

BARRIERS TO PROCESS LEARNING:

AUTHORITY AND ANOMIE IN REGIONAL CLUSTERS

Abstract: In this article we consider the nature and implications of barriers to collaborative process learning that may occur in regional clusters. Our approach is rooted in research in interorganizational collaboration and focuses on interview-based research in photonics clusters in: Scotland and the West Midlands in the United Kingdom; Berlin-Brandenburg in Germany; and Arizona in the United States of America. From this research we develop characterizations of the barriers to collaborative process learning in clusters at three levels of analysis—the macro, micro and meso levels. We also develop an integrated conceptualization of these barriers, which reveals a difficult tension between ‘authority’ and ‘anomie’. This tension has implications for the management of process learning, but also connects with recent debate about whether learning is most helpfully understood as an individual or collective process.

INTRODUCTION

This paper is concerned with the identification and characterization of potential barriers to process learning in regional clusters of organizations. This is particularly interesting since clusters are commonly thought of as environments that support the learning of organizations by offering opportunities for observing, discussing and comparing technological knowledge and organizational practices (Cooke, 2002; Carayannis, Assimakopoulos and Kondo, 2008; Maskell, 2001). Though cluster research distinguishes learning through horizontal and vertical collaboration, through competition and rivalry, and through knowledge spillovers following informal interaction and the local mobility of individuals (Malmberg and Power, 2005), it is generally focused on substantive learning and pays little attention to process learning – the means by which interorganizational relationships are developed and managed. Research on learning in interorganizational collaborations and networks, by contrast, is clearer on process learning (Hibbert and Huxham, 2005; Holmqvist, 2004; Toiviainen, 2003). Since regional clusters are intended to support collaboration between organizations (although competition is not absent), the body of insights about process learning generated in interorganizational collaboration research provides a basis for our work in this paper. As such

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it will contribute to a better understanding of knowledge acquisition, creation and diffusion in regional clusters.

Whilst process learning in collaboration is reasonably well characterized in the literature, in practice managers find collaborative processes to be complex and difficult (Huxham and Vangen, 2005). Further attention to *barriers* to process learning merits attention, as there is a gap between what ‘should’ be possible in collaborative practice, and that which is actually achieved – including practice in clusters. Our work on the barriers to learning contributes to this debate too, by showing that process learning in interorganizational, collaborative contexts is hindered by ‘authority’ and ‘anomie’. Such constraining influences – from both internal and external sources – can significantly impact on the participation, learning and socialisation of individuals (Aanestad et al., 2003; Fox, 2000; Roberts, 2006) and their organizations (Knight and Pye, 2004; Toiviainen, 2003). This is important since substantive learning and innovation first requires that participants learn to understand and communicate with each other in a transformational way (Brown and Duguid, 2001; Handley et al., 2006, 2007; Roan and Rooney, 2006). Thus our research, in shedding light upon the barriers to this essential socialization, also speaks to the debate about how individual (acquisition) and community (participation) characterizations of learning may be appropriate, and helpful (Antonacopoulou, 2006; Antonacopoulou and Chiva, 2007; Handley et al., 2007), and indeed how they may be related.

The remainder of this paper proceeds as follows. In the next section, we discuss regional clusters as contexts for collaboration and learning, followed by a theoretical discussion of the barriers to process learning. Following these two sections we detail our methods and data after which, in the main part of the paper, our empirical insights about barriers to process learning are developed and integrated. This leads to implications for

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theorizing and practicing interorganizational learning both in general, and within regional clusters in particular.

CLUSTERS AS CONTEXTS FOR COLLABORATION AND LEARNING

Regional clusters

Clusters of specialized firms and other organizations within particular industrial fields have been studied for some time (Bell et al., 2009; Enright, 1998, 2003; Porter, 1998). Clusters can be defined as “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated industries (e.g., universities, standards agencies, trade associations) in a particular field that compete but also co-operate” (Porter 1998:197). The core elements of this definition (i.e. the relationship between the collaborative and competitive linkages of firms and the geographic proximity of interlinked companies and other organizations), remain largely unspecified, leaving the cluster concept somewhat ambiguous (Martin and Sunley 2003). However, clusters may be understood as contexts for interorganizational collaboration, defined as any process through which people work, across organizational boundaries, on areas of mutual interest (Everett and Jamal, 2004; Gray, 1989; Huxham and Vangen, 2005). In particular, clusters can be seen as contexts for collaborative *learning* processes or, at best, be considered as (regional) learning systems that can accommodate shared tacit knowing (Hassink, 2001; Gertler, 2003; Rutten and Boekema, 2007). This allows us to draw on literature on learning in collaborative contexts to complement and extend that specifically related to clusters. In particular, it provides a basis for the development of a better understanding of the micro-level learning processes that are assumed but seldom unpacked in the cluster literature (see Ibert, 2004; Malmberg and Power, 2005 for exceptions).

