This section deals with the partnership and stakeholder constellation of SCWL over the course of its lifetime. This analysis is split into three parts, building on each preceding section, with the aim of uncovering the various stakeholders of SCWL, their salience to the project and how they have influenced the project's development. This will involve identifying the specific key stakeholders of the project, classifying what type of stakeholder they are and finally determining what the consequences of the project's stakeholder and partnership constellation has had as it changed and developed from one phase to the next.

IDENTIFYING SCWL'S STAKEHOLDERS

Based on (Freeman, 1984)'s definition of stakeholders, there are several broad groups and more detailed sub-groups which the stakeholders of SCWL can be divided into, with some stakeholders fitting into multiple groups. The first of these groups of stakeholders are the partners in the project – these can be divided into a variety of sub-categories and vary to a great deal from one stakeholder to the next. Depending on how they are viewed, the financiers and potential financiers can also be viewed as another stakeholder group or as a partner sub-group. Then there are the participating companies in the project, who can be sub-divided by sector, challenge/living lab/project-owner in Singapore and by the phase in which they were involved in the project. There are also the living lab operators, separated by geography, size and centrality to the project, and the government institutions in Singapore and Denmark – most importantly the city governments in Denmark and Singapore. Beyond that there are potential buyers of smart city solutions, both in Singapore but also from across the region, the citizenry who will eventually have to live with these solutions and the various media organizations who impact how SCWL is viewed as a project. In this section the thesis will highlight and analyze several of the key stakeholder groups

and seek to build an understanding of why the project was constructed in such a way as to involve so many disparate stakeholder groups.

At the heart of SCWL's construction is the triple helix model, in broad use within the smart city sector, which brings together research organizations, public institutions and the private sector to co-create projects and solutions (Fjældhøj, 2018). This is a model that is often used in the construction and operation of urban living labs (Bulkeley, et al., 2016) and which helps to explain the specific construction of the SCWL partnership construction in both the first and second phase of the project (Rottbøll, 2018). In this context, NTU, DTU, Gate21 and to some degree Climate-KIC all represent the research organizations of the project and the Danish Embassy and Trade Council represent public institutions while Quercus Group and Surbana Jurong represent the private sector. Climate-KIC, as a highly involved financier, and Industriens Fond, as a less active funder of SCWL, only half fit within this context and can be considered to hold a position half-in and half-outside of the SCWL partnership constellation.

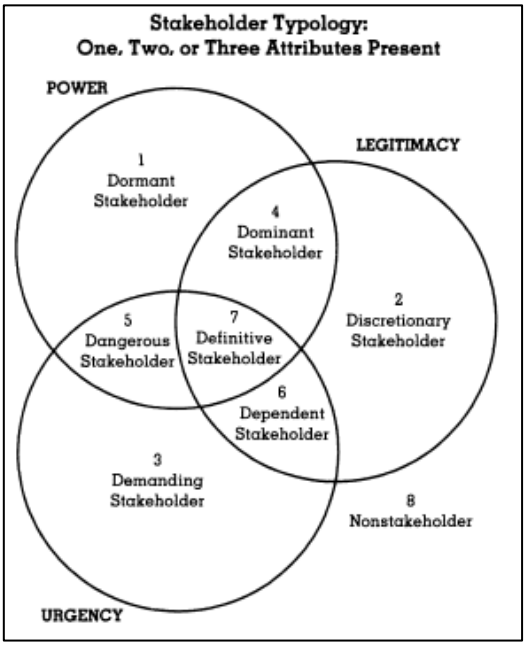
The companies who participate in SCWL are best divided according to what phase of the project they were involved in, their size, their level of participation and their sectoral focus. The first phase can thus be considered to have been characterized by around 50 small companies and startups – commonly with little experience and a limited staff. Of these fifty companies, only twelve made it to the point of companies becoming involved in concrete project activities – of which five were close to securing involvement in actual projects in Singapore. These companies fit into four separate sectors of industry – namely water, waste, energy and mobility (Quercus Group, 2018). The second phase had a much more limited starting group of nine companies, which was shortened to six following a virtual pitch and further reduced to four companies by the end of the brokerage process in phase two. These companies are larger, more experienced and come from a wider geographic region than in the first phase – though the companies remain in the Small- and Medium-sized Enterprise range (Fjældhøj, 2018). These differences are critical to understanding how significant the changes from the first to the second phase were.

The Singaporean "buyers" – a term used to include living lab operators, project-owners and challenge-owners in this context – make up a significant group of stakeholders in the project, though some of these buyers have a greater involvement than just serving in that capacity – namely Surbana Jurong and NTU, who cover several of these sub-groups and also serve as partners in the project. While there are various

governmental institutions, private companies and non-governmental organizations that have played a role in this capacity, the two partners, PSA unboXed, Singapore's Housing Development Board (HDB), Jurong Town Corporation (JTC) and Sentosa Development Corporation (SDC) have been the primary buyers or potential buyers during SCWL's first or second phase – Surbana Jurong, NTU and PSA unboXed serving as challenge-owners for the second phase and as such are the only buyers in this phase (SCWL, 2018; SCWL, 2017a).

CLASSIFYING SCWL'S STAKEHOLDERS

In this section of the analysis, the previously identified stakeholders and stakeholder groups will be classified and categorized according to the classification scheme set out in (Mitchell, Agle, & Wood, 1997). As has been detailed previously, this typology of stakeholders identifies stakeholders according to three attributes: 1) the stakeholder's power to influence the organization, 2) the legitimacy of the stakeholder's relationship with the organization, and 3) the urgency of the stakeholder's claim on the organization – resulting in a total of eight categories which stakeholders can fall into. These categories and their interrelation are outlined in the model to the right. This section will analyze the partner consortium, the project's financiers, the participating companies and the Singaporean buyers – before classifying some of the lesser stakeholders in the project.



