



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Knowledge, Technology and the Professional Learning of Localisers

Citation for published version:

Plowman, L & Malcolm, I 2014, 'Knowledge, Technology and the Professional Learning of Localisers' Professions and Professionalism, vol. 4, no. 1. DOI: 10.7577/pp.617

Digital Object Identifier (DOI):

[10.7577/pp.617](https://doi.org/10.7577/pp.617)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Professions and Professionalism

Publisher Rights Statement:

© Plowman, L., & Malcolm, I. (2014). Knowledge, Technology and the Professional Learning of Localisers . Professions and Professionalism, 4(1).

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Irene Malcolm and Lydia Plowman

Knowledge, Technology and the Professional Learning of Localisers

Abstract: A study of the software localisation industry examines learning in digital society by describing localisers' knowledge practices. The shortcomings of standard models of professional learning that assume shared goals, codified knowledge and workers' co-location are considered, along with the problem of learning in distributed and technologically mediated work contexts. The paper uses Knorr Cetina's concept of macro-epistemics to highlight the need for theoretical development in relation to two questions: i) How do ways of organising localisers' work constitute opportunities and constraints for shared knowledge practices? ii) How does technology disrupt macro-epistemic potential and personal learning trajectories?

Keywords: digital work, professional learning, Knorr Cetina, macro-epistemics, knowledge, localisers

Localisation is the process of making digital products suitable for use in specific regions of the world through work that entails linguistic, cultural and software adaptation. Like many knowledge workers, localisers are rendered invisible by the nature of their work but this is magnified when a goal of localisation is to make end-users unaware that a product originated in a different country. Individual localisers are usually freelance, often women, who work on a series of short-term contracts from home, with no contractual guarantee of continuity of employment. The paper takes as its starting-point the premise that standard models of professional learning that assume shared goals, proximity of fellow workers and the availability of mentors may be inadequate for digital workers such as localisers whose conditions of work offer no induction, career progression, or security of employment. Digitisation renders most communication remote, localisers do not get to see the end product of their work, and globalisation is supported by outsourcing that disperses co-workers in different continents. These circumstances present challenges for professional relationships that support the co-creation and sharing of knowledge considered essential in professional learning and reflected in core educational concepts such as communities of practice (Lave & Wenger, 1991; Wenger, 1998).

To address these problems, the paper explores the heuristic potential of macro-epistemics (Knorr Cetina, 2007) for understanding distributed knowledge practices in hi-tech work that is outsourced and globally distributed. We present localisers as an empirical case through which wider theoretical issues for professional learning may be examined by conceptualising knowledge as a practice, rather than as an entity. We seek to contribute to conceptualisations of digital work and learning through two research questions: i) How do ways of organising work (through outsourcing and digitization) constitute opportunities and constraints for shared knowledge practices? ii) How does technology disrupt macro-epistemic potential and personal

Irene Malcolm
Centre for
Academic
Leadership and
Development,
Heriot-Watt
University

Lydia Plowman
Moray House
School of
Education,
University of
Edinburgh

Contact

Irene Malcolm
The Postgraduate
Centre, Edinburgh
EH14 4AS
Scotland
I.Malcolm@hw.ac.uk

Received:
23 June 2013

Accepted:
18 December
2013

learning trajectories? We draw on a study of localisers that combines data from 10 interviewees with ethnographic field notes from a localisation industry conference. The paper explores the tension between the need to support new knowledge through shared knowledge practices and how these are socially and technologically disrupted.