Learning in collaborative contexts

Both *substantive* and *process* learning in collaborative contexts are well described in interorganizational collaboration literature. These characterizations highlight the distinction between “learning-through-networks” and “learning to network” (Toiviainen, 2003), while also reflecting the distinction between knowledge and “knowing in practice” (Orlikowski, 2002). We provide summary characterizations of these two kinds of learning outcome in Table 1.

Learning outcome	Characterizations	References
Substantive learning	<p><i>Knowledge transfer</i> One partner learns from another.</p> <p><i>Knowledge creation</i> Partners jointly develop knowledge:</p> <p>(a) as a deliberate initiative</p> <p>(b) as a ‘side effect’ of processes such as spillover</p> <p>(c) as an emergent outcome of relational capital.</p>	<p>Reagans and McEvily, 2003; Simonin, 1999; Tsai, 2001.</p> <p>Assimakopoulos and Macdonald, 2003; Boari and Lipparini, 1999; Breu and Hemingway, 2002; Nonaka et al., 1998.</p> <p>Keeble and Wilkinson, 2000; Maskell, 2001; Malmberg and Power, 2005; Tallman and Jenkins, 2002.</p> <p>Capello and Faggian, 2005.</p>
Process learning	<p><i>Transferable process learning</i> Concerned with knowledge acquisition, by individual participants, of skills and information about ‘how to collaborate’ or ‘how to make collaborations work’ in a range of different contexts.</p> <p><i>Local process learning</i> Concerned with developing a negotiated understanding of such elements as purposes, partners and processes; such learning is situated within a <i>particular</i> social context.</p>	<p>Asthana, Richardson and Halliday, 2002; Beech and Huxham, 2003; Drujalans et al. 2003; Huxham and Vangen, 2005.</p> <p>Hibbert and Huxham, 2005; Ring and Van de Ven, 1994; Lehrer and Asakawa, 2003; Sydow and Windeler, 1998, 2003.</p>

Table 1: General characterizations of learning in collaboration

It is important to note that the general characterizations of learning in Table 1 are concerned with the kind of knowledge that is acquired, transferred or co-created and, finally, inscribed in either partner-specific *or* generalized organizational capabilities for managing interorganizational relationships (Zollo et al., 2002), rather than a detailed characterization of the processes of learning. Whilst it can be argued that the processes of substantive and process learning are usually connected (Hibbert and Huxham, 2005), our focus is purely upon the barriers to the two kinds of process learning; that is, *transferable process learning* (related to cumulative, generalizable alliance experience) and *local process learning* (related to partner- and context-specific experience). We therefore discuss the processes of, and barriers to, these kinds of learning in more detail below.

PROCESS LEARNING: LEVELS AND BARRIERS

Process learning is characterized in three ways in the literature: at a micro-level of individual development; at a meso level of relational interaction; and at a macro level of cross-collaboration transformation, as shown in Table 2.

Learning Level	Process learning: processes	Process learning: barriers
<i>Micro: individual focussed</i>	Learning occurs through individual process skills or competency developments (Adam, 1980; Drujalans, et al., 2003; Olk and Earley, 2000).	<p><i>Transferable process learning</i> that is dependant on 'vicarious learning' from partners (Nathan and Misra, 2002) may also be interrupted by prejudices and communication issues.</p> <p><i>Local process learning</i> may be impeded by individual prejudices and interpretations about specific partners and communication failures (Durnell-Cramton, 2003; Griffith 2002; Vaara, et al., 2003).</p>

Learning Level	Process learning: processes	Process learning: barriers
Meso: relationally situated	Learning occurs in relational patterns of interaction between organizations, especially in situations where exploratory (or 'knowledge creation') goals are explicit (Assimakopoulos and Macdonald, 2003; Boari and Lipparini, 1999; Breu and Hemingway, 2002; Nonaka et al., 1998; Tallman and Jenkins, 2002).	<i>Transferable process learning</i> barriers are not apparent in the literature, or easy to infer, at this level. <i>Local process learning</i> may be hindered by the degree of effort necessary in developing and supporting connections across specific organizations, between infrequently interacting communities in creative processes (Mohrman, et al., 2003; Lehrer and Asakawa, 2003).
Macro: Cross-collaboration	Learning occurs through collective reconfiguration of the collaboration, in processes such as 'network learning' (Knight and Pye, 2004). These community situated processes involve embedded 'sticky knowledge', or perhaps more helpfully engagement in participative knowing (Brown and Duguid, 2001; Breu and Hemingway, 2002; Lave and Wenger, 1991).	<i>Transferable process learning</i> achievements may be difficult to adapt to multi-situational contexts such as regional clusters. <i>Local process learning</i> may be obstructed by the breadth and complexity of participation, or by top-down policy initiatives that undermine self-directed learning (Meyer-Stamer and Harnes-Liedtke, 2005).