Adapted from (Mitchell, Agle, & Wood, 1997)

Quercus Group, as a central member of the partner consortium with a prominent role in the project, is undoubtedly a definitive stakeholder. It has considerable power over the project and exerts a great deal of influence on the direction of the project – including playing a key role in the project's original formation. It has a considerable degree of legitimacy through its position as part of the partner consortium of SCWL. Finally, it has a considerable degree of urgency regarding the project's course because of the prominent position this has as the largest and most successful project in which Quercus Group has played a role. It is invested in the success or failure of the project to a considerable degree (Fjældhøj, 2018;

Rottbøll, 2018). Many of the same factors are present in the case of Surbana Jurong, though its much greater size means that it has less urgency about its participation in the project, which leaves it closer to the dominant stakeholder categorization – with immense power over the success of the project and considerable legitimacy in making its influence felt, due to its key role as both a partner in the consortium but also as a buyer of brokered solutions – but lacks much of the urgency present in Quercus Group's participation in the project (Quercus Group, 2018).

By contrast, DTU and NTU can both be classified as definitive stakeholders, though with a slightly different weighting of their attributes. DTU, as a core partner and later project lead – as well as a key living lab operator in Denmark, has considerable power and legitimacy in SCWL while also having a great deal of urgency due to their key role in the project. Much the same can be said of NTU, though from a Singaporean side. The key difference between the two is that DTU is project leader in the second phase, as such meaning they have that degree of greater legitimacy, while NTU is a more powerful actor due to its position as "buyer" for the project. These two key stakeholders are both research institutions, with a pre-existing relationship, and have served as a key driving force of the SCWL project since its inception (Dahlstrøm, 2018; Vizard, 2018; Quercus Group, 2018).

The Danish Embassy can be categorized as a definitive stakeholder in the first phase, given their considerable role in establishing and developing the project – whereby they secured considerable legitimacy – and their important role as door-openers and point of contact in Singapore for the project – resulting in considerable power. However, in the second phase the embassy largely stepped back from the project, only providing support with little input in the project development, and as such surrendered a considerable amount of power and urgency over the project – though retaining its legitimacy through its role as a representative of the Danish government in the project. Thus, in the second phase the Embassy goes from being a definitive stakeholder to a discretionary stakeholder position – leaning towards a dominant position in the diagram (Vizard, 2018).

This brings us to the most complex of stakeholder of the first phase, Gate21. While it served as project leader in the first phase, it was eventually decided that the project was beyond the remit of Gate21 as an organization – thus, on one hand, Gate21 had considerable power over the project and the legitimacy to influence the project, but at the same time it experienced a lack of legitimacy in its stakeholder position

because of the fact the project did not fit Gate21's remit. At the same time, there was considerable urgency at Gate21 towards influencing the project as it was viewed as the starting point for a wider international approach which was ultimately abandoned. Thus, in the first phase Gate21 could be considered a definitive stakeholder – but leaning heavily towards the classification of dangerous stakeholder because of a lack of legitimacy. In the end, this resulted in Gate21 withdrawing from the project and ending its international experiment, leaving it a non-stakeholder in the second phase (Sichelkow, 2018).

This only leaves BloxHub and Copenhagen Solutions Lab of the partnership constellation, whose primary contribution to the project consisted of connecting companies to SCWL and providing locations for project events. As such, neither of these actors had a particularly significant degree of power over SCWL, nor did they have any particular urgency when it came to the project – with limited importance for either actor. However, given that they are partners in the project, they are a legitimate stakeholder in SCWL (SCWL, 2017a). Thus, BloxHub and Copenhagen Solutions Lab can be considered to fit into the category of discretionary stakeholder.

When looking at the two financiers of the SCWL project it is possible to identify several key differences in what type of stakeholder they were for the project based on their degree of involvement and investment. Industriens Fond financed the project, and as such exerted considerable power over the proceedings, and had a great deal of legitimacy when it came to shifting or changing the project's approach – most clearly demonstrated by their insistence on corporate letters of intent before they would make financing available (Fjældhøj, 2018). However, the urgency felt was quite limited – SCWL was not a particularly large project by their standards and most of their worries were quieted by the participation of an established governmental actor in the form of the embassy (Vizard, 2018) and the recruitment of sufficient companies for the project (Fjældhøj, 2018). Thus, Industriens Fond was a definitive stakeholder turned dominant stakeholder following the end of the pre-project phase in May 2016, capable of exerting considerable legitimate power but with little reason to do so after their initial adjustments. By contrast, Climate-KIC – due to its interest in joining the project as a partner in future phases – has had a great deal more urgency than Industriens Fond while retaining the power and legitimacy of a project funder, leaving it with the classification of definitive stakeholder (Vangsbo, 2018).

The next group of stakeholders to consider are the companies that participated in SCWL during its two phases. There are considerable differences both within and between companies participating in the project's phases. First, the clear majority of the 50 companies who were exposed to the first phase turned out to be non-stakeholders, with neither power, legitimacy nor urgency to act on SCWL. This leaves the twelve companies who actually participated in visits to Singapore and were involved in negotiations with buyers in Singapore. These companies had limited power over the project individually but as a group they were powerful, they had legitimacy in that they are essentially serving as suppliers in SCWL's brokerage efforts, and a sense of urgency in that they were investing heavily in these events (Quercus Group, 2018). Thus, this group of companies can collectively be seen as a definitive stakeholder group, but individually fit into the dependable stakeholder category – with significant urgency and legitimacy but little power. The companies involved in the second phase, on the other hand, were more carefully selected and – due to their lower number – have considerably more power than those of the first phase (Fjældhøj, 2018). However, they retain the legitimacy and urgency of the companies from the first phase, and as such can be considered to fit into the definitive stakeholder category.