The significance of the localisation industry

The present study was designed to generate insights into the relations between localisers, clients and managers, the virtual worlds in which they operate, and the validation, translation and reconfiguration of knowledge through technology that is at the heart of localisation. There were three main reasons for using localisers as the empirical focus of this study. First, global communication depends on a highly skilled workforce to provide localisation services which affect all of our lives through the localised tools that we use daily (such as email or virtual learning environments). Second, earlier research (Malcolm, Davis & Johnstone, 2003) commissioned by Scottish Enterprise, an agency to stimulate economic growth and support the business infrastructure in Scotland, identified the need to understand the professional learning of localisers and similar groups of digital workers. However, little is known in social science about those who carry out localisation (with the exception of Malcolm, 2013) which is surprising given the significance of the localisation industry to the reach of the digital economy: the market research company Common Sense Advisory predicted a value of US\$31 billion in 2011 with the market growing at an annual rate of more than seven percent and forward-looking growth rates expected to be much higher (Kelly & Stewart, 2011). Third, localisers' work circumstances share similarities with workers, such as software developers and programmers (Nerland & Jensen, 2010); the paper seeks to add further theorisation to this literature in professional learning through a new empirical case of digital workers whose work is globally distributed at non-traditional sites.

The paper, first, describes the case of localisers and localisation; second, it explores the theoretical potential of Knorr Cetina's concept of macro-epistemics; third, it summarises the design of the study, and extends discussion by analysing the data through the two research questions outlined above. Lastly, it discusses learning in a digital society where knowledge is a primary resource.

Localisers and localisation

Dating from the 1980s, and linked to the desktop publishing industry, localisation was one of the first sectors of the digital economy to develop (Esselink, 2000). Software packages from worldwide conglomerates needed to be marketed globally, but made accessible at a local level. The distribution of e-content (electronic content) to new markets led to the expansion of the localisation industry as it allowed the creator of the original product to increase the return on development costs through the adaptation for new locales. This foregrounds the commercial potential of localisation to increase returns on initial investment. Localisation is a direct consequence of globalisation as software and digital content needs to be linguistically and culturally appropriate to the target country where it is to be used. It involves, for example, adapting a website, electronic game or software product (usually produced in US English) for sale in countries such as China, Israel or Spain so that it appears to end-users as if it may have originated in the country where it is sold and supported. This is a more complex matter than translating the language of origin or substituting the local currency: computer games are localised for cultural sensitivities, and banks or car companies which have a global presence adapt the language, imagery and colours of their websites to appeal to customers in the target region, revising cultural and historical references as needed. Varying degrees of software engineering are also

required to ensure the continued functionality of the product.

Localisers are more than IT workers and more than translators, although their pay and status do not reflect this specialised professional knowledge. Their work of linguistic and cultural redesign is combined with their knowledge of business processes and technological expertise in developing software that enables localised products to function. As we will describe, the commodity localisers produce is delivered in a complex supply chain where end-users are unaware of the labour behind what they see on the screen.

Literature: professional learning, knowledge and technology

The rise of digital working challenges our understanding of professional learning and raises questions about how it can be supported and developed in distributed and highly technologised conditions, marked by globalisation, digitisation and outsourcing. Standard models of professional learning have tended to assume proximity of fellow workers, based on professionals such as nurses, engineers or accountants who not only share a workplace and operate with some degree of face-to-face interaction, but who also have a clearly defined and codified knowledge base (see Eraut, 2007). However, the present study points to the need to explain knowledge practices among workers in digital industries that are globally distributed at non-traditional sites.

The paper aims to disentangle “the divergent experiences of knowledge workers” (Marks & Scholarios, 2007, p. 98) by shining a light on outsourced knowledge practices at sites such as the home that have been understood as settings for low-skilled activity (Felstead, 1996). While professional knowing has been seen as individual and person-centred (Fenwick, 2012), our approach moves to a conceptualisation rooted in globally-distributed, shared knowledge practices and a dynamic notion of knowledge work. It builds on studies of knowledge work among other groups, for example in health services (Crump & Latham, 2012) and in creative industries (Guile, 2010) and among software developers (Nerland & Jensen, 2010).

