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## **Systemic instruments for regional intervention in practice**

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### **Abstract**

Systemic instruments (SIs) focus on identifying obstacles to building innovative systems and finding solutions to these problems. However, the actual use of SIs has not been specifically addressed. This paper seeks to extend SI research by exploring the ways in which these instruments operate in practice. The context is public intervention in the maritime capital region of Norway, chosen because of its paradoxically strong economy, combined with low venture output. Problem-solution tasks construct a framework in which to explore the operational level through an empirical narrative of a facilitated inventor-investor matchmaking process. This combined approach reveals that the interplay between micro practices of facilitation and macro factors of path dependency are critical to systemic goal achievement. The paper concludes by outlining implications for SI by cutting across micro and macro levels to understand systemic effects and their reciprocal role in the success or failure of innovative policy design and practice.

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Systemic instruments (SIs) focus on identifying obstacles to building innovative systems and finding solutions to these problems. However, the actual use of SIs has not been specifically addressed. This paper seeks to extend SI research by exploring the ways in which these instruments operate in practice. The context is public intervention in the maritime capital region of Norway, chosen because of its paradoxically strong economy, combined with low venture output. Problem-solution tasks construct a framework in which to explore the operational level through an empirical narrative of a facilitated inventor-investor matchmaking process. This combined approach reveals that the interplay between micro practices of facilitation and macro factors of path dependency are critical to systemic goal achievement. The paper concludes by outlining implications for SI by cutting across micro and macro levels to understand systemic effects and their reciprocal role in the success or failure of innovative policy design and practice.

**Keywords:** Systemic policy instruments; regional intervention in practice; public intermediary; facilitation; matchmaking; inventor; investor; maritime industry; Norway; narrative method.

## **Introduction**

Innovation is increasingly seen as a systemic activity (e.g. Borrás and Edquist, 2013; Wieczorek and Hekkert, 2012; Smits and Kuhlmann, 2004). Accordingly, innovation, which is defined as new creations of economic and societal significance (Borrás and Edquist, 2013), is not an activity performed in isolation, but one which involves a variety of actors within the system including entrepreneurs, venture capitalists, and policy intermediaries (Smits and Kuhlmann, 2004). In this respect, systemic policy instruments are seen as means that can be used to stimulate and bring about looked-for collective change and innovation. These instruments represent a sub-category of innovation policy, which comprises all actions undertaken by public organisations that influence innovation processes (Borrás and Edquist, 2013). They are referred to as systemic instruments (SIs) because they are expected to improve the functioning of entire innovation systems (Wieczorek and Hekkert, 2012).

The literature on SIs has so far focused on management functions and characteristics (Smits and Kuhlmann, 2004), forward-looking policy design (Ahlqvist et al., 2012), evaluation in terms of a social learning perspective (van Mierlo et al., 2010), structural and functional design to identify problems and suggest solutions (Wieczorek and Hekkert, 2012), as well as the choices behind such instruments (Borrás and Edquist, 2013). However, understanding SIs is not only about function, design, and decision, but also about their use and how they operate in practice - an important but neglected area of SI research. Hence, this paper seeks to contribute to the SI literature by switching from the existing focus on problem identification and solution-finding to analysing how these policy instruments operate in practice.

SIs can be investigated at various levels such as national, regional and sectorial levels. The focus of this study is on the use of an SI for intervention in the Norwegian context of the capital region of Oslo. Norway represents an interesting phenomenon due to its paradoxically strong economy, combined with a seemingly low innovative output, particularly with regard to entrepreneurial activity (Grønning et al., 2008). Venture funding is relatively scarce in Norway and little is known about how such funds operate. In this context, an analysis of the inventor-investor matchmaking process in the Norwegian maritime industry seems of particular interest due to its strong domestic and international position. The maritime industry, headquartered in Oslo, was facilitated by a public intermediary called the Oslo Maritime Network (OMN). The empirical study includes the voices of various actors who are increasingly dependent on each other as they drive towards a common goal. It is therefore based on narrative methodology

(Riessman, 2008), an appropriate approach to gain a holistic view of the main and connected events that actually contributed to successful matchmaking in the industry. The next section provides an overview of the existing SI research literature. Following this, the two core tasks of SI – identifying problems and solutions – are applied to the Norwegian context and its capital region to identify relevant mechanisms and challenges at a systemic level. Together, these provide the theoretical and contextual framework for exploring how a SI works at the empirical operational level. The paper then discusses narrative methodology before presenting the empirical findings. Finally, the results are discussed and the future implications for SI research are outlined.