This brings the discussion to the "buyers", an eclectic group who fit into significantly different categories. While NTU and Surbana Jurong have already been analyzed as part of the project partner consortium, this still leaves PSA unboXed from the second phase and the trio of city organizations – HDB, SDC and JTC. Of these, PSA unboXed can be considered a dominant stakeholder – moving into the definitive stakeholder category based on how significant they view a potential business opportunity. They are one of three buyers in the second phase and have played an instrumental role in shaping the challenges by which companies are recruited – leaving them with great power over the project's development. At the same time, they have a contractual relationship with the SCWL project and as such have a great deal of legitimacy surrounding interest in the project (SCWL, 2018). HDB, SDC and JTC are quite different. Without clear, contractual relationships – their legitimacy is a good deal shakier than might otherwise be the case. However, they all present important opportunities and relationships for the project and as such can exert considerable power over the project – but have little reason for urgency regarding the project. Thus, these stakeholders fit well into the dormant stakeholder category, having the potential for great impact on the project but little reason nor urgency to do so (Quercus Group, 2018).

This leaves a wide variety of disparate potential stakeholders, ranging from the Singaporean and Danish media – who can be viewed as either dormant or dominant stakeholders given the potential impact of news on the project, or the Singaporean citizenry – a dominant stakeholder given their ability to boycott the solutions brokered by the project and their legitimacy as the final consumer of the solutions provided by SCWL, to other cities searching for solutions – a dominant, dangerous or definitive stakeholder depending on a wide variety of issues centering primarily on whether they are legitimate actors or experiencing urgency for solutions, and various governmental institutions in Denmark and Singapore – who could fit into any four of the legitimate stakeholder categories or even be considered a non-stakeholder depending on what their remits.

THE IMPORTANCE OF SCWL'S STAKEHOLDERS AND ITS RELATIONSHIP WITH THOSE STAKEHOLDERS

Managing SCWL's stakeholder relations is, and has been, a critical function of the project. It is only by drawing in large number of dominant and definitive stakeholders outlined in the section above – as well as ensuring the support or at the very least acquiescence of the other stakeholder types – that the project has any hope of success. Each member of the stakeholder constellation plays a key role in the relatively successful establishment and management of the project's key relationships both internally and externally. This is one of the most important successes of SCWL and has been a major focus for the project since its inception (Rottbøll, 2018).

Understanding the importance of stakeholder relationships – as opposed to the stakeholders in and of themselves – is a key lesson to be drawn from (Freeman et al., 2010). This lesson is at the heart of SCWL and has strongly influenced the development of the project over the course of the project's lifespan. Already in the pre-project phase of SCWL there was a considerable focus on recruiting key actors to ensure the capabilities of the project. It is in the technical expertise and expansive that the reasoning behind securing DTU and Gate21's participation in SCWL becomes clear – without either of these, the project's potential for success would have been severely reduced, this is most critically clear in the vital role of DTU in securing NTU's participation in the project (Dahlstrøm, 2018). The project consortium used an entire year almost exclusively on establishing, strengthening and maintaining the stakeholder relationships that they would use later on – using the prestige and connections of the Danish Embassy to secure access to Singaporean governmental institutions and the privileged position granted to DTU to

gain entry into the Singaporean innovation systems (Vizard, 2018). Gate21, by contrast, was vital in securing Danish participation and in supporting and expanding the Singaporean relationships once they had been established – often relying on technical expertise to demonstrate the project's credentials (Sichelkow, 2018). Throughout this process Quercus Group supported and improved the internal communications networks in the consortium, ensured cultural sensitivity in the Singaporean environment and helped coordinate efforts across all the various parts of the project (Fjældhøj, 2018; Rottbøll, 2018).

This is where the strength of the SCWL project is, and where the greatest amount of resources has been spent – particularly in the pre-project and first phases of the project. Without this groundwork, the second phase would have been next to impossible to establish and when ensuring its smooth conduct moving forward. Over the course of the second phase, the preexisting relationships from the first phase were leveraged while new ones were established with considerable success. With tangible successes in the second phase, only possible through the important relationship-building stage of the first phase, the SCWL project now moves forward with considerable momentum and has finally secured vital local buy-in to the project with the possible result that it could grow ever closer to the sustainable innovation brokerage platform set forth as the ultimate goal of the project (Fjældhøj, 2018).

THE CONTINUOUS DEVELOPMENT PROCESS

The following section examines the way in which SCWL's construction as a transorganizational partnership – built around a managing partner consortium of diverse members – has impacted the development process of SCWL over the course of its lifetime. To properly accomplish this, the following sections set out to first illustrate how SCWL can be classified as a transorganizational partnership, with the attendant consequences of this proof, before examining the patterns that shape SCWL's development through the lens of transorganizational partnership network theory. This is concluded by a clarification of the ties that bind together SCWL as a project and partnership. By illuminating these three facets, this section seeks to understand the continually shifting and changing nature of SCWL as it has made and remade itself in response to the challenges and opportunities it has faced. Understanding this is critical to establishing a proper understanding of why SCWL developed and changed in the way it has over the course of the project's life-time, from pre-project through the first and second phases and looking forward into the future prospects of the project.

