Network learning: An empirically derived model of learning by groups of organizations

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ABSTRACT   Building on a previous conceptual article, we present an empirically derived model of network learning – learning by a group of organizations *as a group*. Based on a qualitative, longitudinal, multiple-method empirical investigation, five episodes of network learning were identified. Treating each episode as a discrete analytic case, through cross-case comparison, a model of network learning is developed which reflects the common, critical features of the episodes. The model comprises three conceptual themes relating to learning outcomes, and three conceptual themes of learning process. Although closely related to conceptualizations that emphasize the social and political character of organizational learning, the model of network learning is derived from, and specifically for, more extensive networks in which relations among numerous actors may be arms-length or collaborative, and may be expected to change over time.

1. Introduction

The idea of 'network' is long established in social and natural science, but in the last 15 or so years its use has burgeoned; in much the same timescale,

interest in learning in organizations has also grown. Academics from many disciplines including sociology, economics, public policy, and organization studies have researched networks and learning. Both are complex concepts subject to different interpretations that, from a theoretical perspective, can help us to describe and explain aspects of organizational life. From a practical perspective, this understanding might help us to influence change and developments to improve capability, and so performance. This article brings together 'network' and 'learning' to illustrate empirically a model of 'network learning' – learning by a group of organizations as a group (Knight, 2002).

The key premise of the study reported here is that the notion of learning by networks might be as useful to theory and practice about interorganizational networks as organizational learning has proved to be for understanding organizations and organizing. The study began with an investigation of research on learning in interorganizational settings and a review of the literature on networks and organizational learning, to test and develop the initial, tentative definition of network learning into a more robust conceptualization (see Knight, 2002). This then provided the basis for empirical inquiry, to evaluate and elaborate the concept. Here, we present the key findings of this second phase, and discuss how our model relates to conceptions of organizational learning and our initial conceptualization of network learning.

This introduction is followed by a brief review of the concept of network learning, and the literature on which it was based. In part 3, we describe the research process. The fourth part of the article introduces the main empirical setting, which provided five episodes of network learning. One of these is described in more detail, and then used to illustrate the model of network learning explained in part 5. This model is critically evaluated in the discussion section. Finally, we present our conclusions, together with some implications for practice and future research.

2. An initial conceptualization of network learning

Crossan et al.'s (1995) review of organizational learning (OL) literature elaborates a distinction between learning by individuals and learning by groups – both of which they term learning *within* organizations – and a third, 'organization-centred' view of OL. They also proposed a fourth level of learning – interorganizational learning (IOL). Our subsequent review of the literature revealed, however, inconsistency in uses of terms relating to learning in interorganizational settings. Based on prior research and building on Crossan et al.'s (1995) arguments, we concluded (Knight, 2002) that:

- the fourth system level of 'learning entity' after individual, group and organization is (interorganizational) network;
- the term IOL is best applied to learning within an interorganizational setting, whether by individuals, groups or organizations;
- in analysing OL from an organization-centred perspective, learning is indicated by changing organization-level properties, such as systems, processes, culture.

From this, we conceived of 'network learning' as learning by a group of organizations *as a group*. In this specifically network-centred view, changing network-level properties, such as shared practices and processes, would indicate network learning. Network learning, by definition, would be characterized by changes to network-level properties; in the absence of such changes, there is no network learning. Network learning is not merely the 'sum' of learning by the individuals and organizations that make up the network (after Crossan et al., 1995). If, for example, changes within an organization had no discernible effect on network properties, then we would say that, at most, there has been organizational learning within the network (a form of interorganizational learning).

To evaluate this initial conceptualization, we first examined published, description-rich cases of change in interorganizational networks. The sources found (Kouzmin et al., 1995; McHugh, 1995; Nathan & Mitroff, 1991; Paton et al., 1998; Spender, 1989) provided strong evidence of network learning, although it was rarely described in those terms. They enabled us to elaborate the concept (see Knight, 2002) sufficiently to design further, empirical investigation of the subject.

In our own prior research on organizational learning, we were able to recognize learning outcomes as being behavioural, cognitive, or both (Crossan et al., 1995), through observing changes to, for example, routines and strategies, and widely shared values and procedures. The cases of network learning found in the literature suggested that this categorization of learning outcomes could also be useful in investigating network learning.

Learning process is an aspect of learning that is generally neglected in organization studies (Easterby-Smith & Araujo, 1999) and is described in several contrasting ways (Huysman, 1999; Prange, 1999), such as: alignment with the environment, the consequence of strategic management and leadership, institutionalization, information processing, learning from experience. Cook and Yanow (1993) point out that many conceptualizations of organizational learning process are grounded in an information-processing view (Huber, 1991) of OL developed from the study of individual, cognitive learning (see, e.g. Larsson et al., 1998; Levinson & Asahi, 1995). While

intending to work with the categorization of cognitive and behavioural learning outcomes, we recognized that some notions of learning process might give undue emphasis to formal, purposive learning and so we sought to explore 'proactive and emergent, and formal and informal, processes of institutionalisation, communication and sense-making in networks' (Knight, 2002: 447).

Having distinguished interorganizational learning and network learning, it also seemed important to consider the relationship between network learning and learning networks. In line with distinctions made between organizational learning and learning organizations (Easterby-Smith et al., 1998; Tsang, 1997), we concluded that learning networks are networks whose purpose is to learn. Therefore, although network learning might be regarded as a normal process that goes on in every interorganizational network (after Easterby-Smith, 1997), not all networks are learning networks.

