Learning for sector change: the development of a knowledge sharing and learning network

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Introduction

Globalisation is placing unprecedented challenges on the manufacturing base of the UK. A frequently cited response is for the UK to move "from a location competing on relatively low costs of doing business to a location competing on unique value and innovation" (Porter and Ketels, 2003). One key mechanism for meeting this challenge has been identified as learning and innovation across value chains. Whilst each firm has an internal value chain (involving logistics, operations, marketing and sales etc), "the firm's value chain interconnects with that of other firms to form an extended value chain or system" (Edwards, et al., 2004).

The industry sector[1] studied here typifies the challenges of globalisation. Product development in this sector is a collective activity, requiring the exchange, combination and integration of varied specialist knowledge, throughout the value chain (Hobday and Rush, 1999). Whereas business improvement and learning for change is primarily focused at the individual or organizational level, learning also needs to involve learning *in the context* of organizations that interact. Learning may be transferred or co-created across organization boundaries. This is particularly challenging for value chain members who collaborate to deliver to one customer but compete on other projects. The locus of learning in this industry can no longer be considered to be the individual or the firm but increasingly the network in which a firm is embedded (Powell, Koput and Smith-Doerr, 1996).

Learning networks and network learning

A significant literature has accumulated in recent years on organization learning resulting in a multitude of perspectives (Easterby Smith and Araujo, 1999). Elkjaer

[1] The sector is not identified here to preserve the anonymity of the organisations involved.

(2004) argues that the organisational learning literature has often been separated by those authors who focus individuals' acquisition, processing and transfer of knowledge (Argyris and Schon, 1996; March and Simon, 1958) and those authors that suggest learning takes place during social interactions in everyday organisational practice (Lave and Wenger, 1991). A further distinction in the literature has been the systems level of the 'learner' under study (Knight, 2002). Bapuji and Crossan (2004) in a meta-review of the field argue that most of the literature on organisational learning addresses learning at the individual, group and organization levels. Far less attention, however, has been paid to organisational learning as a function of inter-organisational networks (Dyer and Nobeoka, 2000). Whilst this research is sparse, studies have demonstrated the importance of learning that occurs in alliances and joint ventures (Liebesking et al., 1996) and in the interstices between firms, universities, research labs, suppliers and customers (Powell et al 1996).

Research highlights the importance of interpersonal relationships on learning (Cross and Sproull, 2004). In inter-organisational networks "close interaction is important, especially for complex products, since it enables exchange partners to appreciate each other's needs and capabilities and adapt their own needs and capabilities accordingly" (Nobeoka et al., 2002, p. 721). By engaging in collaborative activities, actors develop a sense of 'networkness' (Human and Provan, 2000), which creates a network identity and rules for knowledge sharing (Dyer and Nobeoka, 2000). Other researchers, adopting a network perspective, have demonstrated the importance of social relationships for acquiring information (e.g. Granovetter, 1973) and how social structure affects the diffusion of innovation (Rogers, 1995; Burt, 1992).

The literature on inter-organisational learning tends to address learning *within* the context of networks by actors (e.g. Bessant and Francis, 1998), few contributions have, however, explored learning *by* networks (Knight and Pye, 2004). Knight (2002: 436) highlights the importance of network learning – 'learning as a group of organisations as a group'. Such a conceptualisation is premised that organisations and inter-organisational networks are learning entities in their own right, rather than simply structures in which individual or group learning takes place. Organisational learning, and similarly inter-organisational network learning, is evidenced by changes in their,

> "systems, structures, procedures, culture and schemata which reflect, and are reflected in, changing patterns of action (routines strategies)… an important marker that helps us to identify organizational learning, as opposed to individual or group learning is whether the cognitive structures and behavioural patterns endure despite personnel turnover" (Knight, 2002: 432)