SCWL AS A TRANSORGANIZATIONAL PARTNERSHIP

According to (Hofstede, 2003), transorganizational systems consist of multiple partners who come together to form a network, with each participant having its own unique history, culture, and viewpoint. Thus, while a collective of people involved in the same project or platform may have a similar frame of reference for interpreting what "something" is, the multiple parties will still make sense of these components based on their own history and understanding of those components, with a resultant divergence in their interpretations. With that understanding in mind, this section seeks to analyze and identify the SCWL project as a transorganizational partnership – exploring the ways in which the numerous partners of the consortium – as identified in the section on SCWL's organization – come together in this project with a common purpose.

As has already been outlined, the partners in the SCWL are vastly different – coming from different sectors, with incredibly diverse histories, across two very different nations – and as such, the likelihood of these partners coming together in a single major project would ordinarily seem a surprising occurrence. However, once the project and its disparate partners are examined in more detail it slowly becomes clear how these actors were largely able to consolidate around the project – although there were multiple instances in which actors were unable to align their own interests with that of the project, which is a key reason for why the partnership constellation underwent considerable changes in the transition from the first to the second phase. At the heart of the SCWL project, and the thing that ties together all its partners, is its focus on innovation brokerage of smart city solutions. DTU, Gate21 and NTU are all major living lab actors and are deeply involved in both the development and/or distribution of innovative smart city solutions - although these actors are constrained in how far they are willing to involve themselves in commercial projects (Dahlstrøm, 2018) or geographic regions (Sichelkow, 2018). Quercus Group and Surbana Jurong are both private consultancies – though of vastly differing sizes – who are intimately involved in smart city projects across the globe, despite utilizing different approaches in their business dealings (Fjældhøj, 2018; Rottbøll, 2018). Finally, the Danish Embassy is dedicated to improving relations between Singapore and Denmark while supporting the growth of Danish exports to Singapore (Vizard, 2018).

It is in the merging of these interests, as DTU and NTU seek to expand the reach of their partnership and strengthen the spread of innovative solutions, while Quercus Group works towards the creation of a new form of export promotion and the Danish Embassy seeks to expand Danish influence in the Singaporean smart city sector, that SCWL is able to create a common purpose within its partnership group. While Gate21 played a key role in the first phase, it was eventually determined that it didn't fit clearly within this paradigm and it departed the project while Climate-KIC, with its focus on supporting climate innovation, entered the project – proving themselves a considerably better fit (Sichelkow, 2018). At the same time, as the project grows ever closer to expanding beyond the Singaporean market, the Danish Embassy has exerted a shrinking degree of influence over the project (Vizard, 2018). In fact, this development illustrates (Worley & Mirvis, 2013)'s explanation for why alignment in objectives is critical for the continued success of transorganizational partnerships. In the project's synthesis of its partners' capabilities, it has been able to accomplish objectives none of the members of the SCWL consortium could have accomplished alone. At the same time, the departure of Gate21 and introduction of Climate-KIC clearly illustrates the way in which future alliances are based on past experiences. With Gate21 unable to align fully to the project's objectives, the consortium was able to introduce an actor who seemed to better fit with the project's future (Sichelkow, 2018; Vangsbo, 2018).

SCWL is clearly a transorganizational partnership, involving disparate partners who all bring a wide variety of experiences and capabilities to the table which provide a better combined result than any of them could by themselves. It has gone through a complex process of evaluation and reevaluation between and during every stage of the project, in which adaptations and changes have occurred to the project while seeking to maintain the core structures of the original concept. The partner consortium has been involved in a perpetual discussion between its partners and stakeholders, exploring and changing in response to stimuli of all sorts. By the time the second phase neared its end, the project has undergone incredible adaptations – exploiting the long investment in relationship building and concept development to ensure success. Furthermore, the project has reacted to critical developments where they have encountered them, restructuring the partner constellation, adapting the project description and exploring a wide variety of opportunities through the development of complex relationships.

THE PATTERNS RULING SCWL'S DEVELOPMENT

Attractor Patterns	
First Pattern	Spring 2015 – August 2015
Application	August 2015 – September 2015
Limbo	September 2015 – December 2015
Second Pattern	January 2016 – April 2016
Third Pattern	May 2016 – May 2017
Fourth Pattern	June 2017 – December 2017
Fifth Pattern	January 2018 – December 2018

As outlined by (Worley & Mirvis, 2013), transorganizational partnerships lack precise structures and future prospects, making such partnerships extremely heterogenous. They go on to outline how any individual actor's role in a transorganizational partnership evolves alongside the partnership network itself and during this process it shapes and creates new contexts and dynamic patterns which govern how the network functions at any one point in time. Each of these contexts can be described as attractor patters – which have been defined by (Holland, 1998) as the most repeatable patterns of order in dynamic interactions and structures in transorganizational networks, which keep the network relatively stable. It is the identification and analysis of these attractor pattern in SCWL that is the focus of this section.

The first attractor pattern of the SCWL project comes far before the actual start of the project, when Quercus Group works on the (Quercus Group, 2015a) report on behalf of the Danish Embassy in Singapore. This is a relatively stable period of work in which the dominant patterns of work, leadership and resource use all remain stable and certain. However, this attractor pattern came to an end with the delivery of the report in the latter half of 2015 and prompted a period of rapid shifts in which the previous attractor patter was disrupted. The actual initial application phase, lasting a month between the delivery of the report and the project application deadline with Industriens Fond is a period of constant and rapid shifts to this original attractor pattern in which the partner network rapidly expands and contracts as the original pairing search for others to support the partnership (Fjældhøj, 2018). This period of significant change is important due to the critical role it played in the creation of the central premise of the entire SCWL project. As outlined by (Holland, 1998) and (Wheatley, 1999), these periods in which the attractor pattern is exposed to a great deal of turmoil can provide the richest opportunity for creativity and further development of the network where the previously discernible patterns potentially give way to innovation and possible breakthroughs in how to improve the network's mission, vision, strategy, or structure. By

the end of the application phase a new attractor pattern had taken shape and the core of the project's vision and mission had begun to take shape. However, this new attractor pattern was not particularly stable as the amorphous partner constellation was left in a stressful state of limbo, awaiting a response from Industriens Fond.