3. Research process

The concept of network learning was explored through qualitative and longitudinal investigation of the interorganizational network that provides prosthetics (artificial limbs) services in the English health sector. It was also informed by additional data from two further health networks, for electronic assistive technology and pressure area care equipment. Data were collected through participant-observation and interviews, and from documentary sources, and were analysed using the construct of 'network learning episodes' and Pettigrew's (1987, 1990) context–content–process (CCP) model of strategic change in complex organizations.

The construct of 'episode' was developed from the secondary cases of network learning mentioned earlier. In each study, researchers had to bracket and punctuate (Weick, 1995) network experience to create temporal and structural boundaries for their empirical case. Each case abstracted in this sense from network context can be seen as an 'episode' of network learning. In the prosthetics service, five network learning episodes provided the basis for empirically evaluating the notion of network learning. So, in this comparative case study research project, our analytic case – the focus of inquiry – was an episode of learning within the empirical setting of an extensive interorganizational network (Ragin, 1992).

One of the authors began participant-observation in the prosthetics network in 1997. Thirty-four planned and formal interviews were undertaken between November 1999 and May 2001. These were complemented by many informal discussions and extensive use of documentary sources to

provide real-time and retrospective data on developments in the networks, which for the prosthetics network went back as far as the mid-1980s. Finally, in May 2002, 12 key members of the prosthetics network provided feedback on a draft document summarizing the principal findings.

4. Network context and learning episodes

The network

The key network actors in the English prosthetics service are represented in the illustration of the network in Figure 1. In England, most amputees and people with congenital limb defects receive care funded by the National Health Service (NHS). Several, well-established patient groups represent them, and some groups and individual campaigners have high public profiles, through the media and relations with Members of Parliament (MPs).

NHS patients attend one of 34 Disablement Service Centres (DSC), where personnel from a range of professions provide care, which is funded by health service commissioners. Private sector service contractor employees (prosthetists and technicians) are part of the clinical team, along with NHS-employed doctors, nurses, therapists and rehabilitation engineers.
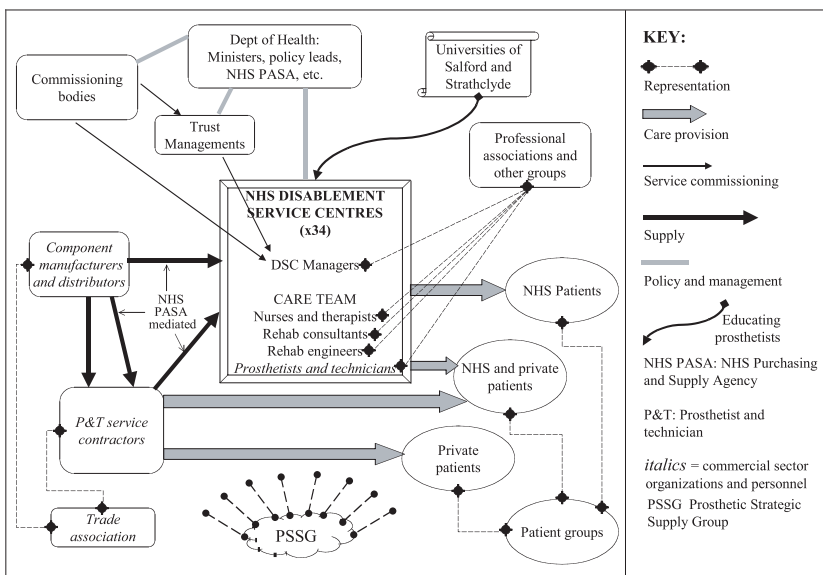

Figure 1 Illustration of the prosthetics supply network in England
Source: Knight and Pye (2004).

Each centre is based on a hospital site, and centre managers are accountable to their host Trusts, and to the health authorities, which commission services.

In the commercial sector, there are service contractors, component manufacturers and their trade association. NHS Purchasing and Supply Agency (NHS PASA) personnel are involved in all NHS contracting for prosthetic services and most purchasing of componentry. Four firms provide prosthetist and technician (P&T) services to NHS centres. These firms also manufacture and distribute componentry, and provide services to privately funded patients. The business of two other companies relates to the provision of componentry, and services to private sector patients.

Centre managers, suppliers to the NHS, professional associations, patient groups and commissioners are all represented in the Prosthetic Strategic Supply Group (PSSG), which was established in 1998 by NHS PASA's predecessor organization, to facilitate communication between these network sub-groups and coordinate improvement initiatives.

From early interviews, a number of key themes, which were considered current and important by actors across the network and which had implications for network properties, were apparent. These provided the basis for five 'network learning episodes', two of which relate to governance arrangements, two to new technologies and the fifth to the development of a profession within the network. This article now focuses on one of the technology episodes, relating to the introduction of silicone cosmesis.[1]

Silicone cosmesis: a case of network learning

Traditionally, prosthetic component manufacturers have invested most of their R&D resources in developing products with increasing functional capability:

> I suppose years back, people didn't worry about what it looked like. They wanted something that was comfortable, that worked. You have to remember that the greater majority of the people years back then were serving soldiers come back from the war and they wanted a limb to get on with their life.
>
> (Supplier)

In recent years, stimulated by pressure from patients and patient groups, there has been increasing interest in improving limb appearance by developing limb covers with a more lifelike appearance. One firm, Company A, offers a spray-on product that provides a colour-matched finish over the limb

cover. In the US, a much more sophisticated product was developed – the high-definition silicone cosmesis (HDS cosmesis). Each HDS cosmesis is crafted by an expert technician. The finished look includes hairs, veins, freckles, etc. This is a relatively expensive product, of the order of £2500 per cover (compared with less than £1000 for the remainder of the components for a limb). An HDS cosmesis is more fragile than more basic covers and typically lasts 2 or 3 years.