### **Literature overview**

The concept of SIs, coined by Smits and Kuhlmann (2004), emerged from the idea that conventionally-financed research and development (R&D) instruments are not appropriate for the management of innovation processes today with their inherent uncertainty and need for experimentation and learning. In reaction to neoclassical linear assumptions for optimising performance, SIs are based on co-evolution and innovation system thinking, that is a set of distinct but interconnected institutions ‘which jointly and individually contributes to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process’ (Metcalf, 1995). Innovation is a complex and risky process, a policy domain which by definition includes some expectation of failure. It is, therefore, ‘*contradictory to the high level of uncertainty to require high effectiveness*’ (Smits and Kuhlmann, 2004: p. 8 italics in original). This means that innovative performance depends heavily on the quality of the system and its subsystems (e.g. users, intermediaries, venture capital and a supportive infrastructure) and on the mutual tuning of these subsystems. Typically, more and more heterogeneous actors are involved, often operating at very different levels and in different arenas as innovation has increasingly become a network activity. With a primary goal to facilitate change at the system level, this demands instruments that are embedded in broader socio-economic contexts to improve the opportunities for tuning and joint action. This is carried out through network steering by system builders and organisers who are able to deal with and stimulate various complex innovation actors and activities (Smits and Kuhlmann, 2004). As a result, SIs must meet the following five functions: (1) management of interfaces across subsystems to stimulate broader debate; (2)

(de)constructing and organising (sub)systems to engage relevant actors; (3) providing conditions for various forms of learning by doing/using/interacting and experimenting; (4) providing an infrastructure for strategic intelligence by improving access, connecting sources, and producing information tailored to actors' needs; and (5) stimulating the demand articulation, strategy and vision development that support discourse and searching for possible applications (Smits and Kuhlmann, 2004). Their examples of SIs include short descriptions of the history, mission and function of an established intermediary, a research programme, a cluster and a foresight process. Notably, Smits and Kuhlmann (2004) do not address how these instruments are carried out in practice other than by calling for in-depth studies into the use of SIs as they attempt to perform and carry out functions in particular situations and contexts.

In another important article on SIs, Wieczorek and Hekkert (2012) define such instruments as an integrated, coherent set of tools designed for a specific innovation system (or part of a system) that can stimulate and bring about desired goals. Their purpose is to create opportunities and conditions for system formation by influencing elements and connections within the system that would not otherwise emerge spontaneously. They develop the systemic evolutionary view further by focusing on design and by adding structural dimensions to the functional elements. They criticise Smits and Kuhlmann (2004) for not paying attention to the systemic failures identified in the literature on systemic problems. To rectify this failure, Wieczorek and Hekkert (2012) combine the structure and functions of innovation systems, systemic problems and systemic instruments into a systemic policy framework for technological innovation. The following functional elements are highlighted: entrepreneurial activities, knowledge development, knowledge diffusion, search guidance, market formation, resource mobilisation and the creation of legitimacy. As structural dimensions, these elements emphasise actors (individuals, organisations and networks) based on their role in the economic activity at the following levels: civil society, government, non-governmental organisations (NGOs), companies (start-ups, SMEs, large firms, multinationals), knowledge institutes (universities, technology institutes, research centres, schools) and other parties (intermediaries, legal organisations, financial organisations, knowledge brokers, consultants). Building on Klein-Woolthuis et al. (2005), they define systemic problems as factors that negatively influence the direction and speed of innovation processes and that hinder the development and functioning of innovation systems due to weaknesses related to actors, institutional set-up, interactions or infrastructural problems. Examples include explanatory problems (why entrepreneurial activities do not take place) or policy issues (how to alter entrepreneurial activities). Whereas

Smits and Kuhlmann (2004) provide descriptive functions of SIs, Wieczorek and Hekkert (2012) offer prescriptive goals for policy design. They identify eight types of systemic goal or problem that SIs should focus on, either individually or in combination: (1) stimulating and organising the participation of the actors; (2) creating space for the actors' capabilities to develop; (3) stimulating interactions between actors; (4) preventing ties becoming either too weak or too strong; (5) securing the presence of (hard and soft) institutions; (6) preventing the emergence of too weak or stringent institutions; (7) stimulating the physical, financial and knowledge infrastructure; and (8) ensuring adequate infrastructure quality. This framework serves two central purposes: to identify systemic problems and to suggest which SIs should address these problems.

In another core article, Borrás and Edquist (2013) emphasise that innovation policy instruments, defined as 'a set of techniques by which governmental authorities wield their power in attempting to ensure support and effect (or prevent) social change' (p. 1515), must be designed and combined into a 'policy mix'. They criticise Smits and Kuhlmann's (2004) view of SIs as co-existing with other (linear mode) policy instruments. For Borrás and Edquist (2013), what makes instruments systemic is the way they are combined and customised into mixes that are intended to address the concrete problems that can be identified in a system. A policy problem has, for example, a low innovation intensity or a low propensity to innovate for a certain category (product, process, etc.). Regulatory instruments, economic and financial instruments and soft instruments are widely used as problem solvers, where the government role is to act as a coordinator/catalyst rather than as provider/regulator. These instruments are typically chosen based on information from innovation indicators, foresight exercises or independent expert assessment. According to Borrás and Edquist (2013), instruments relate closely to different system activities including: provision of knowledge inputs (e.g. R&D, education and training); demand-side activities (e.g. public procurement where a public agency places an order for a product/system that does not yet exist); provision of constituents (e.g. organisational change and networking); and support activities (e.g. incubation for start-ups). Strictly speaking, each policy instrument used by a government or public agency is unique, designed and implemented for a specific problem in a political-ideological context. However, their uniqueness does not impede their classification according to the logic behind public action. It simply means that any one-size-fits-all attempt is irrelevant. Also Borrás and Edquist 2013 leave practice and policy implementation for further research, but emphasise that the way in which instruments are put into practice is as important as their design.