Table 2: Characterizations of process learning levels and barriers in collaboration

Table 2 also outlines (and adds inferences to) the limited extant research on barriers to *process* learning at these levels in *interorganizational* contexts. This characterization is quite separate from, but complementary to, the review of barriers to *substantive* learning in *organizational* contexts developed by Smith and Elliot (2007). Table 2 further indicates that interorganizational research on process learning spans both sides of the debate about individual (acquisition) and community (participation) characterizations of learning (Antonacopoulou, 2006; Antonacopoulou and Chiva, 2007; Handley et al., 2007). We return to this debate later in the discussion section of the paper, which integrates what we know about barriers to process learning and points to important implications for interorganizational learning, after first presenting our methodology and empirical insights.

METHODS AND DATA

Contexts for data collection

Our research was situated in four regional clusters in the global photonics industry. The research reported here forms part of a larger programme, broadly concerned with the organization, development and problems of clusters, and was structured to enable emergent themes or issues within this broad context to be investigated, through pooling the resources of an international research team that formed a collaboration between 2004 and 2007. The cluster regions and participant details for the research reported here are provided in Table 3.

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Region	Cluster character	Organizations interviewed	Type	No. of interviews
Berlin-Brandenburg	Developing, well funded, relatively concentrated grouping of 260 firms (7400 staff)	Max-Born-Institute for Nonlinear Optics and Short Pulse Spectroscopy	RO	2
		DLR (German Aerospace Center)	RO	1
		Optical Institute (Technical University Berlin)	RO	1
		MergeOptics GmbH	SME	1
		Clyxon Laser GmbH	SME	1
		OpTecBB e.V.	CR/NAO	2
Southern Arizona	Developing, unfunded, relatively concentrated grouping of 250 firms (25000 staff)	University of Arizona, Economic Development Unit	RDA	1
		Southern Arizona Technology Council		1
		University of Arizona, Office of Economic and Policy Analysis	RDA	1
		University of Arizona, College of Optical Sciences	RO/RDA	2
		Large Binocular Telescope, Steward Observatory	RO	1
		Optical Electronics, Inc (OEI)	RO	2
		Raytheon Missile Systems	SME	2
		AOIA / Breault Research	LC	2
			CR/SME	
Scotland	Developing, moderately funded, relatively dispersed grouping of 90 firms (4000 staff)	Institute of Photonics, University of Strathclyde	RO	2
		UK Astronomy Technology Centre (Royal Observatory Edinburgh)	RO	1
		Scottish Enterprise	RDA	2
		Photonix Limited	RO/SME	1
		Intense	SME	1
		Forth Dimension Displays Limited	SME	1
		Optimat Limited	E	2
		Thales Optronics	LC	1
		SELEX Sensors and Airborne Systems	LC	1
		SOA	CR/SME	2
West Midlands	Emerging, well funded, relatively dispersed grouping of 60 firms (staff data N/A)	Photonics Research Group at Aston University, Birmingham	RO	1
		Laser Optical Engineering Ltd	SME	1
		Bookham Technology plc	LC	1
		Photonics Cluster (UK)	CR/NAO	2

RO=research organization; SME=small and medium- sized enterprises; LC=large company; RDA=regional development agency; E=external expert; CR=cluster representative; NAO=network administrative organization

Table 3: Interview details

The interviews were conducted face to face around a loosely structured thematic framework, allowing the participants to talk broadly about the present cluster situation and the former and future cluster development. We ensured that the notional core, that is the “network administrative organization” (Human and Provan, 2000), and organizations at the periphery of the clusters were included. The broad themes that we sought to explore in the interviews were:

- The interviewee’s organizational role, including their formal / informal and length of involvement in the cluster

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- How the cluster is organized (formally / informally, structures and processes)
- What activities take place within the cluster, including collaborative activities
- Who is involved in the cluster (individuals and organizations) and what they do
- How (and if) the cluster has changed over time

Importantly, we sought to allow the conversation to proceed naturally, adding in the themes alluded to above only if the interviewee's conversation did not encompass them. The interviewee was thus able to talk at length on issues of interest to them. The interviews in general lasted around 90 minutes and most were recorded and transcribed. In one of the clusters (Berlin-Brandenburg) we also participated in cluster meetings and workshops.

Analytical approach

We were conscious of the need for a critical appraisal of interview data (Alvesson, 2003) and sought to address this in three ways. First, we kept the predetermined structure of discussions flexible and allowing relatively free-flowing conversation, to limit the direction that we might be giving to the participants. Second, we cross-checked the data gathered in interviews with written material wherever possible and relevant, to ground the material in its context. Third, we applied an interpretive framework for analysis involving the elaboration of meaning from data 'point by point', at the micro-level before aggregating interpretations to form more general inferences (Huxham and Hibbert, 2008), to carefully consider the potential meaning and relevance of each item of data. This process of theory development, instead of following a purist grounded approach (Glaser and Strauss, 1967), allowed insights from collaborative learning research to be used as a lens for structuring and interpreting the data as well as allowing for the possibility of emergent understandings to be developed. The detailed process is described below.