Research in the sociology of the professions and in organisational studies points to professional learning being sustained by social interaction within an occupational community (Evetts, 2003). Professional learning is seen to be constituted through shared social practices that develop work identities (Orlikowski, 2002) and sustain knowledge. In research based in the US, Orlikowski draws on field work in a globally distributed high-tech company where she studied everyday work practices over a six-month period at distributed development units and at the company headquarters. She points out that existing approaches to workers’ learning and to organisational improvement tend to emphasise the importance of knowledge transfer, with the aim of defining what is held to be best practice and then disseminating it. In a critique of such approaches, Orlikowski demonstrates the significance of practices that “produce and sustain a collective and distributed knowing” (p. 253), reflecting shared identity and aligned effort in common understandings. This underlines challenges for learning in some areas of digital work because the processes of periodic face-to-face meetings that allowed workers in Orlikowski’s study to build shared identities despite remote working are not present in the localisation industry. Instead, outsourcing in a complex and globally distributed supply chain challenged the ability of workers to develop common goals built around shared understandings of work.

Critical engagement with knowledge practices in hi-tech working moves beyond the conceptualisation of knowledge as an entity and as a globally transferable product; instead, we draw on the idea of knowledge as a social achievement, (see Knorr Cetina, 2001). While knowledge is said to have replaced industry and

manufacturing as a productive force (Bell, 1973), the data analysed below indicate that workers are perceived as producers of finite and fixed knowledge that is essential to economic progress. In the light of these notions, the analysis that follows examines how the organisation of outsourcing presents constraints and challenges, as well as opportunities for further learning among such workers.

Understanding knowledge as formed through practices (Knorr Cetina, 2001) supports our conceptualisation of digital work that is dominated by globalisation, digitisation and outsourcing (Jonvallen, Berg & Barry, 2011). In an extensive study of the needs of hi-tech workers, (Marks & Huzzard, 2010) show that, while responsibility is placed increasingly on workers to keep their knowledge up to date, the opportunities to do this with organisational support are exaggerated. Increasingly, as companies focus on survival and maximising profits, wider learning opportunities are restricted, positioning the individual worker as a commodity in a market economy. The study found that while workers were encouraged to take responsibility for their own learning, institutional allegiance was eroded and their sense of organisational commitment was diminished.

An emerging body of literature focuses on the implications of knowledge practices in digital society (Guile, 2010; Jensen, 2007; Nerland & Jensen, 2010; Jensen, Lahn & Nerland, 2012) by analysing the complex interconnections between rapidly changing technologies and workers' knowledge practices. It argues that knowledge configured as a fixed entity cannot be adequate to circumstances where it is changing rapidly and is created through shared professional practices. In one study, for example, Nerland and Jensen (2010) examine how the materialities of professionals' work with complex objects, including technologies, serve as continuous learning. The authors find that changing technologies are vehicles for developing practice that could be used for stabilising as well as explorative purposes. However, Nerland and Jensen also highlight constraints in research participants' opportunities for making ties to knowledge which they show can be "restricted and fragile" (2010, p. 94) when work and knowledge practices are driven by problem definition set by others.

Drawing on Knorr Cetina, Vygotsky, and Cultural Historical Activity Theory (CHAT), Guile's (2010) research in the creative industries examines how workers collaborate for a temporary period and are spatially distributed with little prior history of co-working. Guile suggests that these circumstances point to the need for new forms of learning and he conceptualises new cultures within which workers are able to "*mediate* between different forms of knowledge in order to create new practice and objects" (Guile, 2010, p. 5, italics in the original). He describes the interdependencies of knowledge where globalisation and transformations in technology are a source of change.

Macro-epistemics

Arguing that western society is dominated by knowledge cultures, Knorr Cetina (1999) reviews the sociological, economic and cultural development of thought in this area. She considers Beck's risk society and Krohn and Weyer's findings that scientific insights are being applied before they are fully tested, demonstrating the porous boundaries between laboratory and society. Knorr Cetina draws on Giddens' notion of "expert systems" to emphasise whole contexts of expert work and to move the focus away from (knowledge) elites. However, while Giddens explains the interpretative output of expert systems, Knorr Cetina argues that the systems themselves remain back-boxed (1999, p.7). By developing macro-epistemics, she seeks to shift the theoretical discussion to knowledge as a production context and open this up to scrutiny (Knorr Cetina, 2007). Highlighting the importance of professional and expert knowledge in society at large, Knorr Cetina explains the need for conceptual development when she points to the "eclectic" (1999, p. 6) nature

of the ideas in use to talk about knowledge.