In another study, Ahlqvist et al. (2012) addresses SIs in terms of the road-mapping of forward-looking policy design. They conclude by recommending road-mapping as a methodological tool to enhance foresight as a SI. Another article with a specific focus on SIs (van Mierlo et al., 2010) provides an evaluation of a SI based on a framework of learning processes as mechanisms to bring about systemic innovation. They argue that SIs are needed to fulfil systemic functions that have a strong affinity with learning, i.e. a collective endeavour to enhance dialogue, vision building, strategic intelligence, demand articulation, and experimentation. They evaluate two intervention programmes by combining the innovation systems approach with a social learning perspective (Argyris and Schön, 1996). The scope is to build up new networks, enhance learning and stimulate a new knowledge infrastructure for soft system innovation. van Mierlo et al. (2010) describe differences in SIs depending on whether or not conditions are available for single and double-loop learning. They conclude that learning can enhance systemic innovation by combating system imperfections.

A summary of emerging themes from the SI literature is provided in Table 1, showing that a more detailed focus on the operation of SIs in practice has not yet been investigated, only called for by SI authors. This is the particular area of empirical research addressed in this study. But first, as the SI literature unanimously emphasises the importance of a situated context, the paper addresses the context for the empirical investigation. This identifies the systemic problems and solutions for policy and innovation in Norway, followed by a detailed discussion of the solution in the specific maritime context of the Oslo capital region.

Table 1. Task and focus within SI literature

<b>Task</b>	<b>Focus</b>	<b>References</b>
1. Identifying systemic problems and its context (where and when)	Problem	Smits and Kuhlmann, 2004; Wieczorek and Hekkert, 2012; Borrás and Edquist, 2013
2. Suggesting and creating a systemic instrument to address the obstacle (why and how)	Solution	Smits and Kuhlmann, 2004; Ahlqvist et al., 2012; Wieczorek and Hekkert, 2012; Borrás and Edquist, 2013
3. Assessing whether the instrument is achieving goals and intentions	Evaluation (of learning processes)	van Mierlo et al., 2010
<b>4. Investigating a systemic instrument in practice</b>	<b>Operation</b>	<b>This paper</b>

## **Policy and innovation in Norway**

Norway's economy is of interest as a result of its peculiar combination of low innovation with high economic performance. The first core task of SI theory, leads to the question what is problematic in Norway?

### *The problem*

According to Grønning et al. (2008: p. 281), the Norwegian economy is 'one of the major puzzles within studies of economic growth and welfare. The country ranks high on indicators for economic output and standard of living, but low on innovation output indicators'. Because innovation is commonly seen as a major factor explaining the economic performance of industrialised economies, it is difficult to explain how a country with a comparatively low level of investment in innovative activities (particularly R&D) still maintains a very strong economy with high productivity and income (even when excluding the rents from oil and gas). A commonly held explanation holds that the statistical measures of innovation-related activities are poor substitutes to capture the particularities of the Norwegian economy (Fagerberg et al., 2009; Grønning et al., 2008). Norway specialises in the low-tech industrial range (e.g. sectors based on natural resources), and has little activity in high-tech sectors except for some niche industries (e.g. biotech).

Therefore, it is argued that its strong economic performance reflects a strong historical path dependency dominated by resource-based natural innovations and system flexibility and adaptability (Fagerberg et al., 2009). First, industries based on natural resources such as timber, fish, shipping and, since the 1970s, oil and gas are crucial to the economy. This contrasts other Nordic economies (e.g. Sweden and Finland) where natural resources have decreased in impact. For example, Norway has the fifth largest merchant fleet in the world and its maritime industry is built on expertise developed over centuries as a shipping nation. Norwegian firms are at the forefront globally when it comes to shipping segments and specialised maritime services such as car transport, petroleum and chemical tankers, equipment supply and management support, classification, certification and risk management, maritime insurance, ship broking, ship financing, maritime law, research and education provision, and an array of other related industries such as offshore oil and gas production. The development of new knowledge-intensive industries that are less closely linked to natural resources has been much less successful despite considerable support from public policy (Fagerberg et al., 2009). On the other

hand, Norway's resource-based sectors (both large- and small-scale examples) have displayed considerable dynamism in developing knowledge and adapting to new challenges (Fagerberg et al., 2009). Secondly the most important factor in Norway's innovative performance has been the ability of Norwegian firms, entrepreneurs and public sector actors to recognise opportunities, mobilise resources, adapt existing capabilities and develop new ones, and to develop appropriate institutions and policies. These activities have been carried out collaboratively by developing a large number of appropriate support services such as incubators for start-ups, public financing and consulting (Fagerberg et al., 2009).