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Data extraction: Each researcher reviewed a subset of the interview data in detail, identifying material that had some bearing on learning issues. These items were then discussed and criteria for a full screen of the data were generated and all of the interview transcripts were then reviewed.

Exploring interpretations: The collated data was examined in order to identify the phenomena or issues that the data could be pertinent to. This process involved the researchers discussing material point-by-point. After a first round of interpretations, the broad, general thematic focus associated with barriers to process learning was established.

Shaping in relation to theory and emergent categories: The category structure of the data was then developed through a process of discussion which explored connections to themes evident in the literature, as well as the potentially emergent data-driven categories evidenced in the data. This dual approach resulted in the combination of the level of analysis framework from the literature with emergent categories of barrier at each level, thus producing a simple category structure that provided a coherent set of ‘handles’ for understanding the data, with particular attention to potential extensions to existing theory and the specific characteristics of clusters.

Developing meaning and coherence through writing: The research team engaged in an iterative process of co-writing, identifying and developing further connections to literature and thematic coherence. This process included the presentation of draft output, and the selection of appropriate illustrative examples from the data, to research seminars and conferences to gain external views and critique. Through this process we developed the thematic terms of ‘anomie’ and ‘authority’ as central elements of this paper, and continued to refine connections to theory (and implications for the same) through engaging with the constructive critique of reviewers.

BARRIERS TO PROCESS LEARNING IN CLUSTERS

In this section of the paper we discuss the micro-, meso- and macro-level barrier categories observed in our research. Our observations on these three levels have suggested a wide range of obstructive influences. However, there are two emergent themes that cut across these levels, which provide the most helpful ‘handles’ on the issues. The relationships between our detailed inferences on the different levels and these emergent, cross-cutting themes – authority and anomie – are indicated in Table 4. Each theme is discussed in detail, in relation to example data, in the text which follows the table.

Barrier level	Barrier type	
	<i>Authority</i>	<i>Anomie</i>
Actor-centred (Micro)	<ul style="list-style-type: none"> • Isolation through reliance on a central actor • Introduction of centralized / systematic bias 	<ul style="list-style-type: none"> • Reliance on individual experiential learning trajectories
Cluster-fragmenting (Meso)	<ul style="list-style-type: none"> • Inward-looking sub-sectoral communities • Stereotypical characterizations of organizations 	<ul style="list-style-type: none"> • Vagueness about cluster purpose • Relational factors undermining interorganizational trust
Cluster-spanning (Macro)	<ul style="list-style-type: none"> • Dependency culture in relation to governing institutional framework 	<ul style="list-style-type: none"> • Complexity and indeterminacy of cluster structures

Table 4: Barriers to learning – examples of authority and anomie

Authority

As the classification of in Table 4 suggests, many of the barriers to process learning are associated with a degree of centralization in clusters, and this is related to notions of authority at each level – whether of a charismatic individual, a sub-sectoral ‘tribe’ or a governing institution – which have the effect of limiting learning possibilities. We therefore characterize this type of barrier as *authority*.

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Actor-centred: Whilst the authority of focal actors may be helpful in imposing structure and advancing centralized communication, it seems that over-reliance upon them may hinder the development of other relationships in which socialized, informal learning processes are enacted. We found that focal actors were identified by themselves or by most other actors in the cluster, in most of the regions that we studied:

“I know everything that’s going on in optoelectronics in [location] ... if there’s something going on I don’t know about I find out about it pretty quickly.”

Economic Development Collaboration Representative

“[Cluster Co-ordinator] is well known, also internationally.”

University Academic

“But the driving force is [Cluster Association Co-ordinator], who’s paid for by public sector funding.”

Sector Consultant

Where such central figures are mentioned (this was less prevalent in Berlin-Brandenburg) their expertise may be characterized as relating to rather general knowledge about the nature of the cluster, or to more partner-specific knowledge; in any case, this concentration of knowledge can reduce the engagement of other cluster members in *local process learning*. Reliance on the authoritative knowledge of a central figure in the cluster was shown in our discussions with many cluster members, as illustrated below:

“...probably around 40 or so [core members]. That would be my guess. But again, [the cluster co-ordinator] would be a better indicator of that [...] I don’t know their

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activity in the optics cluster. That maybe [the cluster co-ordinator] could help answer.”

University Academic

“[The cluster co-ordinator] knows what we can do. If within the cluster he can see links, he’ll come and talk to us. Maybe not enough but the doors are open to do that.”