Once the SCWL project proposal was accepted on a conditional basis, the in-limbo attractor pattern found itself pushed onto more stable footing – undergoing minor shifts but remaining largely stable, in effect entering the second period where a stable attractor pattern is identifiable. This second attractor pattern was characterized by continual development of the mission, strategy and structure of SCWL in an evolutionary fashion while the current project partners sought to secure enough corporate to secure the funding from Industriens Fond (Fjældhøj, 2018). It was in this period that key decisions surrounding the focus on startups and early-stage small enterprises were implemented and can in many ways be viewed as the starting point for many of the weaknesses that characterized subsequent attractor patterns during the first phase of the project. This pattern came to an end in mid-April 2016 when enough enterprises had been recruited for Industriens Fond to release funding for the project. The period of instability to the pattern that followed was likely among the most critical of the entire project, seeing the formal launching of the project, an infusion of funding, the entry of new leadership in the form of Gate21 – the organization which functioned as project lead for the first phase – and much more (Fjældhøj, 2018; Sichelkow, 2018). The turbulence of this shift would eventually settle down after the recruitment of NTU to the project and the establishment of a general direction for the project, inaugurating a third attractor pattern of SCWL.

The third attractor pattern lasted for much of the first year of the project and was characterized primarily by the establishment, improvement and management of relationships with stakeholders in Singapore – but also by efforts at clarifying and improving the project's model and structure. During this period a few minor partners joined the project on the Danish side – but by far the greatest amount of participation came from Singapore. It was here that Surbana Jurong and some thirty other Singaporean actors were contacted, and relationships were initiated (SCWL, 2017a). This pattern was marked by nearly bimonthly visits by the Danish partners to Singapore as a wide variety of market possibilities were examined, ranging from the potential of starting an actual living lab under SCWL auspices to various models of engagement with pre-existing living labs – the second of these approaches eventually winning out

(Quercus Group, 2018). This period saw stable but constant progress as the concept was developed and relationships were explored. However, by the end of this attractor pattern, the financing for the project began to run low – the result of a lack of corporate operationalization budgeting from Industriens Fond – and forward progress slowed considerably (Fjældhøj, 2018) as a period of turmoil hit the attractor pattern and set it off its course.

With financial resources drying up near the middle of 2017, the previous attractor pattern shifted into a new pattern – inaugurating the fourth attractor pattern of SCWL. This pattern was characterized predominately by very limited progress in the operationalization of the participating companies due to a lack of funds to support these efforts. Instead, this pattern saw a comprehensive evaluation of the project's forward progress, identifying the challenges, opportunities and miscellaneous lessons that had been uncovered during the previous patterns. Thus, this pattern can be viewed as one of considerable forward progress on the project's mission, vision, strategy, and structure, as the various partners weighed in on their experiences alongside the participating companies and Singaporean actors to secure full alignment across all four subjects. This period was somewhat tumultuous and allowed for considerable creative disruption of the preset patterns. By the end of this pattern, as the first phase came to an end, the project was on considerably firmer ground than it had been at the start – with an aligned mission, vision, strategy and structure, as opposed to the chaotically freethinking third pattern. However, the end of the fourth pattern was an event of considerable turmoil and change as the entire model shifted according to previous learnings, an entirely new funder entered the picture, the previous leadership of Gate21 came to an end with DTU stepping in to fill this post and much more. However, this remained a refinement of the patterns of the first phase – having moved through an experimental pattern (3rd), an evaluative pattern (4th) and was now entering a pilot phase where the patterns were considerably clearer cut and where there was considerably less deviation from the established pattern.

The fifth attractor pattern marked the start of the second phase of SCWL and in effect could be considered to cover almost the entirety of the yearlong second phase despite several controlled and prearranged shifts to the pattern. These shifts occurred for the first time following the shaping of the second phase's challenges, when active recruitment of companies began. This was followed by a second shift once recruitment was completed and the companies had held their virtual pitches, while a third shift followed

the conclusion of the sole Singaporean workshop in June 2018 – marking the last major event of the phase – as an evaluation of the second phase was begun and work on applying for a third phase of the project came under way (SCWL, 2017b; Fjældhøj, 2018). This pattern saw relatively minimal changes to its mission, vision, strategy or structure during the first two period – with only the third shift seeing changes as lessons were absorbed and preparations for the next phase came under way. A period of turmoil and instability is likely to follow the end of phase two, only stabilizing once/if the third phase comes under way with a new partner consortium and a vastly expanded structure (Vangsbo, 2018).

SCWL is a project which has experienced considerable shifts and changes over the course of its lifetime, going through both tumultuous periods in which there is no stable attractor patter – as can be seen after the first and fifth pattern as well as during the second and fourth patterns – but also periods of considerable stability in the first and fifth patterns. However, it is in the periods of uncertainty and when the project is less defined – as seen in the second and third attractor patterns – that the project was at its most innovative. In many ways, the ideas prevalent in (Holland, 1998; Wheatley, 1999) surrounding the connection between significant and tumult in the attractor pattern creating the most significant opportunities for creativity and development of the project seem to hold true for SCWL.