Through the concept of macro-epistemics Knorr Cetina seeks to link individual practices with the knowledge structures in which they are located. She uses macro-epistemics to analyse the machineries of knowledge as a productive force in society and suggests that professionals' expertise and innovation skills are vital to knowledge practices as part of these structures (2007, p.372). She theorises practices as part of wider meaning contexts and locates professional practice in "wider networks of knowledge generation" (2007, p.361) as the focus of analysis. These are conceptualised as macro-epistemic circuits, set in a wider cultural environments in which specific knowledge processes are embedded.

Through research at CERN¹, Knorr Cetina (1999) identified how macro-epistemics contributed to scientists' knowledge-building across geographical and disciplinary boundaries. Over a nine-year period, she and a team of researchers analysed how such knowledge-building depended on forms of participation in wider knowledge networks within which scientists were able to extend their identities and develop their practices. The theory expresses the phenomenon of collaborative knowledge-creation among experts who are not co-located and who are in different time zones, but who are bound together in macro-epistemic cultures constituted by knowledge practices.

Macro-epistemics links specific work practices with wider contexts (Knorr Cetina, 2007) and supports a description of society in knowledge terms. Because epistemic functions and roles are embedded in macro-social arrangements their analysis can make macro and micro levels of activity visible. In this way, macro-epistemics helps us to think about both the systems that underpin knowledge and the practices of workers within these. The importance of macro-epistemics in working across multi-disciplinary and spatial boundaries is emphasised in Knorr Cetina's argument that expert systems can turn in on themselves and become self-referential, as they "orientate more to internal and previous system states than to the outside environment" (2007, p. 364). This critique of traditional ways of seeing expert groups transposed to a knowledge society is relevant to localisers who have diverse disciplinary backgrounds, but whose work appears constrained by restricted notions of them as co-workers.

Knorr Cetina (1999) argues that knowledge as a productive force in post-industrial society changes the nature of work and workforce requirements and that it is important to understand these as part of analysis of expert practices. We seek to apply and extend the theorisation of macro-epistemics to analyse knowledge as practised; this moves beyond knowledge as bound to disciplines as an organising structure, but understands it as part of macro-epistemic relations. The theory of macro-epistemics brought to view the complex texture of knowledge in action and made it possible to examine the link between localisers' practices and the organisational structures of localisation. This gives purchase for establishing the patterns on which practices converge, are instantiated and dynamically extended as part of the "dense" and "intricate" way that knowledge is constructed (Knorr Cetina, 1999). The concept also sheds light on the use of work and learning spaces beyond the laboratory, workshop or office.

In localisation, the nature and quality of relations with objects are important as communication is mediated by technology rather than face-to-face, and may be dynamic, creative and "conflictual" (Knorr Cetina, 2001), setting up complex webs of connections. The role of objects in helping to focus professional practices has been particularly highlighted as part of macro-epistemic theory (Knorr Cetina, 2007). The idea of an object is more than the everyday idea of material things, since objects are conceptualised as "centering objects" which can sustain or focus work, with one example being the use of code by computer programmers. Macro-

¹ l'Organisation européenne pour la recherche nucléaire; European Organization for Nuclear Research

epistemics supports our analysis of the distributed and changing nature of knowledge when work and social aspects of learning are mediated in this way, and the role of technology emphasises flux and knowledge construction. Our analysis shows how localisers' knowledge is complex and changing: people who are bound by (technologically mediated) work, but are not co-present, create and draw on knowledge at separate locations through practices set in complex spatial arrangements “for exchanging and processing knowledge” (ibid. p. 370). However, as we discuss below, these macro-epistemic practices are subject to disruptions in knowledge sharing.