The technology was imported to the UK in the mid-1990s by Company B, which only provided limbs and covers to private patients. The company supplied HDS cosmeses to several people who took leading roles in campaigning for the provision of better NHS prosthetics services generally, and NHS funding for silicone cosmeses in particular, which included participation in national TV programmes and lobbying MPs and government ministers.

Before the media campaign began, some DSCs had been working on improving limb appearance, both through use of the more basic technologies and by funding a very limited number of patients to be referred to Company B (a firm which does not have any service contracts at NHS DSCs).

> We already saw the need. We were getting some feedback from our patients but (they were) not going to the press. Because of the area that we . . . worked in, (inner city boroughs), we had a lot of ethnic minorities; therefore we had always been into different colours, and different limbs to enable them to carry out their normal work. For example, just to pray they had to have a special knee that they could kneel down . . . It was our goal to improve the cosmeses of the limbs that we supplied. We looked at different things. We looked at spray finishes, we bought Company A spray guns and we did lots of trials . . . Our objective that year was to improve the look of what we supplied.
>
> (Centre manager)

Because other centres refused to provide any HDS cosmeses, these attempts to meet special needs for appearance resulted in different care being provided in different regions (termed 'postcode prescribing'). Because the government was committed to ridding the NHS of inequalities in care provision, this placed campaigners in a powerful position, though some criticized the way the campaign was conducted:

> they got someone from one of these fashion TV shows to take this young lady around Oxford Street shopping. It gave the impression that

> because she had this nice looking leg now, she could go shopping. It annoyed a lot of people.
>
> (Patient representative)

Others pointed out that the campaigners did not represent the vast majority of service users:

> I would like someone to come in (to the centre) with a camera, I'd say, 'Come and see what we actually do, come and see what this is – What actually happens in here day to day and the sort of people that we are dealing with. We are not dealing with young female models'.
>
> (Prosthetist)

In the autumn of 1999, following prominent TV coverage, two suppliers announced their plans for improving cosmesis. One, Company C, having recruited the chief technician from Company B, set up a silicone cosmesis workshop to produce low-, medium- and high-definition silicone cosmeses. Company C's business strategy relied on many UK patients choosing to pay for their own cosmesis and in supplying international markets. Company D opted for a different strategy – large volume and low margin sales – and launched a more durable, low definition, and low cost (approximately £200) product. Later, the chief technician originally at Company B moved on again, this time to Company E that also set up production facilities, which meant that all the main NHS suppliers had entered the cosmesis market.

Under pressure from campaigners, the Department of Health committed £4 million over 3 years for silicone cosmeses (which equates to approximately £5000 per annum for each health authority serving approximately 600 potential prosthesis users). Some network actors believed that this funding was only forthcoming because the government feared adverse media attention during the course of the 2001 general election.

In response to the public criticisms, the merits of silicone cosmeses were widely debated among all the professions in the network, and they continue to be so. There are areas of agreement but also many caveats and sources of dissent. For example, many agree that young women should have a high priority, and that a model should have cosmeses because they enable her to work; others believe it is wrong to focus on young women, as many men and older people are also interested in better appearance. There is disagreement about whether children should have HDS cosmeses, since: (i) children should not be encouraged to conceal their disability; (ii) because they are growing, their cosmeses would need to be replaced frequently, and funds for one child would meet the needs of several adults:

most young kids of 8 and 9 years old, they batter lumps out of their artificial limb. You can send them away with a beautiful looking leg and . . . the next day you'd think they'd had it through a cement mixer!

(Prosthetist)

Some see the product as offering aesthetic benefits only and that it should not take up scarce NHS resources that could be better applied to improving comfort for the many, rather than appearance for the few. In contrast, others emphasize the important psychological benefits of good limb appearance, and assert that cosmeses should be regarded as an integral part of care for all patients.

The health authority was saying 'we need some criteria', and I said 'It's based on clinical need, isn't it?', but they said 'It's not clinical'. I said 'But it is clinical – if you feel that this person needs a silicone cosmesis, clinically needs it, then yes, you do it.' Even though they were a doctor, they could not grasp that somebody might need to have a leg that looks like a human leg for all sorts of reasons, other than just it looks like a leg. There could be a whole host of psychological, social, emotional, postural (reasons).

(Commissioner)

This quote illustrates the complexity that underlies a decision about whether to provide patients with this new technology. Clinical teams that were used to dealing with the more technical aspects of care provision were challenged to relate patient's psychological, social and emotional needs into clinical criteria and protocols.

. . . and it's all based around the person, those sort of decisions, and it's very, very difficult to write a real protocol for that type of thing . . . the decision is a team decision . . . psychology is a theme of that decision. (What) [w]e have (also) said is that there are certain clear things – that you don't get one if you're not an adult; you don't get one if you are not an established limb wearer with a stable stump; you don't get one unless you have a mobility grade of X; and, if you do get one, you only get one every three years and then, the kind of last one is, the decision is ultimately a clinical decision made by the consultant in consultation with the prosthetics team.