Large Company Representative

“I think again you have to ask [the cluster co-ordinator] about the national history.”

Research Institute Representative

In essence, such central figures – although thought of as network managers who create social space for interorganizational interaction – may also interrupt, rather than facilitate, the recursive, evolutionary development of network-based social systems within clusters (Sydow and Windeler, 1998, 2003). The reliance upon the central actor as a means of connection leads to deficiencies in the breadth of network connections developed by participants in the cluster. Emergent limitations in the pattern of relationships can have additional consequences; the reliance on a central actor exposes participants in the cluster (as in any collaborative context), to the risk of being reliant on a single individual’s competencies or understandings (Drualans et al, 2003; Williams, 2002), thereby limiting the potential for shared, *transferable process learning*. This is not to suggest that charismatic central actors are necessarily deliberately unhelpful or manipulative, but merely that their opinions (however benign) can easily become unchallenged norms because of their central influence.

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Cluster-fragmenting: Even a focus on a small central community (rather than an individual) may also be problematic, when it develops the character of collective authority. Barriers to both *local process learning* and the uptake of *transferable process learning* can be ascribed to differing notions of acceptable practice, associated with particular sectoral or professional groups or even different sizes of organizations. These variations in practice were important in our study since in each cluster, patterns of fragmentation were clearly present, although the particular emphasis varied. For example: in one region, sub-sectoral divisions seemed to be the most important; in another, it was the differences between academia and industry; and in a third, it was the large company - small company divide. However, there was evidence for multiple patterns of fragmentation in all of the clusters. The effect of these divides on the potential for learning was evidenced in two ways. First, there is a direct, ‘inwards turn’, which closed off the sub-group to others, as exemplified in the expression of actual or perceived norms and behaviours:

“...because I’m an academic, I’ve spent 20 years as an academic. I would like to share all the information I have about everything because that’s the way you get recognition...”

Economic Development Collaboration Representative

“And we’re big enough, such that people know what we do. There’s a big presence, there’s a web site. If anything people wanting to discuss things with us, we’re almost too big, we’re getting a little bit too intimidating to approach.”

Large Company Representative

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In addition, defining their own area of specialization (or even several areas) might prevent cluster members from exploring wider connections through an overwhelming focus on the importance of their own professional niche:

“And it’s just the ... disciplines are getting so deep into their own knowledge that they don’t see what’s going on sideways and it’s very important to try and see what’s going on sideways [...] When we speak to the chemists they speak a different language. I mean ... and it must be the same for them when they speak to us.”

Research Institute Representative

Second, there is also an indirect effect, in that insular groups develop stereotypical characterizations of those in other sub-groups (for example, different professional communities – Lehrer and Asakawa, 2003):

“They [venture capitalists] don’t give a darn about the technology. They just want to know the market size and the management.”

Cluster Co-ordinator

“...a lot of the people, you know, talk to each other in education.”

Large Company Representative

Such characterizations can mean that that even when circumstances favour inter-group *local process learning*, unfavourable preconceptions and expectations may obstruct productive engagement with partners from other subsets of the cluster (Hitt et al., 2004).

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Cluster-spanning: Authority is also a problem at the broadest level, when the members of a cluster become over-dependant on some governing institutional framework. In the cases we studied there was *some* form of institutional framework, although this was sometimes multi-layered and included a range of structures, such as: the ‘overlapping’ industry associations in Scotland and Arizona; the network administrative support organization in Berlin-Brandenburg; and the economic development agency programs in the West Midlands and Scotland. The impact of institutional authority upon the potential for learning *between participants* seemed to be particularly significant when associated with a source of funding or other resources:

“The problem with quite a lot of these clusters, [in particular locations] is, they’re all supported strongly by the public sector [who] try and generate action and the companies are [...] not really engaging as such.”

Sector Consultant

In such cases, cluster members become rather passive and are not actively engaging in the network relationships that are both intrinsic to *local process learning*, and can also act as channels for *transferable process learning*. Similarly, the role of overlapping, formal structures in ‘making things happen’ in the cluster seems to detract from collaborative learning:

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“The ‘RPA’ [the particular regional photonics association - most cluster members were participants] holds meetings so you really have to look at that to say what do you mean, what’s the difference between an association and a cluster. Is a cluster working together more? So is there much more interaction? In which case you need to know the companies more.”

Research Institute Representative

The quotations above thus illustrate two potential barriers. First, informal learning situations and possibilities at events without a clear institutional mandate may not be recognized, and potential learning relationships between participant groups are lost. Second, the very existence of a formal structure, with a formal program, can mean that participants see their interactions and learning possibilities as coming through that, rather than through actually ‘getting to know’ other participants more directly.