With regard to new businesses, Norway performs relatively well relative to its population (Grønning et al., 2008) with higher start-up rates than in Sweden, Finland, Denmark and the Netherlands (Eurostat, 2007). However, recent documentation suggests that entrepreneurial activity is relatively low and decreasing. Measured against the Global Entrepreneurship Monitor (GEM), Norway comes ninth out of the twenty-four innovation-driven countries in terms of early-phase entrepreneurship, yet, this is the highest score among the Nordic countries (Alsos et al., 2012). Nevertheless, GEM (2012) shows a continuing decline with 2012 at the lowest level since 2007. This downward tendency seems to have bottomed out in 2013. In contrast, when viewing innovation more broadly (as product, process, organisational and market innovation), a considerably larger part of business has introduced innovations during the last three years compared with the results portrayed in previous studies (Wilhelmsen, 2014). GEM (2012) also shows a decrease in the number of business angels. Grønning et al. (2008) emphasise that there is no real lack of capital in the Norwegian market. Still, VC in Norway appears risk averse, with investment well below the European average in terms of seed capital. Investment is mostly made through public funds with a few large private investors. Borch et al. (2002) show that over 60 percent of the entrepreneurs involved in creating technology-based companies saw obtaining finance as their greatest challenge. Although there is a growing number of professional VCs as well as a regional system providing advice and grants to entrepreneurs, lack of communication between investors and entrepreneurs is a common problem. VC and seed funding are concentrated around the expansion phase of new business developments. There is limited availability of risk capital, particularly to larger projects in urban areas (Grønning et al., 2008). As a result, the number of new high growth firms is small. Compared with other countries, little has been done in the area of competitive incentives to encourage investment or to facilitate the early-phase development of new firms (Grønning et al., 2008). In response, the OECD (2014) suggests that Norway should do more to promote

entrepreneurship, which offers a means of boosting productivity and supporting growth as petroleum production declines. To sum up, Norway is not particularly innovative compared with other industrialised or innovation-driven countries especially with regard to new venture start-ups. As a result, the government has launched initiatives to improve the situation.

### *The solution*

In order to put innovation firmly on the agenda, the Norwegian government presented their first white paper on innovation in December 2008, *An innovative and sustainable Norway* (St.meld. nr. 7, 2008-2009). The aim articulated is that Norway should become one of the leading innovative, dynamic and knowledge-based economies in the world within the areas where the country has comparative advantages. Energy, environmental technology, tourism, marine and the maritime sector were highlighted as strategic priority areas to enhance innovative ability and competitive power. Efficient collaboration between business, research institutions and public authorities is essential for innovation and competition. The most important policy instruments for innovation and the development of enterprises and industry comprise: Innovation Norway, SIVA (the Norwegian Industrial Development Corporation for regional and local industrial clusters) and the Research Council of Norway. Of particular importance is the need to further strengthen regional innovation ability and the interplay between big cities as the main engines of innovation and their surroundings. Based on the view that cities can function as catalysts in national and regional development (e.g. Hall, 2001; Sassen, 2001), the Big City Project was launched in six Norwegian cities. This policy represented something new: policy instruments were to be designed to free up bottlenecks and open up possibilities for increased innovation and to propose pilot and demonstration projects. In Oslo, the Capital City Project was set up. It is interesting to pursue this project because Oslo is one of the fastest growing capital cities in the world, with a GDP about €73,00 per capita, an unemployment rate of 3.3 percent and employs nearly a fifth of the country's total population of 5.1 million (Statistics Norway, 2014).

### **Innovation policy and operation in the Oslo capital region**

The Capital City Project (2004-2009) was based on the national policy report for innovation and growth, *From Idea to Value* (2003). Five business areas were chosen for the project. These

already had or were seen to have the potential to develop peak competitive competence internationally. The areas also had substantial knowledge available and critical mass. The five areas were to be stimulated and developed through the establishment of cluster organisations, based on the argument that added value can be realised by connecting actors within the same business area in a region. A common definition of a business cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (Porter, 1998). The five clusters chosen were: Oslo Maritime Cluster, Oslo Renewable Energy and Environmental Cluster, The Life Science Cluster (including Oslo Bio and MareLife – a bio-marine innovation network), Oslo ICT Network and Oslo Culture Network. The project was organised as a mutual project by the Oslo municipality and the adjacent Akershus county, the cooperative alliance OsloRegion, and Innovation Norway. The policy instrument chosen to carry out the initiative was Oslo Teknopol, a regional intermediary (Howells, 2006) industry partnership owned by Oslo municipality and Askershus county. The agency was led by a Chief Executive Office where each cluster had its own secretariat and coordinator heading the operation of the cluster development on a daily basis. In literature such a primary actor is often referred to as an orchestrator (Dhanaraj and Parkhe, 2006; Gausdal and Nilsen, 2011) or broker (Winch and Courtney, 2007; Batterink et al., 2010) who is engaged in the design and management of the cluster as a set of deliberate actions are undertaken to create value with and extract value from network collaboration.

The project was evaluated by Oxford Research (2010). They reported that although the project had contributed positively to business policy in the region, the overall conclusion was that the project had not attained its goals and ambitions. First, the project was characterised by a top-down perspective which lacked anchorage and downward engagement in terms of real commitment, contribution and value creation for and among its participants and users. Secondly, without a systematic or common work model across the clusters, decisions and activities were made on an individual and ad hoc basis. Taken together, this did not provide the common platform and momentum needed to achieve results beyond connecting to other already existing activities in the business area and take on a role in such underlying networks. This verdict applied to all the clusters with the exception of the OMN, which has 'achieved much in [a] short time' (pp. 11), is 'the only one that stands out in a positive way after being measured on most dimensions' (pp. 8) and is the only one which has successfully achieved the goal of 'establishing a cluster organization on its own' (pp. 11). This evaluation shows that the cluster organisation of OMN is a direct consequence of the Capital City Project. The intention to enhance the