(Centre manager)

Suppliers, whose margins have been very low, had the opportunity to increase turnover and profit, but only if there was a net increase on

componentry spend (whether funded by the NHS or privately). For government at a national level and for managers locally, there were issues of political pressure to be balanced against resource allocation choices:

> I still have a problem with the fundamental concept of providing a cosmetic improvement to a prosthesis, when you are comparing other shortfalls in assistive technology services.
>
> (Centre manager)

The first tranche of national funding was distributed to health authorities for the financial year 2001/02. Despite pressure from the Department of Health, DSC managers and patient groups, in 2003, many DSC managers were still liaising with commissioners to get the funding allocated to them, and demand and supply of cosmeses through the NHS had yet to stabilize. The network learning episode was therefore seen as ongoing.

The next section presents the model of network learning that was derived through cross-case analysis of the five episodes, with illustrations from the silicone cosmesis episode.

5. A model of network learning

Data analysis within and across the episodes was framed using Pettigrew's (1985, 1987) context–content–process model of strategic change in organizations, and thus our model of network learning is also organized around these three factors. Also, we have differentiated between descriptive and conceptual elements; each part of the model is presented.

Descriptive elements of the model

Context

For the prosthetics network at the time of the study, the many facets of the outer context could be grouped into three main categories relating to: (i) the health service in England, and in particular plans for its reform; (ii) the area of disability – rights, awareness, organizations and campaigns; (iii) practice in market management and contracting between the public and commercial sectors. The inner context of the prosthetics network was described in terms of its history, purpose, actors and their relationships, and its 'routine' operations.

Content: changes in network-level properties

In line with the initial conceptualization of network learning, the 'content' of network learning is the set of key changes to network-level properties occurring within and between the episode's temporal boundaries, which are relevant to the focal topic of the episode. For the silicone cosmesis episode, the key actual and prospective learning outcomes are listed in the second column of Table 1.

Process: 'sub-plots'

The actions and interactions through which network-level changes occur are not evenly distributed in time or among network actors, but can be seen as coalescing into a number of 'sub-plots', literally 'a story within a story', which comprise critical components of the episode storyline. These key developments represent learning process within an episode. In the case of silicone cosmesis, we discerned nine sub-plots which, together, describe the unfolding of the episode (see third column of Table 1).

Across the five episodes, 42 network learning outcomes and 46 episode sub-plots were distinguished. These provided the basis for developing the conceptual aspects of the model, described next.

Conceptual elements of the model

Cross-case comparison enabled us to identify a number of common, critical features that were consistently apparent in all episodes.

Context: key factors

Although the prosthetics episodes share a common context, the impact of particular contextual factors on the unfolding of an episode varies from episode to episode. The important feature of contextual factors is that they must be regarded in conjunction with each other. That is, analysis of context is not just about whether a factor enables or constrains change, but how factors interact and compound or reduce one another's impact upon the way learning episodes develop.

The silicone cosmesis episode is particularly affected by disability rights/awareness; changing attitudes in society supported, or indeed drove, campaigners' efforts to have NHS-funded HDS cosmeses. And yet other actors in the network drew on different contextual factors, notably lack of funding for basic services and the fact that campaigners were not

Table 1   The silicone cosmesis network learning episode, categorized by conceptual theme

Content conceptual themes	Outcomes	Sub-plots	Process conceptual themes
Changes to **network interpretations**	• value of limb fit and function versus appearance and comfort • expenditure on non-essential products in the context of scarce resources; need versus want • whether the service in England is good or poor; coping with adverse media attention	• developing silicone cosmesis, and other appearance-related technologies • suppliers setting up production in the UK • (not) distributing central funding • setting up national contract • service providers at centres organizing themselves for providing and, especially, rationing the provision of silicone cosmesis and related products	*developing method*
Changes to **network structures**	• private and NHS funding for cosmeses, some from central government investment programme • manufacturing facilities and supply chains established • 4 suppliers of P&T services to the NHS involved in cosmeses in 2002 versus none in 1998	• at local and national levels, choosing to make limb appearance an improvement priority, including allocating funds • suppliers deciding to invest in cosmesis production	*developing commitment*
Changes to **network practices**	• widespread provision of high-, medium- and low-definition cosmeses • rationing of high-cost products • prescribing and fitting silicone cosmeses	• developing the view that limb appearance matters, not just limb fit and function • developing the view that the NHS might / could / should fund better limb appearance	*developing meaning*

typical of the elderly majority of service users, to make the opposite case. Another example is that government's policy to devolve decision-making to local levels and its policy to eradicate regional inequalities in care provision and outcomes (i.e. postcode prescribing) are clearly in tension in this case.

By considering the relationships between key factors, and not just the factors themselves, we can better bring together the 'global and local' to provide an integrative, systemic narrative and analysis of the case. This supports a network perspective (Granovetter, 1992) of network learning that recognizes the embeddedness (Dacin et al., 1999) of actors, events, learning episodes, etc.

Content: network practices, structures *and* interpretations

In the silicone comesis episode, we can observe that 'operational' network learning, which is needed to produce, prescribe, fit and maintain silicone cosmeses, involves both behavioural and cognitive learning. Activities are informed and guided by knowledge, procedures, policies, etc., which are developed through learning at all system levels – for example, individuals learn new skills, groups develop protocols, organizations are adapted to provide the new service. Rather than differentiating between cognitive and behavioural learning, this analysis suggests that at the network level, widespread changes to the way patients are cared for are more usefully seen as changes to **network practices**. These are about behaviours but also include the more technical aspects of knowledge that underpin practice.

Changes to formal organizational structures can be seen as a type of cognitive learning outcome; they represent senior management's understanding of how to organize to best meet organizational goals. This idea does not, however, smoothly translate to the level of extensive interorganizational networks, in which the configuration of the network and the quality of relationships are typically the collective, emergent consequences of multiple, more localized and fragmented actions. Therefore, a second type of learning outcome – changes to **network structures**, such as the establishment of new manufacturing facilities and supply chains for cosmeses – was differentiated.