We use macro-epistemics to trace how, as a knowledge environment, the localisation supply chain and localisation technologies sustain or discourage certain epistemic outcomes that affect the achievement of work goals. We describe localisers' ways of working and consider how knowledge practices in localisation require critical appraisal to understand opportunities and constraints for sharing knowledge and how technology creates disruptions to macro-epistemics and personal learning trajectories.

Research procedure and methods

The paper is based on research conducted in the localisation industry over several years leading up to 2009. The principal author built an understanding of the industry and its technologies through immersion at four annual localisation industry conferences and a localisation summer school at the University of Limerick. Subsequent data gathering involved participant observation at one of these conferences and extended interviews over one to two hours with 10 interviewees. All participants volunteered freely on the basis of extensive information about the study and the themes that would be explored. Ethical approval was obtained from the university where we were employed at the time, and confidentiality has been preserved by anonymising the data.

While the interview sampling was mainly opportunistic, interviews with workers, managers and company owners from the UK, continental Europe, Ireland and South America reflected the global nature of the industry. Interviewees were contacted at international conferences or approached through their professional networks and invited to participate. Two interview proforma (one for localisers who deal with the software aspect of the work and one for translators who deal with linguistic adaptation) were piloted in advance and adjusted (Gilbert, 2009), with a limited number of open questions to encourage interviewees to talk freely. One interview took place in Ireland at a localisation conference while others were conducted in the UK at locations chosen by the interviewees. Permission was obtained to record all of the interviews which were subsequently transcribed, anonymised and passed to interviewees who looked over the transcripts. Following interim analysis of the interview data a participant observation was conducted over the course of three days at an international localisation conference held at the University of Limerick and organised by the Localisation Research Centre. Additional data consisted of conference documentation, including speaker slides, field notes relating to both general and specific aspects of the pre- and main conference, and from associated workshops. The main author obtained approval from the conference organisers for the conduct of the study and was open with delegates about her research interest.

While this method shed light on problems of workers' individual identities and technology interactions, the original design offered no heuristic tools for the analysis of globally distributed knowledge practices that were mediated by technology. This was problematic, since an important insight was the extent of the industry's dependence on knowledge-workers located at non-traditional sites. We re-analysed the data through a close reading of all transcripts and field notes, with a simultaneous

re-reading of Knorr Cetina's work. From this we produced the current research questions by interrogating the data using a new analytical framework that involved consideration of: i) how the supply chain offered opportunities and constraints for shared knowledge and ii) the role of technology and the disruption of macro-epistemic potential.

The data pointed to localisation work marked by constraints and opportunities for sharing knowledge, with ruptures and new stimuli to knowledge linked to technology. Drawing on Knorr Cetina's macro-epistemics made it possible to shed light on these issues and to examine localisation work and professional learning in distributed conditions. We focus here on how localisation work offered opportunities and constraints for shared learning and on the ways that changes in technology disrupted macro-epistemic potential.

Findings: a supply chain offered opportunities and constraints for shared knowledge

In our study, support for macro-epistemic practices in multi-professional knowledge networks was vital for sharing ideas and innovation. However, the functioning of these was problematic as many workers were based at non-traditional sites and the resulting changed relations challenged learning in macro-epistemic practices. As we will describe, shared knowing was disrupted by practices that treated knowledge as a commodity and assigned workers at non-traditional sites a differential value which did not recognise them as important contributors.