maritime profile, innovation, and competence development have been sustained from the beginning through substantial and systematic work focused on relationship building, formalisation of roles (the board, the three thematic committees, OMN Springboard, the steering and work groups), and the establishment of a number of meeting places. Two priority areas experienced the most positive development. First, OMN Innovation arranges several seminars and workshops on a yearly basis, as well as providing meeting places where idea generation is central. The best ideas are then taken further to CONNECT Springboard, a non-profit organisation which offers talented start-ups intensive meetings with expert panels who give advice, feedback and support to entrepreneurs to refine their business and financial strategies through a process called Springboard®. The customised OMN Springboard is a meeting place where entrepreneurs are matched with leading relevant companies. The activity is seen as part of the secretariat's connecting role. Oxford Research (2010) emphasises that the results of the innovation activity have been particularly important for the small start-ups that were orchestrated through the Springboard. In this respect, the connecting function is highly central to the cluster. Secondly, OMN Competence has established the Maritime Knowledge Hub, the largest privately-financed research initiative in Norwegian history, with the aim to sponsor professorships within the frontiers of maritime research. The cluster is well-anchored among its members and the orchestrator role was central as interaction between actors generated results.

Oxford Research has made comparative evaluations at a cluster level, highlighting OMN as a 'well-established and well-functioning role model for future work' (pp. 8). It is therefore interesting to explore this cluster as a narrative example of what was achieved and how this happened at the operational level. Given the systemic problems of entrepreneurial activity and the particular difficulties in gaining VC, the story chosen is the facilitation of an inventor-investor matchmaking process. The SI context for the narrative is summarised in Table 2.

Table 2. The SI context of the Oslo maritime region

<b>Problem:</b>	Too little entrepreneurial activity. Difficult to gain venture capital.
<b>Solution:</b>	Developing strong regions around big cities: The Capital City Project.
<b>Context:</b>	Maritime industry in the capital region of a nation strong on natural resources.
<b>Actors</b>	Individual, organisational, network.
<b>Goals</b>	Increase innovation by stimulating and organising participation of actors and interactions including physical, financial and knowledge infrastructure. Propose demonstration projects.
<b>Functional elements</b>	Coordinating for the aim of matchmaking.
<b>Structural elements</b>	Intermediary, start-up, financial organisation.
<b>Evaluation</b>	A well-functioning regional maritime cluster.

### **A narrative research enquiry**

This investigation comprises the voices of various people with different concerns and perspectives representing different organisations, operating within the same type of industry. These actors are increasingly becoming dependent on each other as they develop and work towards a common goal. A narrative research method was chosen because of its ability to account for such connected events and its ability to add a holistic perspective to this interrelated multi-actor process. The use of narratives in social research is growing (Andrews et al., 2013), used in a variety of academic fields including politics and macro-level processes (Riessman, 2008) as well as business and organisation studies (e.g. Czarniawska, 1998). Resting on realist, postmodern and constructionist foundations, narratives are grounded in the study of the particular, allowing research to include many voices and subjectivities, however, they are not appropriate in the study of large numbers of nameless, faceless subjects (Riessman, 2008). Narratives are distinguished by their attention to sequences of action. Thus, a narrative is defined as a set of events that occur over time, in which an event is something that has happened to a person or thing, where the investigator focuses on particular actors, in particular social places and situations (Bold, 2012). In this paper, narratives of single actors are brought into a holistic story to recount the events leading to the successful match between an entrepreneur and a venture capitalist in a process supported by a public agency facilitator taking place in the context of the Norwegian maritime industry in the Oslo region.

### *Data sources*

This research project was part of a larger study financed by VRI (the programme for regional R&D and innovation) of the Research Council of Norway. VRI (2007–2017) is the Council's main support mechanism for research and innovation in Norway's regions by stimulating cluster collaboration between constellations of triple helix actors. Globally, VRI is one of very few attempts to promote and implement a broad-based innovation policy at the regional level (Asheim, 2012). The author has been involved in VRI from the beginning and in its predecessor, Value Creation 2010. The author researched the Oslo region including OMN for four years, interviewed many of its members about innovation issues and attended numerous OMN events and seminars. From this substantial material, this paper focuses on individual data accounts of a matchmaking process comprising three central actors: the OMN coordinator, the entrepreneur of Green Coating, and the venture capitalist representing a large carrier company called Blue Ocean. The carrier operates within the tanker, gas and offshore segment with a fleet of around 100 vessels. For confidentiality reasons, the names of the two firms are fictional. The primary data source comprises in-depth face-to-face interviews with each informant. The interviews were all tape-recorded and transcribed verbatim in order to enhance validity. Written material represents a supplementary data source. Documents, archival records, internet web sites, media publicity, and news coverage were used to better understand the context and the aims and activities of the informants. A third data source includes observations of several OMN Springboard activities. This was helpful in understanding the Springboard process and the method applied. Even though each springboard is unique, there is a certain degree of transferability, particularly in understanding how they work methodologically because the procedure is very much the same each time. These observation experiences were used as reference points for analysis and a better understanding of the interviewees' descriptions of the springboard.