As with organizations and organizational learning, there are network-level changes that are related to aspects of the culture of the prosthetics network. In the case of silicone cosmeses, the traditional value placed on limb fit and function compared with limb appearance is being challenged, with consequences for the identity of the network, in terms of its core purpose and priorities. Such learning outcomes could be collectively labelled changes

to 'network culture', but the notion of culture suggests such a breadth and multiplicity of issues, some of which refer to practice and structure, that instead, they are seen here as examples of changes to **network interpretations**.[2]

Process: developing meaning, commitment and method

The first process-related conceptual theme – labelled *developing meaning* – is about the development of shared meaning relating, for example, to values, identity, frameworks and causal maps. Here, the term 'shared' is employed in the sense that they are 'held in common' (rather than 'distributed' (Weick, 1995)), and 'common' in the sense that they are held by many, but not necessarily all, actors in the network. An example of a *developing meaning* sub-plot relates to changing views about the relative value placed on limb appearance, fit and function, triggered by the availability of silicone cosmeses.

The unfolding of a network learning episode is shaped by a vast number of choices and decisions whose impact on the episode can be major or minor, direct or indirect. Their significance to the network and the episode may be immediately apparent, or may only emerge in the longer term. In the case of the silicone cosmesis episode, suppliers, and health service managers and policy personnel have actively deliberated and made explicit decisions to invest. In other episodes, however, many of the critical choices were more incidental – they were not actively taken, or explicit. Also, the network-level implications of local choices were often not considered; for example, Centre Managers who led efforts to improve limb appearance were concerned with their local patient community rather than the effect of their actions in generating regional inequalities. It, therefore, seems more appropriate to refer to this second conceptual theme as '*developing commitment*', rather than decision-making.

The third conceptual theme for network learning process is *developing method*. Essentially, this theme covers the sub-plots of the learning episodes that relate to innovating and (re)organizing. These sub-plots concern putting into place necessary technologies, structures, relations, systems, routines, resources, etc., such as clinical criteria and protocols for prescribing silicone cosmeses.

Many of the sub-plots, especially those categorized within *developing commitment* and *developing method*, relate to activities undertaken within organizations, or among subsets of network actors. Cumulatively, they have network-level consequences but the processes are not of themselves network level. For example, because resolving technical problems relating to silicone

cosmeses offers suppliers competitive advantage, research and development (R&D) activities tend to be undertaken within commercial organizations. R&D priorities and benefits are, however, determined and received by the wider community.

Table 1 summarizes learning content/outcomes and sub-plots for the silicone cosmesis episode, categorized by conceptual theme. Figure 2 presents the model of network learning in diagrammatic form, showing the relationships between its descriptive and conceptual elements and emphasizing the recursive relations between network learning context, content and process.

In relating learning process and outcome themes, caution is required concerning the assumption of exclusive correspondence between the two sets of themes: linking *developing meaning* with changing **network interpretations**, *developing commitment* with changing **network structures**, and *developing method* with changing **network practices**. The simplicity of this correspondence has some appeal but it is not supported by more detailed analysis. For example, sub-plots categorized within *developing commitment* have implications for **network interpretations** (e.g. determining funding priorities is intimately linked to the relative value placed on limb function, comfort and appearance) and changes to **network practices** can influence *developing meaning* (e.g. provision of improved cosmeses affects expectations about provision). So, there are important and multiple links within and between the various types of sub-plots and learning outcomes. The data
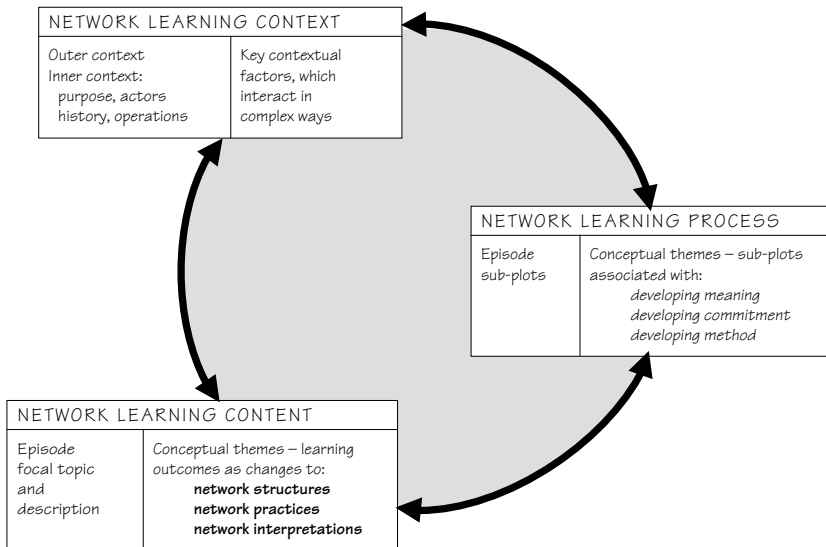

Figure 2   Model of network learning

show that the order and timing of developments are highly complex and iterative.

6. Discussion

Network learning outcomes

A key difference between the initial conceptualization of network learning and this empirically derived model is that learning outcomes are not categorized in terms of behavioural and cognitive change. Instead, the outcome/content conceptual themes more closely reflect social, political, situated and practice-oriented perspectives (e.g. Araujo, 1998; Coopey & Burgoyne, 2000; Gherardi, 2000) in more recent OL literature.