She argues learning can take place in four systems levels,

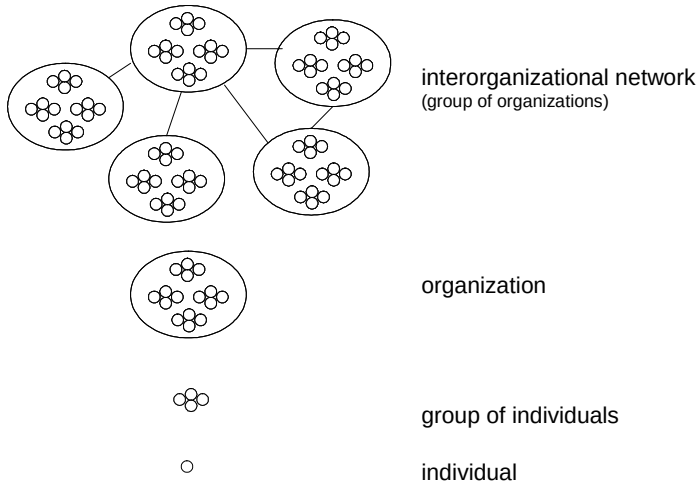

Figure 1: Systems levels of 'learner', (Knight, 2002: 436)

This case describes a key UK manufacturing sector and its' attempt to create a mechanism for network learning. The aim of the inter-organisational network the aim was to facilitate learning by the network as well as learning within the network.

Scope of the inter-organisational network learning project

In 2002 the Department for Trade and Industry launched a task force to draw together the expertise of major stakeholders in the industry and to look 20 years ahead, considering the ways in which the sector could evolve to meet future challenges. In 2003 five working groups were established, tasked with implementing the recommendations made by the task force.

Key to the implementation of the recommendations was the role of the industry's trade association [hereafter 'society'], re-configured to support industry in a structure

aligned to that of the task force with the remit of establishing practices that would enable the industry to 'systematically and continuously deliver productivity improvement at a rate faster than its competitors'. Three demonstrator pilots were established along with the concept of a Sector Learning Directory (SLD) *{note this was not the original name, changed for anonymity}*. The Sector Learning Directory (SLD) proposal evolved, at least in part, through the recognition the there is a danger of the learning from these pilots being lost to the industry as a whole**,** unless new methods of dissemination are established. This fuelled the need to quickly establish the SLD and the results of the pilots were to be accessed via the Sector Learning Directory.

The aim of the SLD was to be a core process for delivering learning to the industry in the context of business performance improvement. It was to be the first source for ideas, experiences, and evidence based performance improvement tools and techniques.

This evolution also posed a challenge for learning in the industry. Process excellence demonstrators, mimetic learning from cases of best practice and a focus on cost plus, improvements to process and efficiency all allowed the industry to succeed in a highly competitive global environment. However, there was a growing recognition that this strategy for business improvement may be necessary but not sufficient to maintain competitiveness and sustain growth for the future. The industry has specific characteristics which**,** taken together, comprise the environment in which competitiveness and sustainability are needed. These can be thought of as

- Low volume and highly configured products to meet exact customer requirements
- Project based industry—few repeaters and runners/lots of strangers and prototypes
- High technological complexity
- Long life product cycle
- Through-life service contracts or products designed for extended service lines.

- Intricate connections between members of supply chain and end user such that any failures over life time in one domain affects all elements of the value chain
- Extraordinary focus on product reliability and safety which can never be at the expense of cost reduction

This means that the industry as a whole is concerned with configuring products and services on a basis that requires: a detailed understanding of the customers' idiosyncratic needs: new ideas and innovations in both what to produce and how to organise production and delivery: multiple approaches to business improvement; and also requires an understanding of how different businesses impact on the end users and consequent need to collaborate within the value chain, in order to meet customers requirements.

In future the value chain is envisaged as the unit of competition and so the industry will be shaped by companies each providing a unique set of activities, occupying a competitive space that can be rapidly re-configured to deliver changing operational capability but within the context of the value chain. This requires a clear grasp of innovation, macro-economic and productivity-related issues and future growth trajectories. Traditional notions of strategy and top down communication will be replaced by individuals and teams who understand the core values and vision of the value chain and who work with high levels of discretion to meet these ends. Loose structures will require tight cultures. Creating such organisational conditions will require mindset shift in leaders and managers, who will need to rethink their assumptions about how to conduct business and redesign their own roles within the system, as well as focusing on the processes that can deliver a different product capability. These value chains comprise processes that require inter-organisational collaboration and common purpose-and yet the businesses that house these processes also house other elements of business which may compete with the businesses that they collaborate with in certain value chains. Understanding the dynamics of value chains would be a core competence of the SLD.