CLARIFYING THE TIES THAT BIND SCWL TOGETHER

This section of the analysis will focus on understanding the network ties that bind together SCWL on the basis of (Borgatti, Brass, & Halgin, 2014)'s framework differentiating between state-type ties – including similarities and social relations between stakeholders - and event-type ties – relating to interactions and information flows. This is important to understand in the context of SCWL due to the critical and central role of relationships between stakeholders in the project – as has been previously outlined. By establishing clarity surrounding the way in which SCWL is bound together this section seeks to explain in what ways the project has been able to create cohesion internally and externally among its stakeholders.

There are several state-type ties that bind together some partners and a few that tie together all of them. The one tie that bind them all together is their interest in smart city technology and innovations, although this is a more important tie for some than for others. For example, the Danish Embassy's primary goal in partnering in the project was to support the export of Danish solutions to Singapore – with the specific

sector a lesser concern (Vizard, 2018), while DTU's focus has primarily been in developing and spreading technology – with the smart city aspect a lesser matter (Dahlstrøm, 2018). Another state-type tie that binds together most of the partners is that the vast majority of the partners are Danish and are located within a short distance of each other – with the obvious exception of Surbana Jurong and NTU, who are Singaporean and located in Singapore, and the Danish Embassy which, while Danish, is located in Singapore and as such shares a geographic state-type tie with the Singaporean partners. There are relatively few social relations between most of the partner representatives, beyond working in similar sectors and a few of the partners having separate projects in common. However, there are also vast differences between many of the partners – this is one of the hallmarks of the project. SCWL brings together vastly different stakeholders from across public, private and research sectors to create synergies and cross-pollination when trying to enter the Singaporean market (Sichelkow, 2018).

When examining SCWL's event-type ties there are once again several different examples that can be identified. There have been many trips back and forth between Denmark and Singapore for the partners in the project, so this has served as a major form of interaction both between partners and with external stakeholders. However, despite nearly bi-monthly trips back and forth, particularly during the third attractor pattern outlined previously, most interactions between partners have been in the form of electronic communications – e-mails, phone calls and the like – and in the form of meetings of the project's steering committee which met regularly throughout the first and second phases of SCWL. This leads us to the second type of event-type ties, namely flows. These include the transfers of financial resources from the funder, in the form of Industriens Fond and Climate-KIC, to the partner constellation and from them to the end recipient. At the same time there were countless transfers of information, both internally in the project consortium, but also to external stakeholders such as the participating companies – exemplified in the training given to them in the second phase – as well as to the funders to inform them of project progression and various media sources to spread word of SCWL. These types of ties are important to understand, because they highlight the way in which SCWL functioned as a network of exchanges, with information, money and services moving back and forth between various members in pursuit of a common goal (Fjældhøj, 2018; Quercus Group, 2018).

These two types of ties perform critical functions within SCWL as a way for the project network to create and maintain a feedback loop, through which information, experience and other forms of intellectual resources can be exchanged in an easier manner. While event-type ties fulfill critical functions such as moving resources around the project and ensuring that not only is everyone on the same page but has access to the resources they need to accomplish their tasks, it is in the state-type ties that SCWL really places the majority of its efforts (Borgatti, Brass, & Halgin, 2014). By drawing on disparate actors from vastly different sectors and with varying interests in the same field, the project has succeeded in meshing together a diverse combination of capabilities to form a separate series of synergies. Without the technical capabilities of an organization like DTU, Climate-KIC or Gate21 to engage the technical experts in Singapore, neither Quercus Group nor the Danish Embassy would have stood much chance of pulling off a project like this. However, without Quercus Group the technical experts would have been liable to flounder in the face of the complex interrelation aspects of the project and would have been unable to secure the sort of access provided by ambassadorial participation in the project (Sichelkow, 2018). In the end, it is on the back of these ties that SCWL has succeeded.

DISCUSSION

This section of the thesis will seek to draw together the various threads of analysis to provide a synthesis answering the thesis research question: *What has been the underlying reasoning behind SCWL's numerous adaptations from its conception and initial implementation through the subsequent phases of the project?* This is followed by a concluding statement summarizing the findings of the thesis before entering a discussion on the potential implications of the research conducted on SCWL practically and the role this thesis might play in the wider realm of academic literature.

THE REASONING BEHIND SCWL'S ADAPTATIONS

Throughout its lifetime, the SCWL project has undergone dozens of shifts and changes as challenges and opportunities presented themselves. As has been outlined previously in the thesis, these developments have happened across several different aspects of SCWL, ranging from changes to the project's purpose – and how that purpose is accomplished, through the organizational complexities and developments of SCWL and the changing processes as the project moved from one attractor pattern to the next. However,

while these sections of analysis have outlined the ways in which SCWL has adapted to its circumstances, understanding the underlying reasoning of these developments remains unresolved. That is the purpose of this section.

There are several important points at which major adaptations occur within SCWL which should help to clarify why precisely SCWL has changed to such a considerable extent over the course of its lifetime. The most important factor to understanding the first phase of SCWL seems to be that it was, from beginning to end, a major learning experience. Many different approaches were attempted, there remained a lack of clarity about the scope, mission and vision of the project and it was during this period that the greatest number of challenges were encountered by the project consortium. Viewing this phase as a learning experience seems to be a recurring feature among the partner consortium (Dahlstrøm, 2018; Fjældhøj, 2018; Rottbøll, 2018; Sichelkow, 2018; Quercus Group, 2018), and it has come to be treated as such during the second phase.