To be considered as learning, change to network-level properties would have to endure for some time; a passing change might be significant in terms of learning process (i.e. a relevant aspect of a sub-plot), but we would not think of it as a learning outcome. That is not to say, however, these changes must be homogeneous across the network. Szulanski (2000) describes how the process of knowledge transfer within complex organizations is 'sticky', and Anderson's (1999) account of technology transfer relates how small 'communities' of cement plants did not follow the national trend in switching to a new technology. Furthermore, changed **practices**, **structures** and **interpretations** that seem similar at a macro-level analysis can be diverse in their detail; for example, clinical protocols may differ between centres, while nevertheless sharing many common features. In summary, changes in network practices, structures and interpretations must be widespread and enduring to be seen as network learning outcomes, but they need not be universal or uniform.

We recognize that the use of 'change' to identify learning invites the challenge 'why not simply speak of change and changing, rather than learning outcomes and processes?' We have addressed this question in greater detail elsewhere (Knight & Pye, 2004). In summary, we find that change evokes notions of change management, and planned, rational change, whereas the notion of learning is more useful in abstracting key changes from the stream of network life, to capture the (mainly) emergent developments in a network around an important issue over the long-term.

Many authors on organizational learning (e.g. Argyris & Schön, 1978) distinguish between orders of learning, regarding first-order learning as 'within the frame', whereas second-order learning is associated with more fundamental, often cultural, change. In this study, there is evidence of changes that fit both categories of orders of learning, but there is not a simple

relationship between **network practices** and first-order learning, or **network interpretations** and second-order learning. Furthermore, such an analysis would not cater for changes to **network structures**. Whether one would define a given outcome, or set of outcomes, as first- or second-order learning depends very much on the perspective one selects, in terms of: level and timescales of analysis; actors' perspective; and the point in time we make the analysis.

For example, for DSCs that had been providing some highly specialist, expensive products such as sports limbs for some time, the provision of silicone cosmeses is first-order learning; other centres need second-order learning to develop and implement the highly sensitive prescribing protocols for silicone cosmesis. Taking a network perspective, the technology itself seems less important than its implications for care objectives (fit and function 'versus' appearance), for funding priorities in the context of scarce resources and for the impact of campaigning and lobbying on ministers' and local NHS managers' decision-making. Different orders of change/learning make sense in this study, but the construct does not have sufficient explanatory power to add value to or further strengthen the conceptual model of network learning set out earlier.

Network learning processes

We initially focused our analysis on the notion of institutionalization but found that this did not help us 'get close' to the data and develop a richer understanding of *how* network learning happens. Breaking down the complex storylines of episodes into sub-plots proved to be a critical stage in making sense of learning process, enabling us then to identify the three conceptual themes described.

Cognitive views of learning are clearly very different from the description and analysis of network learning presented earlier. From a cognitive perspective, the silicone cosmesis episode might be regarded as simply the introduction and implementation of a new technology in a health service. This, however, would provide an impoverished account of the episode, which has actually been a highly politicized and emotive process of change that has challenged some fundamental aspects of network identity and in which network actors have had to contend with great uncertainty. The elements of the model are not specific to knowledge and information processing, rather they present learning as changing 'practice' (Gherardi, 2000) and as a *political* process (Easterby-Smith et al., 2000).

The order in which the conceptual themes of learning process are presented – first, *developing meaning*, second *developing commitment*, and

third *developing method* – might be taken as implying that these are seen as stages in the network learning process, and this was in fact how some respondents in the feedback process seemed to interpret the draft findings. When, however, specific examples were discussed with them, interviewees agreed with the analysis here, that *developing meaning*, *commitment* and *method* can in fact occur in any order, and they may be consecutive or concurrent.

Sub-plots' constituent activities are typically localized rather than occurring across the network as a whole. For example, a few individuals were instrumental in importing silicone cosmesis technology from the US and in campaigning for it to be funded through the NHS. In due course, as 'followers' adapt and adopt what others have previously developed, network norms become established. Thus, unlike network learning outcomes, network learning processes are not, by definition, network level; the initiation and early development of what may be seen as new 'industry recipes' (Spender, 1989) occur at a system level 'below' network. This insight – that network learning outcomes are network level, and yet learning processes are localized – elaborates a 'network-centred' view of network learning.

Networks that learn

Busenberg (2000) and Kouzmin et al. (1995) discuss how networks can continue to learn over the long-term. Although they do not refer to them in these terms, they are concerned with developing learning networks. Whereas some of the literature on learning organizations has a 'faddish' (Newell et al., 2001) tone, Busenberg's and Kouzmin et al.'s approach (see also Lane, 2001), together with evidence from the empirical phase of this project, suggest that the distinction between learning network and network learning is not as clear cut as initially envisaged (Knight, 2002).

In the eight years since we began participant-observation in the prosthetics network, there have been several changes that have led to an increasing level of integration and coordination, much of it under the auspices of the PSSG. Progressively, the contribution of the PSSG has developed from serving as a communication hub, linking previously well-established groups representing sub-sections of the network, to a more active change facilitation role, with influence upon the unfolding network learning episodes. So, the particular network investigated in this study can be viewed as both a network in which network learning is a 'normal process' (Easterby-Smith, 1997), and a nascent learning network (i.e. a network which is good at learning, and whose members share a commitment to learning).

