Trans-regional Supply Chain Research Network: Developing Innovation Strategies Within and Between Regional Oil and Gas Clusters

Gudrun Jaegersberg[a1], Jenny Ure[b] and Ashley D. Lloyd[c]

[a] School of Econonomics – University of Applied Sciences at Zwickau, Germany.
[b] School of Informatics – University of Edinburgh – UK.
[c] School of Management and Economics – University of Edinburgh – UK.

Abstract: Regional clusters at different stages in their life-cycle, provide opportunities for benchmarking regional and trans-regional strategies for innovation and change management. The paper reports on trans-regional knowledge transfer and benchmarking strategies used to enhance the alignment of SME, operators and other stakeholders in regional oil and gas clusters in two regions with ongoing projects. These were part of separate regional initiatives to enhance innovation and competitiveness in the supply chain through support for SMEs as key repositories of niche expertise and local knowledge relevant to the competitiveness of large operators in particular and to the cluster and the region in general. The Western Australia and the UK North Sea oil and gas clusters are used as examples to highlight the recurring sociotechnical problem: solution scenarios that arose in facilitating communication and coordination of diverse stakeholders within and across regional clusters.This is part of a wider set of case studies developed by the network in the oil and and gas and automotive supply chain sector.

Keywords: Supply chain cluster, trans-regional research networks, benchmarking, SME, innovation, human factors.

1 Introduction

The competitiveness of regions increasingly depends on their innovative ability. Clusters can be innovation drivers and are therefore key to economic development. The term "cluster"[2] was coined by Porter, who describes this as a geographical concentration of sector-specific companies, suppliers, service providers and associated institutions (e.g. universities, research institutes, funding bodies) all of which are interconnected [14].[3] Clusters are linked by extended enterprises and

[1] Corresponding Author E-mail: Gudrun.Jaegersberg@fh-zwickau.de
[2] This articles does not discuss different concepts of clusters. We refer in this case to clusters as Porter [14] defines them.
[3] The phenomenon of „industrial districts" was discussed by the British economist A. Marshall [10] as early as 1890.

their supply chains. Therefore, some successful regions have set up knowledge-sharing networks [20, 18,12,16,25] across clusters and this is increasingly the focus of research and development funding and particular in the European Seventh Framework Programme [4] [4].

A cluster-based initiative is currently being carried out by the authors in the Western Australian (WA) oil and gas supply chain to identify stakeholder perceptions of gaps, barriers and opportunities to innovation in the supply chain, and also to support knowledge-sharing between the oil and gas regions of WA and the UK North Sea, highlighting the need to consider strategies that can develop the human communication infrastructure required for stakeholders to identify gaps and barriers and coordinate or reuse strategies and practices. In this case the focus is on strategies that can facilitate SME-led innovations to meet the needs of large operators in the supply chain.

2 Theoretical Background

Porter's theory of national competitive advantage [14] can help to understand the structure and dynamics of clusters. He suggests that four broad attributes of a nation shape the environment in which local firms compete: factor conditions (basic factors such as natural resources and advanced factors such as communication infrastructure, sophisticated and skilled labour, research facilities and technological expertise); firm strategy (different management ideologies), structure and rivalry; related and supporting industries; and demand conditions (sophisticated customers in the home market create pressure for innovation and quality). These four determinants promote or impede the creation of competitive advantage and constitute the so-called diamond which is a mutually reinforcing system, where the effect of one determinant is contingent on the state of others.

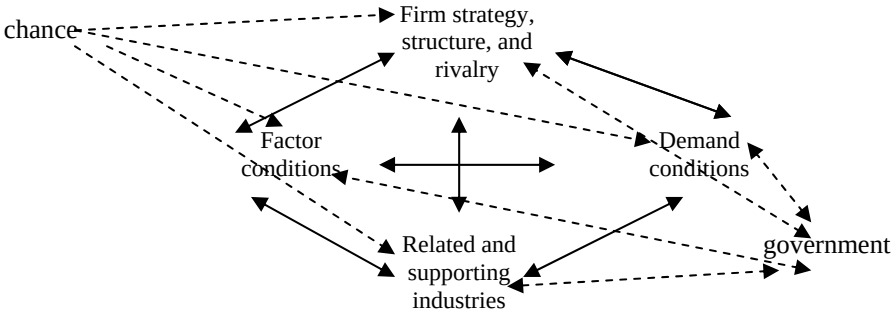

Figure 1. Porter's diamond model [1]

[4] Cp. also the Aho report 2006 [1].

Porter argues that two additional variables can influence the national diamond: chance (e.g. innovation) and government (e.g. policies such investment in education or incentives).

According to Porter, a precondition for a cluster to emerge is a critical mass of companies that agglomerate in spatial proximity and start combining their activities along a value chain. The cluster identification of related industries is one of the most influential findings of Porter's research. The diamond model is an ideal tool to analyse hard factors of a cluster and to identify a cluster structure. However, although it stresses that mutual reinforcement between the determinants is key to successful clusters, there is less clarity with regard to how to build up the communication structures (advanced factor) and to align the knowledge and interests of diverse and distributed stakeholders to common ends.