Terms of reference for the project team

[It should be noted here that the initial scope described in this paper does not cover all the facets of the SLD that would be produced, such as the Ideal Type for the industry (based on Weber's notion of Ideal Type) and the derived futures map that accompanied this work, nor do we explore the way the SLD would be implemented--the focus in this paper is on the SLD as it contributes to understanding of learning in a network rather than the SLD project as a whole as it is conceived and executed by the industry. We would like to emphasise that the points of view reflected in this paper are those of the authors and do not necessarily reflect those of the Society and sector for whom this work was carried out.]

Against this backdrop of high expectations and urgency, the SLD was a new concept, which for a few was 'understood' and mentally scoped. For much of the industry it was at best a good idea waiting to happen and for many it wasn't on the radar. This project was part of the efforts to realise the SLD in practice. The project was undertaken in three parts.

The first was a report which provided an underpinning and set of learning principles that would be suitable to guide the development of the SLD. The second was the production of a set of principles and guidelines for producing workbooks, and a set of workbook pilots, which could be used for transferring best practice form one pilot into the industry as a whole. The third was the production of a Systematic Review process whereby the industry would acquire meaningful knowledge from the wider literature base than usually explored and in a form that could inform industry developments.

Research approach

The project undertaken on behalf of the Society can be best thought of as a piece of mode 2 research (Gibbons, Limoges, Nowotney, Schwartman, Scottand Trow, 1994, Tranfield Starkey, 1998, Starkey and Madan, 2001). There are a number of challenges that are associated with mode 2 research, and which need to be considered in conducting the work. Building on earlier work by MacLean, and MacIntosh, (2002), Burgoyne and James (2006, forthcoming) suggest that a number of imperatives and

choices need to be considered. Important in this project were two of their choices: how the existing literature would shape the research and deciding how to extend the research beyond case exemplars to enable reflective practice and generalisable findings beyond the research sites. The third imperative was also important: to recognise the tensions to be managed derived from diverse and/ or implicit epistemological or ontological assumptions informing research orientations; these need to be managed or unresolved tensions can influence the viability of the research collaboration.

The Cranfield team had a key link to Society through a consultant working for Society on this and other projects, who formed part of the research team. A consultation group was also established which met twice at key stages in the development of the work to review progress.

Project 1 –scoping the SLD

In producing the first report the literature was crucial to establishing the principles that would underpin the SLD. The need for this was established because, in a parallel experience to that described by Burgoyne and James (2006), there were potential differences in emphasis between the researchers and client about the nature of transfer of best practice. The pilots chosen for the development of the workbooks were a vehicle by which transfer of learning across the industry network was to begin under the auspices of the SLD. The nature of these workbooks was unclear but the practitioner orientation to description, and the academic orientation to understanding and analysis, was apparent in early meetings.

The researchers believed, based on their understanding of the client need to transform the sector, their experience as learning professionals and their knowledge of change and learning literature, that descriptions of practice alone would not effect the changes needed by the industry; this was in part because although the projects were described in terms of their technical content, the social processes of change embedded in them were implicit rather than explicitly discussed. Rooting these out would be a key part of the project.

The first report which established the basis for the later work on the pilots therefore drew widely on organizational learning literature but in particular, the notions of organisational learning cycles involving reflective practice, abstraction of learning and systems for capturing and disseminating new practice (Dixon, 1994) and levels of learning (adapted from Mezirow, 1991) as these were particular ideas that resonated in discussions with industry representatives. The report proposed that provision of static content was insufficient to bring about mindset change at an inter-organisational level. People needed to see the relevance of the SLD and find its vehicles for supporting learning both engaging and appropriate to their needs. The notion conjured up in the title 'Sector Learning Directory' that had been established by the industry might have had elements of 'yellow pages', 'dial a learning event' etc according to the interpretations of some industry members to whom the researchers talked in the early stages, and might imply that learning was a package that could be sent off for rather than a process in which people engaged. The idea of collective and collaborative learning was also important and understanding the notion of learning as not only an individual experience but embedded in groups, organizations and wider networks needed to be established at the outset. Developing the idea of the SLD away from the 'yellow pages' image was important in establishing learning as a process rather than content alone.