It is important to note that this emphasis on the negative consequences of authority in clusters on learning is largely related to *unintended* effects of intentional actions (Giddens, 1984). It does not preclude such possibilities as an authoritative person or organization seeking to stimulate process learning in networks or clusters, through emphasising relationships, or cluster-overlapping structures incorporating processes that deliberately potentiate collaborative learning.

Anomie

It is also possible for learning to be limited because of disconnection, a lack of a sense of collective purpose, or even uncertainty about the nature or reality of the collective and a

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resultant lack of effective social norms. That is through *anomie*, which is apparent at each of the levels of analysis.

Actor-centred: At the actor-centred level, the particular foci of interest of each participant in the cluster can result in a pattern of diversions that is unique, so that each participant comes to rely on their individual experiential learning trajectory, which may be rather random:

“I didn’t know until a couple of years ago when I was doing a market survey.”

Economic Development Collaboration Representative

In particular, a common phenomenon in the evolution of photonics clusters is that large trans-national companies (TNCs) are not actively involved in the development process. Such companies might be very important for a cluster because they employ many knowledgeable people, make important resources available, link the region characterized by ‘local buzz’ to other parts of the world via ‘global pipelines’ (Bathelt et al, 2004) or, even more importantly, act as lead customers. However, individual learning may occur either only within the TNC, only within segments of the region or, even worse for cluster development, only with other companies outside the region. Such international networks were commonly referred to by large company representatives participating in our study (as well as some larger research organizations). This international focus has the consequence of limiting the potential for sharing *transferable process learning* insights within the cluster:

“... What a cluster does in my view is, take some competences in, like universities, DTI and the micro electronics institute you know, enabling ideas [...] you get strength

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from many. You can share things around there and you would pull together different things. So in some ways we're too big, too mature to fit into that. You will probably find that the companies like Ericsson, Marconi are a bit in the same way."

Large Company Representative

This perceptual barrier between large companies and the cluster organization was also observed from the 'other side', as participants commented on the necessity of including 'big players' but also the apparent limitations in their engagement:

"Large corporations are involved because you cannot operate without having them. So in some cases they benefit from our activities but they don't actually subscribe to our activities."

Cluster Co-ordinator

Thus actors from large corporations are seen to be important to the cluster, but for them the potential learning opportunities lie in different sets of (often international) relationships, and learning connections within the cluster suffer in comparison. Even for participants that are 'fully' engaged in the cluster, isolation and self reliance is also related to the way in which roles and relationships in collaborative contexts, such as regional clusters, emerge and evolve over time. This leaves each individual participant in possession of a different partial picture, which always lags behind current patterns (Kale, Dyer and Singh, 2002; Perrone, Zaheer and McEvily, 2003).

Cluster-fragmenting: We have also seen that cluster-fragmenting barriers to process learning arise from disconnection with other organizations and structures involved in the

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collaborative context, and uncertainty about the purpose of collaborating within the cluster (Huxham and Vangen, 2000). Two kinds of example of this relational kind of barrier are evident in our data. First, evidence in our data suggests that learning how to collaborate may not take place because company representatives seem to be most aware of the competitive independence of their organizations, rather than their (potential) inter-relation with others. Second, participants may feel obliged to avoid imagined conflicts of interest that arise from such perceptions. These issues are illustrated by the following quotations:

“There isn’t a feeling of belonging to the community. Each individual company is absolutely independent of any other optics or opto-electronics company.”

Economic Development Collaboration Representative

“See the other thing too is you want to avoid any conflict of interest. We cannot afford as a cluster to be in a situation like that.”

Large Company Representative

The issues alluded to above result in a lack of belief in the communitarian nature of the cluster, which obstructs engagement. This also connects with Cullen et al’s (2004) observations that the enactment of certain institutional or cultural values can be a driver of anomie, and the notion of ‘competitiveness’ is one such driver. More concretely, competitive values may also be a cluster-fragmenting issue if learnt capabilities emerge amongst the cluster coordination body, and are perceived to overlap with the business interests of particular participants:

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“In fact, as time goes on, they will become more threatening to the participants within [the cluster...]. They said, ‘we now wish to offer that service.’ I said, this was the service my company provides. [...] But now you’re becoming a competitor to us. How is that?”

Small Company Representative

Even when there may be a degree of faith in the notion of the cluster and coordinatory functions within it, the complexity and infrequency of patterns of interaction can mean that learning effectively becomes disconnected from its ‘roots’, such that locales of learning are hard to re-identify:

“During the meetings people always absorb information and then it ferments/ brews in the back of people’s heads. And then weeks or months later it is [...] hardly accountable to any particular meeting.”