In global distributed markets clusters are networked globally through extended enterprises [3] and their supply chains [2]. As clusters, like organisms, pass through a life-cycle [15] - they are born, evolve and decline - there is an opportunity for cluster cooperation in a range of ways such as strategic process benchmarking [7] in core areas such as innovation, where emerging clusters can learn from more mature ones.

Innovation itself may refer to changes to products, processes or services. Tidd et *al.* [21] refer to four types of innovation as Product, Process, Position and Paradigm. From an organisational perspective it may be linked to performance and growth through improvements in efficiency, productivity, quality, competitive positioning, market share, *etc*. From a change management perspective it is increasingly perceived as a complex process that links many different players together - not only developers and users, but a wide variety of intermediary organisations such as consultancies, standards bodies etc. Sawhney and Parikh[17] and Molina [11] suggest that much of the most successful innovation occurs at the boundaries of organisations and industries where the problems and needs of users, and the potential of technologies can be aligned. This requires the development of sociotechnical constituencies, "dynamic ensembles of technical constituents and social constituents'' through a process of sociotechnical alignment - creation, adoption, accommodation (adaptation) and interaction (interrelation) to achieve these common ends.

3 The UK North Sea and the WA Oil and Gas Clusters – Opportunities for Benchmarking

The UK North Sea and WA oil and gas clusters present an example of opportunities for strategic process benchmarking, because they are at different stages in their life-cycle. Newer clusters have the potential to learn from the successes and failures of more mature ones that have addressed comparable challenges in maintaining competitiveness.

3.1 The evolving WA cluster – a rough diamond

The evolving WA oil and gas cluster can be regarded as the engine of economic development in WA, where the oil and gas industry is of strategic importance for a wide range of stakeholders in government, education und industry. All four determinants of the Porterian model can be found in the structure of the cluster. Oil and gas resources (basic factor) off the WA coast have stimulated related and supporting national and domestic industries to cluster around global operators like Chevron, Woodside, BP, Halliburn, Shell, Agip, Schlumberger. Advanced factors such as communication infrastructure, sophisticated and skilled labour, research facilities and technological know-how, which, according to Porter, are the most significant for the fostering of competitive advantage, are present in WA. However, the core question is how can conditions be created so that all determinants mutually reinforce each other and effectively support the change process so that the diamond begins to shine on value creation.

3.2 Identification of problem areas in the WA cluster

This is one of a set of regional studies where researchers and students on placement have used collaborative action research with a range of stakeholders in the supply chain to identify gaps and barriers, and stakeholder requirements. Students on placement in WA initiated interviews with a wide range of stakeholders, to identify gaps and barriers, moving from open interviews to more formalised questions with larger reference groups.

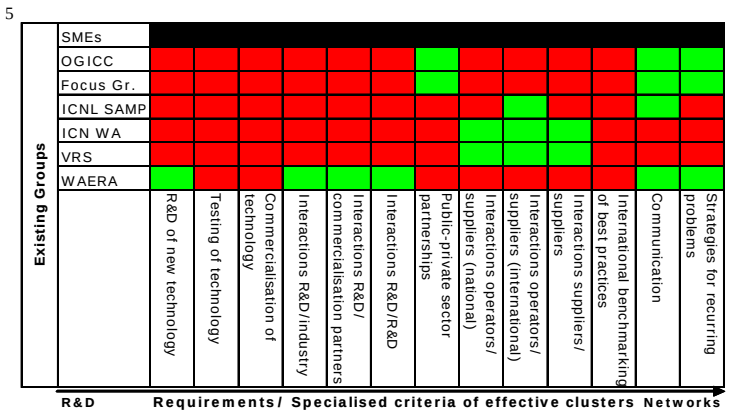

Figure 2. Gaps as perceived by SMEs [19]

[5] OGICC – Western Australian Oil and Gas Industry Coordinating Council; OGICC: Action Plan Focus Group; ICNL SAMP – Industry Capability Network Ltd: Supplier Access to Major Projects; ICN WA – Industry Capability Network WA; VRS – Supplybase Vendor Registration Service; WAERA – Western Australian Energy Research Alliance

Action research is a qualitative approach [8] to elicitation and discussion of multiple stakeholder perspectives as a basis for change in pursuit of common goals. In many respects it is the equivalent to the benchmarking process, and ideal for contexts where knowledge transfer and negotiated change are important outcomes.

This involved an extensive number of institutions, groups and inititatives that had already been created to facilitate coordination, strategic development and sustainable economic development within the WA oil and gas industry. Students were able to work across boundaries, often bringing together groups who would not normally be able to discuss problems and strategies in this way, and appeared to have a catalytic effect in raising issues and fostering exchange. The study revealed that there is great potential in terms of organisational infrastructure (advanced factors, see above) to create a prosperous oil and gas cluster, however, there are big gaps in the fulfilment of stakeholder requirements for success, as indicated in Figure 2. This initiative has facilitated collective awareness and understanding of the gaps and barriers among stakeholders and provides a template for development.