Constraints on macro-epistemics

We begin by describing the key work processes in localisation which informed the macro-epistemic relations of the industry. Localisation involved the creation of an electronic product which had to be adapted and developed for dissemination in other regions of the world and for other languages and cultures. Major e-content producers, such as MSN and Vivendi, outsourced work to localisation companies who then outsourced it again to home-workers. The supply chain model that predominated in the industry included some localiser employees and many outsourced workers whose knowledge practices were disparate and distributed across global projects, framing the contributions of workers to the supply chain. Typically, the customer (usually, but not exclusively, a large organisation) requested the adaptation of a product for additional markets. The localisation company then negotiated project details, agreed terms of reference and a price and then managed the project outsourcing. Those aspects that required text translation were outsourced to a global market of freelancers and the localisation company brought the diverse elements of the project together to deliver the end-product to the customer. The supply chain model was driven by economic factors to improve margins and reduce costs. For example, one localisation manager described how outsourcing as the dominant mode of working affected employment patterns and the distribution of workers in his company. Although localisation was a sizeable part of the value of the business, his company engaged only 15 or so full-time employees in this area:

There are about two hundred people working throughout the company. The translation division is between ten and fifteen... I mean most of it's outsource you know: we employ a large database of translators who are based round the world. (Interview with Pierre, senior manager in a localisation company)

The configuration of the supply chain challenged the scope for creative macro-epistemic practices as knowledge was perceived to be a transferrable product to be

moved around in a global market, separated from specific professional activity. This concealed the potential to support new learning through distributed workers' macro-epistemic practices as a resource for knowledge building. As producers of what was seen as a commodity, home-workers were treated as part of the technology of localisation. Pierre viewed translators as interchangeable and as replaceable instruments of static knowledge, rather than as practitioners of know-ledge that is changing and dynamic. This is reflected in the way localisers' knowledge was captured and reused from company databases:

Pierre: Yes that's right, we wouldn't use the database from one client to the next, just for a specific client.

Interviewer: Yes, so for big clients you'd store that, the bank.

Pierre: Yes that's right. It also means that, you know, if one particular translator isn't available then they've got a lot of previously translated material there that they can use to keep it consistent.

This way of organising work constrained the potential of macro-epistemics and suppressed opportunities that could support the exploration of new practices. It seemed that these were disrupted in the supply chain, since development in one part was regarded as separate from what was to come next. The meaning of knowledge and its interpretation by those in a subsequent phase of localisation varied as workers with different professional backgrounds took over and the knowledge used at one stage in the localisation process was replaced at the next stage by new knowledge (Knorr Cetina, 2010), without critical dialogue and worker interaction. This occurred, for example, when one translator home-worker advised against the use of a particular marketing term, pointing out the nuance of its meaning in the target culture. However, her advice was disregarded and she withdrew from the project, indicating a rupture in macro-epistemic practices:

I said I am not translating this...and I said "I'm sorry I'm not going to put my name to it" and I pulled out and they were very miffed and I could not understand why they could not understand it. (Interview with Suzanne, home-worker)

Knowledge work commoditised

Changes in the supply chain described above had been introduced as a result of web technologies which had sharpened market competition by offering work through a tendering process on e-auction websites. Translators saw this as threatening the value of their contributions, reducing highly skilled work by commoditising their knowledge according to competition based on the lowest price rather than any quality criteria. The opportunities of macro-epistemic practices in wider networks of knowledge generation were constrained by e-auctions, and translators were concerned that new practices made it difficult to develop relationships with their customer base and create shared knowledge. Interviewees said that the quality of professional knowledge was no longer a salient criterion in the tendering process, and the continual competition for work affected the possibilities for solidarity and aligned effort. The price-emphasis and the global nature of the business presented a further constraint, rather than an opportunity for renewed knowledge practice through macro-epistemics. Workers in other markets had a cost advantage, and one interviewee described those in "India or Romania" who were able to win commissions "if they're getting [only] one cent a word."

Competition among workers and the differential value ascribed to particular areas of work, such as software development and globally outsourced language

translation, detracted from the possibilities of multi-professional knowledge-building. As we describe below, work that was seen as important was carried out in-company, whereas seemingly less significant areas could be outsourced. The organisation of work drove down the cost of localisation and contributed to workforce fragmentation.