### *Narrative analysis*

Narratives do not speak for themselves. For research purposes, they require contingency and close interpretation in terms of narrative analysis (Riessman, 2008). Narrative research interviewing is a discursive accomplishment in which experiences and events are rendered meaningful collaboratively. And, like all stories, they are selective, based on different perspectives, reflecting the power of the human mind to remember, forget, neglect and amplify

moments in the stream of experience (Riessman, 2008). This calls for a close description of how the narrative analytical process was carried out. This paper creates a story from in-depth interview conversations building on McCormack (2004). In her two stage analysis, the recommendations were dealt with as described in Figure 1. Part I consisted of verbatim interview transcriptions. In Part II, these transcripts were used to create interpretive stories for each informant with the purpose of eliciting data about the same event. These individual stories were analysed and transformed into a holistic narrative in Part III, based on collective events and themes that held true across all the stories. The process consisted of analysis followed by a synthesis of data, repeated in cycles to formulate the final narrative, namely, a holistic account of connected events. In order to outline the success factors behind the process, the analysis focused on the events that brought the project together and the collaborative process that followed from the mid and late phases of testing to market.

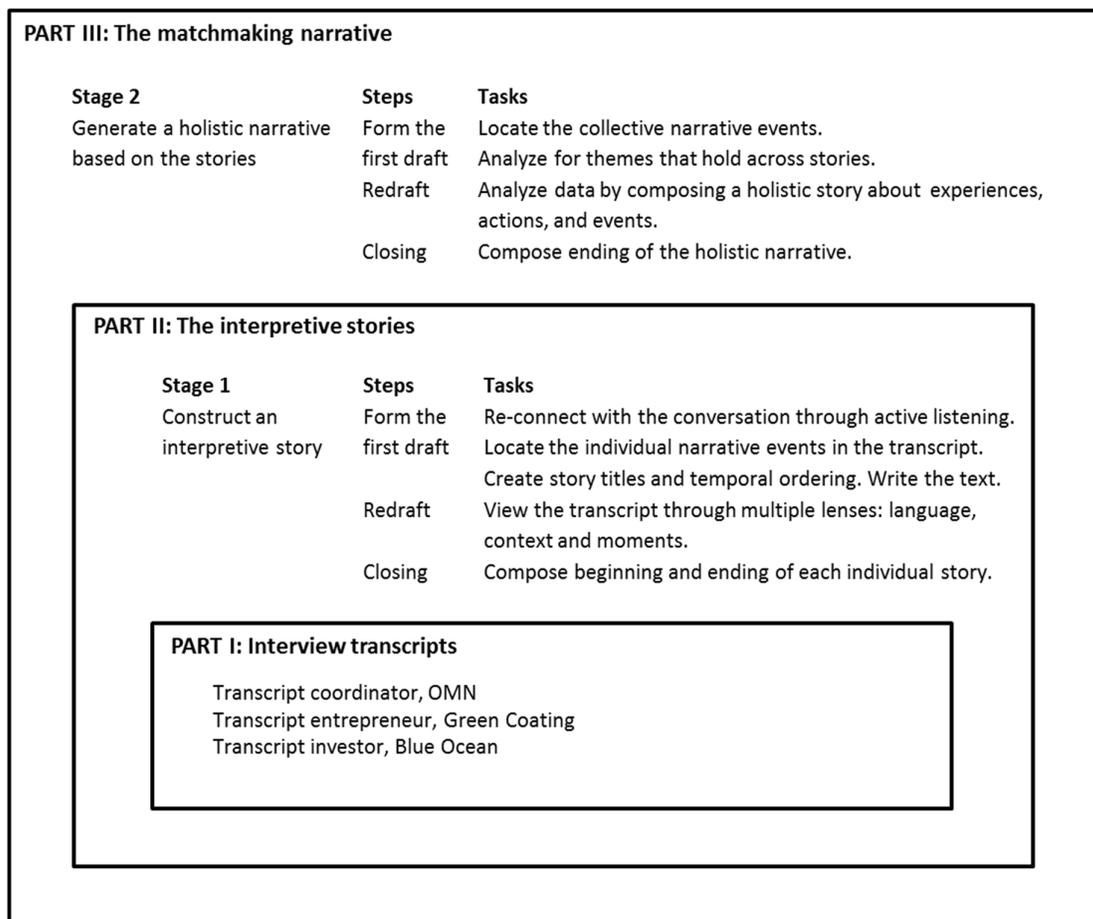


Figure 1. The narrative analysis

In order to illustrate the operation of a SI in practice, the matchmaking narrative will focus on a few critical incidents, organised under the following headings: (1) the role of OMN; (2) the start-up company; (3) gearing up for Springboard; (4) actually finding a partner; and (5) hitting the market.

## **A systemic instrument in practice**

### *The role of OMN*

OMN was established in 2005 based on the existence of a strong maritime environment. There was great potential for improved optimisation in terms of collaboration across sectors and in a triple helix constellation. OMN is a non-profit innovation network gathering over 60 member organisations from all maritime segments in the region. In order to better realise the innovation potential in the cluster, OMN initiated cooperation with CONNECT Springboard. CONNECT helps entrepreneurs speed up the commercialisation process and prepares them to meet investors and industrial partners. The idea was to bring together OMN's knowledge of the maritime cluster, and its needs and opportunities with CONNECT's business competence and inventor-investor assessment. In this way, the OMN Springboard was born, a partnership that turned out to be of great importance in accelerating the region's maritime innovation potential. The OMN coordinator commented: *'What we pay CONNECT to do is to enhance and safeguard the quality of the business foundation of the start-up company, so that we don't stumble because of that at a later stage. When this is made clear early on, we can proceed and investor capital can be spent on investments that lead to real innovation'*. By joining forces, their reach in terms of network contacts could not only grow, but, more importantly, they enhanced each other in complementary ways. One of the first start-up companies on the Springboard was Green Coating.