In addition, the study detected that interaction between all of the above mentioned stakeholders was insufficient, with a significant lack of communication and coordination across the entire industry [19]. Thus, the possibilities of transferring competitive knowledge are very limited; technology diffusion cannot take place to the extent required. There was also evidence of a lack of awareness among large and medium sized operators of technical innovations by SMEs in the region which could address operational problems they were encountering. This was one of a series of gaps in the innovation process. Gaps such as these were a focus of the research, as for example in Figure 3.

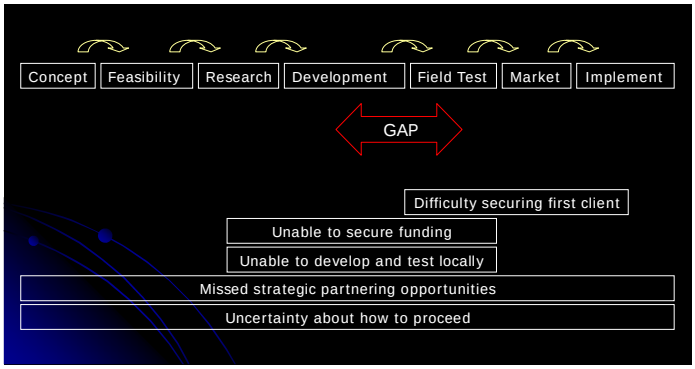

Figure 3. Identifying barriers in the WA Oil and Gas Supply Chain. [19]

It is of interest that a number of the gaps and issues encountered appear to be evident in the UK oil and gas sector, but across other industry sectors also researched such as the automotive industry supply chain [23, 6].

3.3 Lessons learned from leaders – the UK North Sea example

The Australian supply chain is now embarking on a range of approaches to SME led innovation/integration in the supply chain that has already been successfully used in the North Sea PILOT project [13][6]. The growing interest in strategies for developing innovation as a source of competitiveness (as opposed to the previous emphasis on cost-cutting) is also reflected internationally in current research by the European Community to identify strategies and practices that can support innovation [1].

The competitiveness of the UK oil and gas supply chain has been the focus of different government and industry sponsored initiatives, initially as part of a cost-cutting model in which the LOGIC [9] organization took a significant role and latterly through support for SME based innovation with the PILOT project, which faced very comparable issues to those uncovered by researchers in the WA project[7] in relation to the need to support SMEs. These were seen as holders of niche and local expertise underpinning innovation and implementation of complex technologies in difficult local terrains. It is notable that in both regions

- innovation has become a more significant feature of competitiveness in contexts where the supply chain is already very lean as regards cost
- the previous loss of SMEs as part of the initial approach led to a loss of a core resource for innovation
- SMEs were particularly vulnerable to unfair payment and contracting practices
- SME-based innovations were poorly supported at crucial stages, from funding and proof of concept
- SMEs were not made aware of the long term requirements of large operators and large operators were often not aware of the innovative technological solutions that had been developed locally by SMEs that could have been implemented.

From a benchmarking perspective, the initial exchanges with the PILOT project meant shared ideas could be implemented more effectively, and some new ones considered – notably the use of templates for fair contracting, and payment practices as an industry standard, and the setting up of operator/contractor/sme work groups to look at key issues. It became evident from discussion that the role of PILOT itself was perceived as effective because of the brokering role of the team, with very senior representatives of all stakeholders, and senior ministerial commitment underlining the importance of participation, and the potential of the process to execute change (i.e. not a talking shop).The intention is to extend this

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[6] PILOT is a joint programme involving the UK Dept. of Trade and Industry , the aim of securing the long-term future of the Industry in the UK.

[7] One difference specific to mature fields was the more pressing requirement for more innovative technological solutions to extraction in the difficult pockets of recoverable oil and gas in mature fields which can extend the life of the field.

trans-regional process through the linkage now established at different levels across the regions through governmental, industry, support and higher education organisations.[8] From a socio-technical perspective, the technical networking within and across regions needing to be matched by the development of communication and collaboration networks between stakeholders who, through coordinated action, can create value through sharing knowledge and resources to common ends. The use of collaborative action research and benchmarking was both a means of jointly confronting these issues, and starting the process of building shared spaces [26] and regional/ trans-regional infrastructure for addressing them.

4 Conclusions

The paper demonstrates an approach to supporting cluster development within and across regions through the provision of 'shared spaces' for collaborative stakeholder communication as a basis for aligning efforts towards the common end of innovation in the supply chain. Porter's theory is a helpful tool to understand the structure of successful clusters, however, less is known about the means by which the stakeholders in these complex, dynamic, socio-technical systems can provide the human communication infrastructure through which some of these processes need to be realized. The research outcomes from the project in Australia reinforce the findings of earlier work on the automotive clusters in Germany and Brazil, and parallel work in Grid-enabled systems as complex hybrid systems [24] aligning technical infrastructures with and heterogeneous distributed human infrastructures across national boundaries. In conclusion, the intention has been to demonstrate the value of trans-regional action research networks and collaborative benchmarking as a framework for developing and sharing policies and practices between regions as a means of enhancing innovation to enhance competitiveness both for the region itself, and for the cluster in the wider global context.

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