Research Institute Representative

More generally, it seems that learning in clusters is hindered by confused and uncertain patterns of power and trust between partner organizations. In this respect our findings confirm similar insights from research in other (non-cluster) collaborative contexts (Everett and Jamal, 2004). In part the issues of trust and power that we have identified connect with the multiple levels and structures of authority in the clusters, as discussed earlier in this paper. But a lack of trust also seems to be grounded in a number of other factors, such as a concern for the protection of intellectual property, as some cluster participants were clearly reticent about sharing knowledge:

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“[A laser company] is very, very cautious with information that they make externally available. They come to gatherings/meetings and look and listen but they don’t say very much.”

Company Representative and Sub-group Coordinator

More generally, cluster participants often had attitudes to particular kinds of member organization which affected who they would regard as safe to engage with in a knowledge sharing relationship (Huxham and Hibbert, 2008); thus their engagement was necessarily limited to fragments of the cluster.

Cluster-spanning: At the broadest, cluster-spanning level, anomie in regional clusters is related to the complexity and indeterminacy of structures within such collaborative arrangements (Benson-Rea and Wilson, 2003; Sydow and Windeler, 2003). Participants in our research indicated considerable uncertainty about the nature and composition of the clusters in at least two of the four cases. Such difficulties seem to be part of the *local process learning* challenge, but it is the particular vagueness in the cluster situation that can be seen as a barrier:

“Looking at it from another way, there is the State Science and Technology Institute in Washington D.C. and they came up with a high tech company definition [that defines membership in the cluster] this definition leaves a lot to be desired because it misses a lot [...] and that then is the universe according at least to a set [of] data. So one never really does know. As you know.”

University Academic

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Thus there was an uncertainty about which organizations were involved in the cluster, and perhaps even some scepticism about whether the cluster was purely an artificial construct, a ‘universe according to a set of data’. This barrier even applied to those central figures identified as ‘experts’ in the cluster (of the kind alluded to earlier); even they only worked with a minority of specialist groups, and were uncertain about the full range of interests:

“It’s homogeneous in a sense but we are all different that we have like maybe 24 different specialties. And I am maybe involved in six of these 24.”

Cluster Co-ordinator

The cluster that is seen to be relevant and real is thus quite likely to be different for each particular participant, and it need not bear any relation to an ‘official’ description or external image. In addition to variations in perspective at any given moment in time, there is uncertainty – but also change – in the way that the clusters are perceived to be driven or developed. This relates in particular to whether this is seen to be a ‘top-down’, often publicly-led process or something rather more emergent, which might be associated with industry-level normative pressures, as the following quotation illustrates:

“I think industry sort of defines people in their strengths and brings them together as a team...”

Cluster Association Co-ordinator

Thus we see a variety of contributory influences that result in participants, who typically stem from different ‘societal spheres’ (Giddens, 1984) and ‘epistemic communities’

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(Lawson, 2000), seeming to have limited knowledge of the sectors, organizations, professional groups and individuals that form the cluster, and the ways in which the cluster develops over time. More importantly, collectively these influences result in different perspectives about what (or whether) the cluster is *for* particular participants. This is a serious limitation to potential collaborative process learning of any kind, as the cluster may not actually be recognized as a viable collaborative context. This is exacerbated by the fact that its structures will change over time (Enright, 2003) – as will the relationships within it – further destabilizing the picture perceived by the cluster participants. As a result, clusters may (as in three of the four cases we investigated), also lack a coherent cluster identity. A coherent cluster identity is a signal that the cluster is seen as ‘real’ by its participants, and thus an enabler of broader engagement (Romanelli and Khessina, 2005). It is perhaps for this reason that in the one case where such an identity was apparent, cluster-spanning anomie did not seem to be a significant issue.

IMPLICATIONS FOR INTERORGANIZATIONAL LEARNING

Implications for theory

This research leads to implications for theorizing interorganizational learning, particularly in relation to the possibilities and limitations for overcoming barriers to process learning. Whilst much extant literature suggests that practitioners understand learning in collaborative contexts to be an individual-centred process (for example: Assimakopoulos and Macdonald, 2003; Drualans et al, 2003; Huxham and Hibbert, 2008; Huxham and Vangen, 2005; Lehrer and Asakawa, 2003; Olk and Earley, 2000; Williams, 2002), there are two qualifications to this interpretation that seem to be important.

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First, Handley et al.'s (2007) connection between identity, participation and learning seem to be valid; recognizing the existence of a defined collective (such as a sub-sectoral, focussed group) that is 'for me', can be connected with openness to sharing knowledge and enables learning *within* such structures. However, our evidence relating to 'inward focussed' sub-sectoral groups suggests that such groups also tend to introduce barriers to learning across more diffuse networks in clusters; interorganizational learning is hindered by the anomic failure of individuals to become socialized into the common values and social identities (Oldenquist, 1991) of a broader grouping (such as a regional cluster). Our study has suggested that this failure is rooted in uncertainty about the precise nature of the collective as well as disbelief about its relevance. Going further, in such circumstances common values and coherent social identities may not even be established at the broadest collective level.