### *The start-up company*

Green Coating was founded in 2005 as a joint venture between two small start-ups. The entrepreneurs behind each of these firms had worked together before but on a different project. Now, the two founders decided to embark on an entirely new type of project, namely to pursue environmentally-friendly coating systems for ships based on nano technology, as they believed

such technology would have many unique properties. Such technology could replace many solvents at the same time as it reinforced the materials used. The very smooth surfaces resulting from these nano-based coatings and their minimal surface roughness provide low friction in water and can correspondingly reduce emissions of carbon dioxide and mono-nitrogen oxides. The result is more than ten percent lower energy consumption for ships. In addition, the dirt-repellent and almost entirely self-cleaning nature of the coated surfaces significantly reduces the need for cleaning. According to one of the entrepreneurs, nano-based reinforcing material provides up to ten times greater durability than conventional solvent as it contains epoxy coating systems with extreme durability and resistance to cracking and flaking when compared with traditional hard coatings. In addition it constitutes a self-polishing anti-fouling system. This prolongs the period between which the ship has to dock for maintenance. In sum, nano-based coatings (which are not much more expensive than conventional coatings) mean reduced costs and more environmental friendly operations at sea. To accomplish this: *'We bought the exclusive rights to exploit a Finnish patented technology to disperse and dissolve carbon nano tube lumps in liquid polymers in marine coatings. The development of the coating has been going on since 2006, followed by several years of testing of the coating in relevant R&D milieus in Norway, Finland, Poland, and South Africa'* (Entrepreneur). The test results were promising, but more funding was necessary for further product development and commercialisation: *'What we wanted was an industrial investor with maritime competence, not a pure commercial one'* (Entrepreneur). Via contacts in Innovation Norway as well as through personal contacts in the maritime cluster, Green Coating was able to get in touch with OMN. Green Coating was put on the list of potential Springboard candidates and passed the first review.

### *Gearing up for Springboard*

The matchmaking process began. OMN arranged a number of meetings with Green Coating to gain an understanding of their potential and their needs and prospects, and to prepare them for Springboard together with CONNECT. The entrepreneurs presented their business plan before a group of business, marketing and management experts in order to improve their strategies and increase their chances of commercial success. The expert panel was selected especially for Green Coating to help them solve problems and identify opportunities, as well as providing practical advice on what actions should be taken to tap into these opportunities. The composition of the panel is critical to finding the right match. Therefore, OMN ensured that the

panel consisted of several potential venture capitalists whose interests were concurrent with those of Green Coating: *'Our task is to offer the entrepreneurs the best possible exposure and make sure things happen. We do careful research and selection of panel experts that we believe will make a good match vis-à-vis the entrepreneur. Here, we benefit from our large network pool and the fact that we know people who know people'* (Coordinator). At the Springboard and afterwards, it is up to the panel participants to show interest. One participant was particularly intrigued by the presentation: *'You could actually see his enthusiasm grow as he kept on asking question after question'* (Coordinator). The participant represented Blue Ocean.

### *Actually finding a partner*

The Springboard event was the first meeting between Green Coating and Blue Ocean. A range of further meetings followed between these two parties and third parties such as technology experts, researchers and so on. OMN was involved at all stages and facilitated the meetings and the process in order to ensure progress. These follow-up activities were highly important to keep the process going in a direction of continuous information exchange, collaboration and trust. The process that followed centred on what type of collaboration would be best and on how to collaborate. OMN listened to the concerns of both parties and invited the participation of relevant experts to sort out the challenges. The entrepreneurs knew that, although their product was exciting, they also needed to get it positively confirmed by others who also recognised its potential. However, they lacked the capital, the functional expertise and the research necessary to bring the product to the next level.

Blue Ocean also wanted to have the product confirmed and to find out more about its properties and qualities: *'We simply wanted to find out more about the tests'* (Investor). A large part of what the investor brought into the collaboration included opportunities to test out the coating on real ships in real operations at sea. *'Green Coating started out by painting one ship at dock in Spain and, based on the good results, several more followed. In this way, the paint was tested both under and above the water line, to see how the coating behaved in real water environments'* (Investor). The tests confirmed less use of fuel/energy, but they still faced the problem of sea plants growing on the surface. This provided an opportunity to test surface cleaning of the coated material. This operation was easy compared with ships using conventional coatings. New compositions of ingredients were tested to further improve the anti-fouling properties of the new coating. Needless to say, another important part of the process involved the business

side. Was the start-up company credible? OMN and CONNECT helped evaluate the start-up company using their experience with the maritime sector and with other start-ups: *'CONNECT is very experienced and has good methods to reveal risks and avoid dangers. They can smell from a long distance who (of the entrepreneurs) is mature or not. They see it more often and faster'* (Coordinator). Another question concerned the scale and scope of the market. While Blue Ocean investigated market opportunities, Green Coating did what they could to look even better in front of the potential investor: *'We hired a consulting company to further dress up the bride. This was very useful as we once again analysed our business plan according to what we now had achieved in terms of test results and added this to our knowledge of Blue Ocean on how to team up together'* (Entrepreneur).