Network learning episodes

The proposal that network learning episodes would serve as suitable analytic cases for empirical inquiry was strongly supported by our investigations of the prosthetics service, and the other two networks (electronic assistive technology and pressure area care equipment). Each account of an episode is developed from a 'collage' of multiple texts. An essential condition for bracketing a part of network 'life' as a network learning episode is that it includes (at least the prospect of) network learning outcomes (i.e. changes to network-level properties). This condition alone would, however, suggest that in principle, and especially given a network perspective emphasizing embeddedness (Dacin et al., 1999), almost any network experience could constitute a network learning episode, because the smallest action or feature can be related to the wider network context. The feedback received from network actors on the draft findings confirmed, however, that the five episodes are meaningful to them, and so justifies the approach adopted here.

Although it is not always explicit, many OL researchers assume a link between learning and performance (Crossan et al., 1995; Huysman, 1999). Cook and Yanow (1993) suggest, however, that learning need not be associated with performance improvement. We found that where changes occurred that delivered (perceived) improvements in performance, it was because there was a new alignment, or consonance, between **network interpretations**, **structures** and **practices**. If structures and practices increasingly reflect and are reflected in the values, identity and goals of the service, there will be a shared sense that progress has been made during the course of the episode, that the network has moved forward. We see this notion of progress during the course of an episode as more relevant to analysing network learning than performance.

Conclusions

This article reports the principal findings of an empirical investigation designed to evaluate empirically the notion of network learning – learning by a group of organizations as a group. The initial conceptualization of network learning drew on prior research on organizational learning, and learning and change in interorganizational settings. The need to gather evidence from extensive networks, rather than strategic networks with few actors, was recognized, as was the challenge of gathering network-level data in such settings.

The willingness of members of the English prosthetics service to provide access, and the long duration of our engagement in that network,

have provided the depth and breadth of evidence necessary to track key developments in the service. The early identification of five episodes of network learning provided foci for subsequent data collection. Pettigrew's CCP framework was an essential factor in structuring and enabling the analysis of the resulting, substantial dataset. Together, these factors allowed us to discern several common, consistent and critical patterns in learning process and outcome, and so develop the model of network learning presented here.

Based on this, we argue that our revised conception of network learning is closely related to but not isomorphic with social, rather than cognitive, views of organizational learning. Learning outcomes are seen as changes, which occur within episodes, to three types of network-level properties – **network practices**, **network interpretations** and **network structures**. Learning processes are seen as relating to: *developing meaning*, *developing commitment* and *developing method*; these processes occur within the network, and may not themselves be network level. There are multiple, complex, and often iterative, links between contextual factors and the various learning outcomes and processes found in an episode. The model thus provides a network-centred view of network learning (after Crossan et al., 1995), and emphasizes a network perspective (i.e. embedded, see Dacin et al., 1999; Granovetter, 1992) of network learning.

The notion of network learning could rightly be viewed with considerable scepticism, if more faddish views of networks and learning were adopted. This study has, however, attempted to approach both topics more cautiously. Networks are seen as bracketed groups of organizations – complex or otherwise, with economic, social, technical or political links between actors – which are regarded as an integral part of the organizational domain, rather than necessarily characterized by actors' awareness of their membership of these networks and participation in collaborative relations. Learning is seen as a normal process (after Easterby-Smith, 1997), which occurs in networks, rather than an activity which is necessarily purposive or associated with improving performance.

We advocate further research on network learning, following several complementary themes. First, more theoretically oriented, this perspective of network learning could be related back to extant theory, notably sense-making (Weick, 1995). From a research content point of view, the model of network learning needs to be evaluated in different empirical settings. In particular, learning process should be investigated in more depth, as should the relationship between network learning and progress/performance. Focusing on process and progress would take forward our understanding of network learning, but might also help with conceptualizing organizational

learning, because these topics are under-researched in the field of OL. In methodological terms, this study contended with the challenges of research-ing (i) learning process in (ii) extensive interorganizational networks and (iii) taking a long-term, macro perspective of a phenomenon which is observable at the micro-(social, political) level. We propose to test and extend what we learnt about the process of researching network learning during the course of further research.

From a practical perspective, at one level, this study has developed an approach for gathering and organizing data to produce a network-level narrative around an issue that network actors commonly hold to be important. Their feedback on the draft findings was very positive; they were able to relate to the account of the network generated through use of the concept of 'network learning', despite their different backgrounds, experiences and perspectives. The value of our approach needs to be assessed in other network settings. At another level, these narratives may be useful for influencing network development. It is possible to envisage circumstances in which practitioners would benefit from shared, coherent, network level, and yet 'decentred'[3] accounts, as they seek to work together in networks.

It is widely argued that politicians, public servants and those engaged in commerce can no longer afford to view organizations in isolation from one another but need to adopt a more integrative, holistic 'network' perspec-tive, if they are to manage the increasingly complex and uncertain tasks of business and government. Dealing with change and facilitating learning in interorganizational networks is seen as a critical aspect of these tasks. Here, network learning – learning by a group of organizations *as a group* – is proposed as a concept that holds promise for researching, understanding and developing network practice.

Acknowledgements

Notes

1   We are presenting different cases in different articles. The 'professionalization' episode is described in Knight and Pye (2004).

2   As noted by an anonymous *Human Relations* reviewer, 'interpretation' can suggest passivity. For us, however, interpretation also has active connotations, deriving from the active verb, to interpret, and requires that the interpreter engages in an act of interpretation, however habituated, routine or responsive the outcome (i.e. interpretation) might be.

3   By which we mean accounts that are not structured around focal actors or events/initiatives.

References

Anderson, P. Collective interpretation and collective action in population-level learning: Technology choice in the American cement industry. *Advances in Strategic Management,* 1999, *16,* 277–307.