The idea of levels of learning (learning within context of my existing frameworks; learning new meanings within existing my framework requiring translation to context; learning that challenges existing assumptions and beliefs and requires letting go of outmoded frameworks; transforming perspective and understanding how to learn and how to step outside of existing framework to transform into a completely new vision) and the organization learning cycle (widespread generation of knowledge about the issue to be addressed; integrating the new knowledge into the organisation context--into the organisation's goals and targets, strategy, policy, and plans; engaging with others widely in the organisation so that people collectively understand what the issues and changes might mean to them; organisation members taking responsible action based on the interpretation of this new meaning which feeds back into step 1) moved the project on from description of, to reflection and learning from, experiences in the pilots that could be captured in terms of principles or abstractions from the experience that would be valuable to others.

In the context of the SLD this was understood to require a process for the individual organizations/teams involved in the pilot process excellence demonstrators to reflect on and capture their experience and knowledge, a process for taking that learning across to another part of the industry network and a process for capturing key knowledge that is publicly available and that could add to the learning of collaborators in the learning network. The phrase which captured these ideas that industry identified with was 'insight rich, not data bound'.

Thus from the first report two further pieces of work were commissioned

- Workbooks that would both capture learning in the form of generalisable knowledge and principles which would also provide the basis for reflection and initiation of new activity elsewhere in the network
- A Systematic Review process which would provide an exemplar of how existing knowledge could be captured, synthesised and made available to the industry network

Project 2 Excellence Demonstrator Pilot Cases—workbooks

It was clear that the production of workbooks would be a complex process; the three main cases were given by the Society as the ones to be researched and a number of others in early stages were offered for further consultation.

The cases offered were in a varied state of completion and the learning was to be captured with hindsight rather than alongside the changes. Each represented a different part of the value chain and involved key industry players.

The researchers, who were associates of the University and experienced both in executive learning delivery and in academic research, undertook the fieldwork in the role of learning facilitator. They visited the people involved in leading the pilots and other team members and drew out the learning they had gained from the pilots.

It was quickly established that their role was not to capture learning but to elicit learning. This was an important message to get across to the client who had framed this process originally as capturing learning. However, it was apparent that the pilots had typically been action oriented and pressures of business and perhaps personal preferences had led to very little individual and virtually no collective reflection on what could be learned from the experiences, even where major change had been initiated. The importance of de-coupling organization change form organization learning was noted. A second finding that quickly emerged was that whilst the client had described the pilots in terms of technical change projects, the learning that was emerging from the elicitation process was more frequently centred on social and organization processes. The third issue to emerge was that it would be helpful to understanding the learning from the perspective of the different levels of learning; this was important in order to locate the kind of principles that could be abstracted and also to establish what kind of transfer might be possible from one pilot into the industry as a whole.

In addition to visiting the pilot sites the researchers also talked with academic supports from three universities that had been working alongside the pilots and this provided invaluable insights that added to their understanding of the pilots.

Once an initial round of interviews had been conducted, the researchers gathered to make sense of their experience with the pilot organizations. They understood themselves to be involved in three stages of work each involving a number of iterations;

- Eliciting learning from the pilots
- Making sense of the data they had now captured, bringing in the academic supports' reports and the conversations with them
- Creating workbooks as part of the process of enabling transfer of learning across the sector

The elicitation process was by far the most time consuming activity; the workbooks as the visible output were the tip of the work iceberg.

The final report noted

'The process of eliciting learning retrospectively is not a simple case of capturing already existing learning. The actions involved in a pilot do not necessarily and immediately lead to the learning emerging. The old adage 'I do and I understand' was found not to be the case at all. In fact the initial scoping meetings that formed the start of the process of elicitation, and which formed the basis of the December report, identified areas where what actually happened at what time and in what order was not clearly recalled. Even more importantly it became evident that the difficult task of identifying actions was not in any way the same as identifying learning.

Moving from what happened in the course of a pilot to the learning gained from undertaking the pilot is a lengthy process. It involves an interactive process of questioning, summarising and repeated iterations of the learning derived to reach any form of reliable basis for transferable learning.

The key to eliciting learning is the process of making the learning explicit and expressed. This is essential if others are to benefit from the pilot experience.

This process means that there is a clear distinction to maintain between the role of academic support (subject experts on the pilot themes) and learning facilitator to develop the workbook.

Where the facilitator role is present, the pilot leads have indicated that the apparently altruistic process of passing on learning to others in fact turns out to have added value for them

Collating and distilling the learning is a skilled process. The case writer must have both an open mind to what has been gathered and the ability to develop a model or framework for organising what has been gathered.'