At the time, Blue Ocean had just established a venture fund of 250 million USD for investment in environmentally-friendly shipping technology: *'The fund was a direct consequence of a battle resulting in additional tax imposed by the government on the shipping industry. We went to trial and the Supreme Court upheld our (the ship owners) claim that the tax was against the law. Yet, we decided to sustain the fund and its objectives, and Green Coating became our first venture'* (Investor). Blue Ocean invested a considerable amount in the company and gained majority shares as they predicted the economic return to be vast. To push the process forward, Blue Ocean invited Green Coating on board.

### *Hitting the market*

The nano-based coating is now under large-scale production and is for sale on the international market. Potential buyers are offered a chance to test out the coating on their own vessels before purchasing the product: *'... this new type of coating on ship hulls as well as inside ships makes the ship go faster at sea but with the same amount of fuel or energy. Since it also demands less maintenance, obviously, this means great savings and cost benefits for the carriers'* (Investor). *'The last two years have seen great progress, an unusually short time span for a start-up company to reach commercialisation on such large scale. But, without OMN and Springboard we would not have gotten this far this fast'* (Entrepreneur). However, when looking back on the many obstacles, he concludes with a smile: *'Luckily, we didn't know the shipping industry beforehand. If we did, I don't even think we would have made a shot. It's such a conservative industry. They are so reluctant to try out new things, even though they have huge financial muscle if they want to. But, you know, they're pedlars and extremely stingy'*. Gradually, the

founders have stepped down. A new managing director has been employed with the appropriate competence to take the firm forward commercially in terms of product differentiation, sales and distribution.

Overall, this process achieved what OMN worked for, namely a knowledge-based innovation beneficial for and with the actors in the region. The results of the activities benefit the region even though much of the testing has taken place elsewhere. Relationships have been built up and the experience has reinforced investment in the region. However, such a successful project can be difficult to copy, as the OMN coordinator is fully aware: *'To make this happen during a couple of years is really something to strive for in the future'*.

### *Closing*

From this narrative, at least two main factors for success seem to stand out. The first is the *match of specific and complementary competences* of the four parties involved in the process: (1) OMN on facilitation and maritime cluster knowledge; (2) CONNECT on start-ups and business understanding; (3) Green Coating on entrepreneurial experience and a unique product idea with major commercialisation potential; and (4) Blue Ocean on shipping, venture and maritime needs. Crucial to making these competences team up, complement and benefit each other was the continuous collaboration process facilitated by OMN. This was achieved by following up on activities and building trust to keep a promising project going. The underlying enabling mechanism for the match was OMN's systematic development of meeting places (including Springboard) and meetings between parties within the cluster. Secondly, certain *characteristics of the network* seem important in order to exploit multiple relationships and multiple types of institutions. The strategic partner match required planning the composition of and access to a large number of network contacts essential to gather a critical mass of potential partners to choose from, making the size of the network important. It also seems that having large and well-known companies on board is important. Those parties with the resources and competences that are needed to succeed and to make things happen were the parties that promoted the matchmaking process and its results. Hence, not only is a large pool of network relationships important, but the size of the institutions involved also matters. This points to the importance of contextual factors beyond the network itself, as will be discussed below. The narrative shows that network activity consists of relationships and practices, which spring from processes, procedures and exchanges important to the network members, where the network

facilitator plays an important role in matching individual competences and regional organisations.

### **Discussion and conclusion**

This paper has identified SI problems and solutions at a policy level, providing a contextual framework for the exploration that followed at the operational level. The paper contributes to SI literature by combining these two approaches. From this combination, we see that in a small open economy such as Norway's and its capital region, the relationship between policy and micro-practices can be powerful. In the example presented, practice was carried out using a bottom-up approach by systematically engaging and mobilising various actors in the system. Such an approach considers specific local resources, relationships and routines as important sources of innovation, as has also been emphasised by Isaksen and Aslesen (2001) in one of the few articles investigating Oslo as an innovative city in the Norwegian context. In addition, there are a number of wider, contextual factors that seem highly influential. The maritime industry has a strong position in the Norwegian economy stemming from path dependency on nature-based resources and the country's long shipping traditions (Fagerberg et al., 2009). It is likely that this macro factor was important to the success of OMN, particularly when compared to the failures of the other regional cluster attempts within newer and less mature industries such as culture, ICT, life science and the environment. As a result, the interplay between the micro practices of facilitation and the macro factors of path dependency seem important to SI success. This supports Borrás and Edquist (2013) in their claim that one solution did not fit all five of the cluster attempts. For SI formulation and implementation, this implies that depending on industry maturity and completeness, innovative activity may need more customised support mechanisms to succeed.

The findings support the literature on big city regions as drivers of innovation and economic growth, and the notion that inventors and investors who engage in regional innovation networks are more likely to reach commercialisation faster than without such networks (Schoonmaker and Carayannis, 2010). This contrasts with quantitative macro studies such as that by Herstad et al. (2011) who found that the capital region location in the Norwegian context actually decreased the likelihood of collaborative engagement between firms within their local host environment. Another study (Isaksen and Onsager, 2010) found no substantial differences in innovation activity based on the notion of urbanisation of the economy in Norwegian regions.

This suggests that more research is needed into the role played by SIs in urban regions, particularly in order to identify enablers of their practical functioning as well as obstacles to their success. Most importantly, there is a need for studies that cut across both the micro and macro levels to understand the systemic effects and the role such reciprocal interaction may play in the success or failure of policy design and practices.

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