During this first phase, the project encountered problems on numerous occasions. From Industriens Fond's decision to withhold funding until sufficient companies could be recruited, a factor that was probably had considerable influence on the relatively low success rate of the operationalization efforts of the first phase, and disagreements over whether SCWL should operate living labs itself, an effort that took up time and resources during the first phase to the detriment of other efforts, to a lack of local resources to maintain the Singaporean relationships and secure local funding, resulting in considerable investments in time and financial resources for near bi-monthly trips between Denmark and Singapore as well as the project running short on money months before its pre-planned conclusion, and a lack of budgeting to support operationalization efforts when that became a component of the first phase. Thus, the adaptations in this first phase seem to come down to two primary reasons, 1) a lack of sufficient funding for anything beyond the basics of relationship building and model development and 2) a lack of clarity and specificity about how the project would proceed in the first phase including major issues such as whether to be a broker between living labs or owner of living labs – which is emblematic of the general lack of alignment between a number of partners in the first partner constellation.

This leads into one of the most important periods in the entire project's development, namely the transition from the first phase to the second, lasting for the last several months of the first phase – as the

project's evaluation was undertaken and the business model was developed to a degree of suitable specificity. By the end of this process, the project had a comprehensive outline for a proper pilot phase in which the project could demonstrate its capabilities to its Singaporean partners, stakeholders and other interested parties. This period is where the reasoning behind SCWL's adaptations are clearest, having been explored and identified in the evaluation of the first phase. Key learnings such as the importance of DTU as endorser, the insufficient amount of funds and time, the considerable potential of innovation brokerage and the importance of better curation and preparation of participating companies were all identified in this period as points of importance. The change to a challenge approach, based on Singaporean preferences for greater specificity in the solutions provided, as well as the inclusion of Climate-KIC to the project – portending SCWL's expansion to cover all Nordic countries – were also secured in this period. Furthermore, this period also saw reshuffling of the partner constellation, in a bid to secure better alignment and a new source of funding (Quercus Group, 2018). Thus, the clearest reasons for changes in this period can be tied to a need to adapt to the loss of funding and the departure of key figures in the project consortium. This necessitated a new source of financing, which in turn required adapting to the demands of that new funder. This period was marked by considerable pressure and uncertainty, and to some degree the clarity of the model that came out of this period is a result of the consortium's efforts to secure tangible results for the continuation and expansion of the project past the second phase.

Because of the considerable developments of the transition period, SCWL saw very few adaptations in the second phase. Beyond the challenge of crafting the detailed challenges, the second phase largely went according to plan from beginning to end, with a relatively quick recruiting period for relevant companies, a successful round of virtual pitches that allowed for greater curation of the companies and an extended period of training and preparation prior to the project's major event – a workshop in Singapore at which the majority of the work required to secure Singaporean contracts for the challenge participants was conducted (Fjældhøj, 2018; SCWL, 2017b). The successes of this phase may well have secured the future of the project, as it moves into its next phases – having ensured Singaporean buy-in to the project and with the prospect of inviting more partners to the project moving forward.

Thus, the answer to the thesis research question can be boiled down to a couple of factors that explain why SCWL has changed so much over the course of its lifetime, as has been outlined above. However, all these factors can be consolidated into a single reasoning. This sole reason is that the SCWL approach of using innovation brokerage through living labs is, to the author's and project participants' knowledge, a unique methodology. Because it is an innovative and unique form of innovation brokerage, the learning process has been considerable, and the project experienced a great deal of uncertainty over what its final model would look like. This has meant that there were many unknowns going into the project, and as these unknowns became known the project was forced to figure out how to interpret and react to this new knowledge. This lack of knowledge when the project was initiated also meant that the project consortium had little understanding of the challenges facing them and resources they would need to operationalize their model – resulting in an insufficiency of funding. By the end of the first phase, the project consortium had secured an idea of what it would take to secure success and had crafted a model well suited to the Singaporean context. The second phase was thus not so much a learning experience, as an effort to prove that the lessons of the first phase had been learned and that the resultant model could function as a successful innovation brokerage model.

CONCLUSION

This thesis has sought to understand the way in which large transorganizational partnerships, such as SCWL, change and adapt to challenges and opportunities when they are presented to them. Using three separate aspects of the project and examining the ways in which they have developed over the course of the project life-time, this thesis illuminates the complexity and interrelation involved in such projects. By examining the way in which projects of such complexity are bound together by complex relations between stakeholders, and the vital importance of securing proper alignment between stakeholders, the thesis examines the interactive and cooperative nature of independent organizations when they join in projects like SCWL.

This thesis has established an understanding of the relationships between its actors and stakeholders, the way in which so much of its efforts were spent on clarifying its model, objective, strategy and much more to learn lessons that could ease operationalization efforts later in the project's processes. There is a constant iterative element to the project as it moves through the first phase, testing one approach after

another while constantly strengthening its relationships, until a strong model could be developed and tested during the second phase. This shift from a learning process to a testing process is critical to understanding the project life-cycle of SCWL and the way in which the interactions both within the project consortium and with external actors have influenced both efforts to a considerable degree.

Securing a better understanding of these sorts of relations would be a good starting point for further research, as an examination of individual interactions and relationships could further strengthen the academic understanding of these sorts of complex and multifaceted relationships. Of interest in this realm would be examining the implementation of a third phase of SCWL, as the project expands to other geographies and socio-cultural contexts and must adapt to new innovation and export systems. The challenges of moving beyond a Dano-Singaporean living lab partnership, with inclusion of other localities, will be a major stress test of the project. As they move into new localities, every relationship will have to be forged anew and every model adapted. The challenges of understanding and adapting to these changes will prove critical to the long-term success of the SCWL project.