The creation of the workbooks rested entirely on the elicitation and sense making process and the organisation of the material for the workbooks needed to adopt a

structure that would enable the new user to understand the pilot, relate to their own circumstance and then go through a process whereby the relevance of the pilot's learning for their own situation could be assessed and incorporated.

The final report noted

'The initial work was done on retrospective cases and this forms the main body of the workbooks to date

From our experience we now believe a better way to gather information and elicit learning is alongside a project, concurrently. Ideally the case-writer/facilitator is involved in supporting the team set up a learning contract and then helps elicit the learning at key pre-determined points during the project. This process allows for eliciting and capturing to be done together throughout the process.

Learning beyond level 1 requires a dynamic interaction between the changes organization wide, including issues related to context and changing current practice, which impact on attitudes and reactions to change and which interact with the specific technical issues involved. Thus in our revised workbooks we have grouped the learning points to create three learning tasks for users:

- *Learning points centring on process/technological issues*
- *Learning points to do with managing and leading the pilot*
- *Learning points which focus on relationship management such as communications, team dynamics and working across boundaries*

Each of the key learning points specific to the pilot in each of these tasks needs attention for transfer to occur. We have developed the workbooks to include focussed questions for users to reflect on, and indicate the tools needed to support the reflection process and generate actions. '

Pilot workbooks were produced but are considered as work in progress –they need to be adapted and developed by users and the report proposed they should be used in

conjunction with learning facilitators familiar with the pilots and the industry rather than stand alone products. They are guides to the learning process not ‘how to’ manuals—or to capture an expression often heard in the industry they are not ‘plug and play’.

The key to the workbooks is that they place the learning in the industry context and the level of learning context and then articulate and join the steps the pilot demonstrator took with the key learning points related to each of these steps.

The final report also produced a process and pro-forma for eliciting learning and a process and structure for the creation of the learning transfer through the workbook and a learning contract for use in future concurrent cases.

Project 3 Systematic Review

In order to create a knowledge base of the best available evidence, many disciplines have made significant strides in developing rigorous and reliable review methodologies. In medicine, education, social policy and other fields, Systematic review has become an agreed and formalised procedure for synthesising and disseminating existing research.

Systematic reviews are rigorous studies that apply ‘the same standards to secondary research (where the unit of analysis is other research studies) as should be applied to primary research’ (Davies and Crombie, 1998: 2). Tranfield, Denyer and Smart (2003) state that systematic reviews include:

- the development of clear and precise aims and objectives;
- pre-planned methods;
- a comprehensive search of all potentially relevant articles;
- the use of explicit, reproducible criteria in the selection of articles for review;
- an appraisal of the quality of the research and the strength of the findings;
- a synthesis of individual studies using an explicit analytic framework; and
- a balanced, impartial and comprehensible presentation of the results.

High quality systematic review reports are conducted according to a review protocol, specifying how the study was conducted. This is necessary not only to help reduce bias, but also to ensure that all decisions are made transparent (Denyer, 2004).

The aim of the systematic review for the Sector Learning Directory was to address aspects of intelligent servicing of complex product systems. Intelligent servicing is a transformation system that enables complex manufactured products, such as aircraft, to achieve predictive near-zero-downtime performance as well as to synchronise with business systems through the use of web-enabled information (Lee, 1995).

As part of the search strategy, 15 databases covering management publications were assessed. A two citation databases (ABI-Proquest and EBSCO) were selected to conduct the searches. In addition, conference papers and selected documents from the Internet were reviewed. Combinations of the following search strings were used to locate articles:

- (Condition-Based OR condition monitoring) AND (maintenance OR asset management)
- (proactive maintenance)
- (asset optimi?ation)
- (intelligent maintenance)
- (device-to-business)
- device relationship management
- Product reali?ation
- (diagnostics and prognostics) AND (maintenance OR asset management)

In total, 291 potentially relevant studies were located. A review team consisting of 5 academics and 1 practitioner from the industry selected 38 studies, which were deemed to be relevant. These studies were synthesised to provide recommendations for practice and further research.

Discussion

Learning as a network ‘as a group of organisations as a group’ (Knight, 2002: 436) cannot occur unless learning occurs within lower systems levels. Using Knight’s

(2002) matrix of learners and learning contexts (Figure, 2), the key focus of the project was to facilitate learning within the inter-organisational context by organisations, groups and individuals (denoted by the shaded areas in the matrix below).