In a related point, we have also been able to suggest a relationship between the anomic disconnection outlined above and a particular ideological context. We see at least some evidence that an excessive reliance on free-market competitiveness, combined with unrestrained avarice for material reward leads to the economic anomie described by Johnson and Smith (1999); but we also see that this insatiability in the economic sphere can undermine relationality in the social sphere, leading to broader levels of societal anomie and dysfunction (Mestrovic, 1991). Under such conditions, the basis for participative process learning and the corollary generation of substantive knowledge (Hibbert and Huxham, 2005) can be limited. Thus we suggest that there is an ideological dissonance that undermines the full development of the collaborative potential of regional clusters.

Second, some *individuals* in our cases did learn (or at least thought they did), even if this was not as optimal or widespread as might have been wished; but returning to the individual-collective organizational learning debate, we tend to agree with Antonacopoulou (2006) and Antonacopoulou and Chiva (2007) that a full understanding of learning must

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consider the individual-centred, relational and societal aspects of situated processes. Societal and relational factors may militate against the effective socialisation that is the foundation of collective learning, but it seems that enough ‘connection’ can happen for some individuals to allow collective learning on some scale, perhaps in emergent cluster ‘fragments’. Thus it can be argued that collaborative policy initiatives can support the development of useful interactive groupings, but that these may cohere along lines of recognition decided by the participants as they become involved in such initiatives (rather than some very broad cluster network). The focal question, then, is to identify how it might be possible to extend the range and potential of social connections to facilitate broader, and perhaps more generative, learning possibilities.

With more specific regard to barriers to process learning, we may conclude that knowledge about such barriers has significant implications. Most particularly, these barriers and the possibilities for learning need to be considered as being multi-level and inter-related; a focus on theorizing at a single level of analysis may therefore present a partial and potentially flawed perspective. Situating theory within and across the levels we have described would, however, allow for the development of a richer and more robust characterization of interorganizational learning processes. Therefore we suggest that integrating the multi-level insights on barriers – as we have done in this paper – may be a necessary, though not necessarily sufficient, condition for the development of a better understanding of micro-level processes of knowledge acquisition, creation and diffusion within regional clusters. This therefore contributes to an emerging line of cluster research focussed on these issues (e.g. Ibert, 2004; Malmberg and Power, 2005).

Implications for managerial practice and policy

It can be suggested that more distributed structural patterns of relating might be advanced to

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overcome barriers to process learning. However, as our research has shown, there is a risk of cluster participants falling into anomic barriers to learning if they are faced with a situation that is too diffuse and indeterminate. The solution to anomie in collaborative contexts seems to be focalized structures, but that also carries with it authority barriers to learning. Indeed, these phenomena may actually be related; Gemmill and Oakley (1992) suggest that the perceived need for authority in the form of individual leadership results from a sense of helplessness in the face of ambiguity and uncertainty about how to act. They also suggest that the myth engendered in this way serves to reinforce feelings of helplessness and alienation. A kind of heroic leadership comes to be a 'social hoax' reinforcing the anomie-inducing climate. Unsurprisingly then, Tsahuridu (2006) found that feelings of helplessness and hopelessness associated with anomie were common across all kinds of organizational forms, from loose markets to highly bureaucratic structures. Thus authority can go hand in hand with anomie, rather than providing a solution. To overcome this quandary, what is perhaps needed is an alternative relational model, in which cluster participants are encouraged to see the process learning challenge as a complex challenge that can only be resolved – if at all – collectively.

We suggest that what is needed, therefore, is the *collective imagining* of a learning community, realized conversation by conversation, connection by connection, day by day. A holistic approach to process learning, in regional clusters and beyond, therefore requires engagement, participation and dialogue, that somehow avoids active management (Shotter, 2005), in the context of an approach that sees building and sustaining of relationships as the purpose of the cluster, or other interorganizational form. Interestingly, it seems that this indirect, process oriented approach might also be the best way to develop the potential for mutual, transformational participation that is the foundation for generative, substantive learning (Brown and Duguid, 2001; Handley et al., 2006, 2007).

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For policy makers, therefore, there is a need to develop a suitable climate and a range of locales for socialized learning, as well as encouraging cluster participants to take on the organization of the necessary spaces and processes for themselves. For participants within the cluster, there will be a need to balance competitive interests and scarce management time with a consideration of how the potential for collaborative progress can be identified and explored. This might involve engaging a broader range of organizational actors in cluster activities and considering how internal organizational learning processes can take advantage of the range of insights that might potentially be collated in this way, such that more active engagement with potentially important partners can be triggered when advantageous. This will nevertheless require a degree of openness, and a commitment to investing in cluster relationships, so that the tension between authority and anomie is balanced out and *enough* trust is established to deliver knowledge about potential partners and collaborative opportunities.

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