IMPLICATIONS OF RESEARCH

PRACTICAL IMPLICATIONS

When considering the practical implications of the research done during the thesis, there are several considerations that have come to light. First, the importance of the first phase of SCWL cannot be overstated – it is based on this phase that the project has secured any of the success it has enjoyed. If not for the considerable learning experiences of that period, it is extremely unlikely that SCWL would have been able to create such a cohesive model for the second phase and secure such significant Singaporean involvement in the project. Even in its failures and weaknesses, the first phase illuminated the critical importance of sufficient funding, the vital role of relationship building, the significance of properly curating participating companies and much more. With these lessons in mind, it was possible to create a successful pilot phase, where the strength of the approach and model could be tested properly and where the ground work for expansion into other markets was conducted.

A second key implication from the research is that, while the broad outlines of SCWL can probably be transferred to other markets, there is a high degree of individuality to the specific markets that must be

understood beforehand. This was clearest in a key misunderstanding by the project consortium that Singaporean stakeholders would be willing to take a risk on untested technologies as first-movers, rectified when an understanding of the market as being primarily early-adopter in nature rather than first-mover had been established. This understanding of the market led to the development of an extremely detailed challenge approach to innovation brokerage at the suggestion of the Singaporean actors – which has proven to work very well for the Singaporean market. However, if SCWL were to go into another market the degree of specificity may vary considerably depending on local approaches to innovation and risk-taking. The challenge approach itself – with its focus on demand-led solutions brokerage – can likely be transferred to other markets but will almost certainly need to be adapted to local circumstances and preferences.

When it comes to generalizable lessons based on SCWL, there are some implications that have proven of interest. While the living lab approach to innovation brokerage is a unique approach, there are several more common aspects to the project where lessons can be generalized to other export and innovation brokerage approaches. An example of this would seem to be the universality of understanding local preferences and cultural quirks that can determine whether an export effort will be met positively or negatively. Similarly, the project illustrates both the complexities and benefits of approaching efforts such as this in a consortium, with numerous different partners from a wide range of sectors. The synergies of this sort of cooperative partnership have become increasingly clear – however, the difficulties of aligning interests, ensuring buy-in from all partners and building a common model are also key lessons to be drawn from the project's efforts.

When one considers the potential of similar projects, it bears mentioning that most of the partners involved in SCWL have already used the knowledge and experience developed during the project's phases to involve themselves in other projects of this sort. While the specifics change from one project to another, it is clear that SCWL has had a considerable impact on the partners involved in it. Many of these projects mirror the specific foci of the individual partners, so while DTU is involved in a number of innovation brokerage and training projects (Dahlstrøm, 2018), the Danish Embassy in Singapore is involved in supporting an export network to Singapore (Vizard, 2018), Climate-KIC is involved in a large number of international innovation promotion projects (Vangsbo, 2018; Sichelkow, 2018) and

Quercus Group is involved in both international Living Lab projects and with other export promotion models (Fjældhøj, 2018; Rottbøll, 2018). While the specific model of innovation brokerage through a detailed challenge approach utilizing living lab infrastructures likely wouldn't work in its entirety outside of the Dano-Singaporean context, each individual part of the model and any single combination of the various sections of the model are likely to be generalizable to other international export promotion and innovation brokerage projects.

ACADEMIC IMPLICATIONS

There are a number of academic implications to this thesis which could be explored in greater detail at some point in the future. The theoretical framework used for this thesis has been rather eclectic in nature, drawing on diverse literatures in an effort to provide a fuller picture of the SCWL project and its development. Within the realm of internationalization literature, this thesis relied almost exclusively on the export innovation literature in order to illustrate the phases through which SCWL had to bring their participating companies to get them to Singapore. However, this set of theories is used differently from their usual usage in that the theory is externalized and focuses on how an internationalized body might push the internationalization of another entity – SCWL and the participating companies respectively – rather than the theory's usual usage to explain the internationalization efforts of the case itself. That said, when dealing with the International Knowledge Transfer literature, this thesis does little more than demonstrate the application of that theory in the context of SCWL – grounding it in a real-world scenario.

The next literature to come into use in this thesis focuses on stakeholder mapping and typology and was drawn heavily from (Mitchell, Agle, & Wood, 1997) where a detailed typology of stakeholders has been detailed. The use of this theory had interesting implications, specifically the way in which each of the types outlined in the theory have considerable differences within each type. Despite multiple stakeholders belonging in the same category, their positioning within those categories were very different and had considerable implications for how they fit into the context of the project. The clearest example of this came with the classification of Gate21 as a Definitive Stakeholder, but one with less legitimacy than the others. This helped to illuminate part of why Gate21 eventually departed the project and raises the possibility of viewing the stakeholder typology over time – as stakeholders move between categories,

some non-stakeholders rising to stakeholder status, as happened with Climate-KIC, or stakeholders moving out of stakeholder status, as eventually happened with Gate21.

For the purposes of the process section, this thesis relied heavily on (Worley & Mirvis, 2013) and (Borgatti, Brass, & Halgin, 2014) for the transorganizational partnership networks outlined therein, as well as the extended transorganizational network literature. However, while both of those articles are theoretical in nature, seeking to explain how precisely such a partnership network functions in theory, this thesis sought to demonstrate the ways in which SCWL matched that description and used the concepts laid out in the literature, specifically attractor patterns and state/event-type ties, to better explain and understand the processes which SCWL has gone through. This thesis thus demonstrates these models in a real-world case example, illustrating the way in which the literature can be used from a case study perspective.

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