Araujo, L. Knowing and learning as networking. *Management Learning,* 1998, *29,* 317–36.

Argyris, C. & Schön, D. *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley, 1978.

Busenberg, G.J. Innovation, learning, and policy evolution in hazardous systems. *American Behavioral Scientist,* 2000, *44,* 679–91.

Cook, S. & Yanow, D. Culture and organizational learning. *Journal of Management Inquiry,* 1993, *2,* 373–90.

Coopey, J. & Burgoyne, J. Politics and organizational learning. *Journal of Management Studies,* 2000, *37,* 869–85.

Crossan, M., Lane, H., White, R. & Djurfeldt, L. Organizational learning: Dimensions for a theory. *The International Journal of Organizational Analysis,* 1995, *3,* 337–60.

Dacin, T., Ventresca, M. & Beal, B. The embeddedness of organizations: Dialogue and directions. *Journal of Management,* 1999, *25,* 317–56.

Easterby-Smith, M. Disciplines of organizational learning: Contributions and critiques. *Human Relations,* 1997, *50,* 1085–113.

Easterby-Smith, M. & Araujo, L. Organizational learning: Current debates and opportunities. In M. Easterby-Smith, J. Burgoyne & L. Araujo (Eds), *Organizational learning and the learning organization*. London: Sage, 1999, pp. 1–21.

Easterby-Smith, M., Crossan, M. & Nicolini, D. Organizational learning: Debates past, present and future. *Journal of Management Studies,* 2000, *37,* 783–96.

Easterby-Smith, M., Snell, R. & Gherardi, S. Organizational learning: Diverging communities of practice? *Management Learning,* 1998, *29,* 259–72.

Gherardi, S. Practice-based theorizing on learning and knowing in organizations. *Organization,* 2000, *7,* 211–23.

Granovetter, M. Problems of explanation in economic sociology. In N. Nohria & R. Eccles (Eds), *Networks and organizations: Structure, form and action*. Boston: Harvard Business School Press, 1992, pp. 25–56.

Huber, G. Organizational learning: The contributing processes and the literatures. *Organization Science,* 1991, *2*(1), 88–115.

Huysman, M. Balancing biases: A critical review of the literature on organizational learning. In M. Easterby-Smith, J. Burgoyne & L. Araujo (Eds), *Organizational learning and the learning organization*. London: Sage, 1999, pp. 59–74.

Knight, L. Network learning: Exploring learning by interorganizational networks. *Human Relations,* 2002, *55,* 427–54.

Knight, L. & Pye, A. Exploring the relationships between network change and network learning. *Management Learning,* 2004, *35,* 473–90.

Kouzmin, A., Jarman, A. & Rosenthal, U. Inter-organizational policy processes in disaster management. *Disaster Prevention and Management,* 1995, *4*(2), 20–37.

Lane, C. Organizational learning in supplier networks. In M. Dierkes, A.B. Antal, J. Child & I. Nonaka (Eds), *Handbook of organizational learning and knowledge*. Oxford: Oxford University Press, 2001, pp. 699–715.

Larsson, R., Bengtsson, L., Henriksson, K. & Sparks, J. The interorganizational learning dilemma: Collective knowledge development in strategic alliances. *Organization Science,* 1998, *9,* 285–305.

Levinson, N. & Asahi, M. Cross-national alliances and interorganizational learning. *Organizational Dynamics,* 1995, *24*(2), 50.

McHugh, C. Preparing public safety organizations for disaster response: A study of Tucson, Arizona's response to flooding. *Disaster Prevention and Management,* 1995, *4*(5), 25–36.

Nathan, M. & Mitroff, I. The use of negotiated order theory as a tool for the analysis and development of an interorganizational field. *Journal of Applied Behavioral Science,* 1991, *27,* 163–80.

Newell, S., Robertson, M. & Swan, J. Editorial for special issue on management fads and fashions. *Organization,* 2001, *8*(1), 5–15.

Paton, D., Johnston, D. & Houghton, B. Organizational response to a volcanic eruption. *Disaster Prevention and Management,* 1998, 7(1), 5–13.

Pettigrew, A. Contextualist research: A natural way to link theory and practice. In E. Lawler (Ed.), *Doing research that is useful for theory and practice*. San Francisco: Jossey-Bass, 1985, pp. 222–74.

Pettigrew, A. Context and action in the transformation of the firm. *Journal of Management Studies,* 1987, *24,* 649–70.

Pettigrew, A. Longitudinal field research on change: Theory and practice. *Organization Science,* 1990, *1,* 267–92.

Prange, C. Organizational learning – desperately seeking theory? In M. Easterby-Smith, J. Burgoyne & L. Araujo (Eds), *Organizational learning and the learning organization: Developments in theory and practice*. London: Sage, 1999, pp. 23–43.

Ragin, C. Introduction: Cases of 'what is a case?' In C. Ragin & H. Becker (Eds), *What is a case? Exploring the foundations of social inquiry*. Cambridge: Cambridge University Press, 1992, pp. 1–18.

Spender, J.-C. *Industry recipes: An enquiry into the nature and sources of managerial judgement*. Oxford: Blackwell, 1989.

Szulanski, G. The process of knowledge transfer: A diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes,* 2000, *82*(1), 9–27.

Tsang, E. Organizational learning and the learning organization: A dichotomy between descriptive and prescriptive research. *Human Relations,* 1997, *50,* 73–89.

Weick, K. *Sensemaking in organizations*. London: Sage, 1995.

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