Context of learning

Level of learner	**Individual**	**Group**	**Organisation**	**Dyad**	**Inter-organizational**
Individual	Individual learns alone	Individual learns within a group	Individual learns within an organisation	Individual learns within a dyad	Individuals learn within a network
Group	Group's learning is influenced by an individual	Group learns through intra-group interaction	Group learns within an organisation	Group learns within a dyad	Group learns within a network
Organisation	Organisation's learning is influenced by an individual	Organisation's learning is influenced by a group	Organisation learns through intra-organisation interaction	Organisation learns within a dyad	Organization learns within a network
Dyad	Dyad's learning is influenced by an individual	Dyad's learning is influenced by a group	Dyad's learning is influenced by an organisation	Dyad learns through intra-dyad interaction	Dyad learns within a network
Network	Network's learning is influenced by an individual	Network's learning is influenced by a group	Network's learning is influenced by an organization	Network's learning is influenced by a dyad	Network's learning is influenced by an intra-network interaction

Figure 2: Cross-tabulation of level of learner and context of learning (Knight, 2002: 438)

A key aim of the project was to take learning at the lower systems levels and elicit, explicitly express and synthesise it in order that the learning is captured and understood and transformed into a process that can be transferred, tailored and then embedded in another locality. The study, therefore, fits within the 'acquisition' paradigm of organisational learning research (Elkjaer, 2004) and contributes to a limited number of studies that have focused on the transfer of learning from one organisation to another (Argote, 1999).

The project also highlights the importance of understanding learning as a social process, despite its origins in the idea of transfer of best practice with its attendant notions of description and content. The project provided an environment for dialogue and collective reflection on what could be learned from participant's experiences. People learned through working together with others in a social learning process (Powell, et al., 1996). Thus, the project also supports the constructivist perspective that the individual does not learn alone but 'learning takes place within a framework of (social) participation, not just in the individual mind' (Elkjaer, 1999: 81). People in the project constructed their understanding 'out of a wide range of materials that include ambient social and physical circumstances and the histories and social relations of the people involved' (Brown and Duguid, 1991: 47). The project supports Araujo's (1998) contention that learning occurs between networks of actors within communities of knowing that exist between organisations. She highlights the importance of heterogeneous networks of social relationships that transcend organisational boundaries.

Conclusions

Learning about existing best practice and ensuring the whole industry/sector adopts it can be necessary but is not sufficient. Learning must enable organizations to see their own business in the context of the whole sector—as a part of a network of organizations.

Learning to meet the major change challenges that led to a focus on sectoral learning is usually required at level 3/4 (Mezirow, 1991) whereas most organizations struggle beyond level 1.

Learning needs to be collaborative and yet recognise the organizations concerned are often competitors. The sector discussed in this paper comprises both SMEs and large corporates and so conversations are difficult to conduct where the players have multiple business interests and different power and resources within the industry. There needs to be an understanding that the larger the pot of 'learning', the more it can benefit all contributors. This may be more likely when learning is not understood as technological advantage or direct adoption of a specific practice but a sharing of understandings and experiences which can then inform other players but still requires them to re-think and create new solutions for their own context.

Businesses need to be in business 'tomorrow' and so the business improvement model is powerful and perceived as highly relevant whereas for example, 'changing mindsets' seems academic or even fanciful. The mode 2 approach to research can be helpful in understanding what challenges need to be met and provide a framework for collaboration on the clients issue, whilst enabling researchers to bring their own knowledge into the process; language and understanding 'what fits or resonates' is very important and perhaps one of the most difficult aspects of this collaboration. In the end our work was seen as academic even though we believed we had adopted industry language.

The key to success of this UK industry sector may well depend on the ability of individuals and organisations to engage in simultaneous, collective and integrated learning for change to meet common environmental demands. Members of the network need enhance the whole network's potential to sense and react to new issues or opportunities.

Knight (2002) draws a key distinction between strategic networks and wide networks. The lack of collective action yet requirement for aligned action, the lack of single common purpose yet the requirement to contribute to the same end product and the more varied types of organization in a very diffuse network make learning in a sector

as a whole challenging. Whilst our understanding of these challenges is still limited, the present change agendas in health services and education, for example, as well as manufacturing suggest that this is of growing interest. Given that these networks require social learning processes that result in new forms of relationship, they present an excellent opportunity for future research.

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