While knowledge was commoditised, it was also presented as a continuum from translation at the “cultural”, less valued and softer end, to “technical” knowledge at the more highly valued, hard end. One company owner described how work practices embedded important, predominantly technical, knowledge in the organisation to retain commercial control while other knowledge could be brought in through outsourcing:

I identify those elements in the process that we want to hold onto, to retain control of something and other parts that we can say “Right we can find good supplies of labour that will do this for us”. (Interview with David, localisation company owner)

Knowledge of freelance survival

The supply chain configuration meant a lack of organisational attachment that shifted the focus of professional learning from the needs of work projects to those of individual workers. Learning was led by freelance survival which took precedence over macro-epistemic practices with work-givers and other professional groups. However, while there was curtailment of macro-epistemics, there was evidence of mutual help and knowledge-sharing among home-workers, particularly in relation to surviving in a global market. For example, one interviewee talked about advising self-employed peers in keeping up to date with the logics of the market. Another home-worker described giving informal advice to a friend who, as a new entrant, was counselled against “undermining the profession” by “selling herself cheap.” The professional networks that home-workers contributed to were described in personal terms as “my umbrella” and “my network is real people.”

Other forms of freelance knowledge-building were supported by practitioner-initiated seminars, through organisations such as the Institute for Translation and Interpreting and the Institute of Localisation Professionals. However, it was not clear how far the goals of such professional networks aligned with the broader, strategic aims of work-givers or how they contributed to macro-epistemic networks that shared knowledge across professional groups.

While localisers brought different professional ways of practising and diverse professional histories to their work, the scope for creativity that such diversity might have offered was not realised as freelancers focussed on individual professional goals and survival techniques. Thus, significant challenges to macro-epistemic practices across the industry were drawn from outsourcing models as part of the machineries of knowing. These disrupted learning trajectories, leaving scant support for macro-epistemic approaches and raising the problem of the conditions needed to sustain learning in digital work. The way the supply chain was managed challenged practices that could synthesise, disseminate and integrate knowledge in continuous learning.

Findings: technology and disruption of macro-epistemic potential

Disruptions to macro-epistemics and learning were seen in technology development and the use of localisation industry software standards. Through processes of upgrading, for example, the knowledge that was inscribed in technology became obsolete as a new industry standard was established. In turn, when the new product became widely available in the market, then the commercial advantage it conferred dissipated and, with it, the value of its associated knowledge declined. At the localisation conference, a presentation was given on behalf of OASIS (Organization for the Advancement of Structured Information Standards) to describe its role in ensuring the effective distribution of knowledge through shared IT standards for global applicability. However, the aim of advancing shared standards was in tension with the aims and commercial practices of large global companies:

Large companies race to complete a technological product/tool/process and then ‘stack’ these innovations before applying for a standard. They can achieve maximum ‘leverage’ before the standard is submitted, approved and available for use by others. (Main conference notes, 5)

The value of knowledge declined (Knorr Cetina, 2010) with its wider uptake which, in turn, contributed to the commercial stimulus for new localization technologies. While this drove innovation, macro-epistemic practices that could inform this from a broad base were limited, with a narrowing focus on the work of a few conglomerates. Although these had the best resources, they were not necessarily drawing on the most innovative thinking and were not motivated to consider wider industrial benefits which may have involved knowledge sharing.

Shifting knowledge objects

Conditions in the localisation industry created a continuing requirement for interviewees to develop new, specialised knowledge and acquire new technical abilities. In such contexts, material objects have been seen as presenting the potential to promote and stabilise learning in technology-intensive work (Knorr Cetina, 2001). However, as we have shown, for outsourced workers, this was a personal and professional responsibility that was not well understood across the industry. The translators worked with databases to grow their linguistic knowledge, but as home-workers their knowledge and ability to work with IT seemed under-appreciated. In fact, freelance survival was supported by complex interactions with artefacts. One home-worker described how she took the initiative to develop knowledge of a new technology:

I organised one of my colleagues who’s got a lot of experience with “Localise-it” to come out to my house and she gave myself and another colleague who wanted to learn, a full-on really intensive one-day introduction course for a fraction of the money of a full-blown course and I’ve never looked back. (Interview with Suzanne)

Translators’ texts, particular translation tools or even particular words could support knowledge, and for some of them a translation database generated pride and stimulated the need for new learning. While such databases contained a body of knowledge that was, although changing, relatively stable, workers needed to update their technical knowledge regularly and in the future would need to learn about new

technological tools. Discussions among localisers at a conference training session on Adobe Altercast, a localisation tool used for dynamic imaging, gave the tool a significant status. However, in view of the rate of technological change, the knowledge practices linked to this product were bound to be replaced by new approaches. It was clear that the focus of attention was temporary, that this was one among many complex technologies, underlining work choices and flexibility. This meant that the stabilizing role of objects in digital work was challenged since technologies were fluid (Knorr Cetina, 2010) and unlikely to embed learning over a period of time. For instance, the localization of apps (application software) for mobile technologies has emerged as a major growth area that requires different skills depending on the platform (e.g. smartphone or tablet computer). There are implications for the number of downloads and revenue generation potential depending on the languages in which they are available (Hegde, 2012).

Discussion: the contribution of a macro-epistemics approach

The discussion that follows is structured round the two research questions: i) how ways of organising localisers' work constitute opportunities and constraints for shared knowledge practices and ii) how technology disrupts macro-epistemic potential and personal learning trajectories.

Practices of sharing knowledge and their disruption

The concept of macro-epistemics helps explain the distribution of knowledge as part of complex practices that constitute work outsourcing. It makes it possible to analyse links between practices and the wider knowledge industry of localisation where a diverse supply chain draws on multi-professional working. Looking at a digital industry in this way reveals the importance of knowledge sharing and locates its disruptions. Since all localisers in the study needed to compete in the market, flows of knowledge and practices were differentiated through competition which reduced scope for new knowledge production through cross-fertilisation. Unlike the participants in Knorr Cetina's studies, localisers' participation in profession-specific knowledge cultures was linked to their self-employed status. This was very specific and focussed on the workers' needs to sustain their employment rather than the wider supply chain or strategic contributions. For example, home-workers' potential to extend their professional practice into new areas was constrained by a lack of engagement on the part of work-givers that might have offered opportunities to challenge perceptions of home-worker contributions. Approaches to organising work disrupted macro-epistemic practices, and new knowledge possibilities were lost as contributions were commoditised and slotted into the workflow, with limited scope for reconfiguring and re-embedding knowledge.

Technology and learning challenges

Localisers' practices shed light on our understandings of the macro-epistemic processes of learning. Distributed work and technology-intensive conditions had profound implications for building shared knowledge and sustaining learning.

Localisers' projects varied greatly in size and in character, with a range of technologies that could be applied. However, the fluidity of technology meant that some approaches quickly became obsolete, making it difficult to develop sustained macro-epistemic practices. Localisers worked to keep knowledge up-to-date when linguistic terminology, technologies and ways of working were constantly changing and demanded further learning. While continuous change prompted new learning, how developmental this was and how far new learning built on and consolidated previous knowledge as a contribution to the wider macro-epistemic system was uncertain. The possibilities for sustained macro-epistemics were challenged by the multiplicity of technological work solutions that compounded supply chain discontinuities.

A technological tool would support work and learning for a limited period, and was replaced by newer adaptations requiring new learning that was for survival rather than integrated developmentally with macro-epistemics. Learning contexts that offered an element of stability gave way to the need to learn through a succession of technological changes. Workers had to develop strategies to evaluate work innovations in short time-scales, to assess their value and determine the best strategy to protect freelance work and professional interests.

Implications for professional learning

At a practical level, there are a number of implications for professional learning related to the issues discussed above. The working lives of localisers involved distributed and project-based work on short-term contracts. Localisers were prevented on the grounds of commercial confidentiality from having direct contact with the customer and did not often see the finished product to which they contributed. Interacting with technology, they worked with unseen collaborators who could be located in any continent. There was a lack of sustained macro-epistemic practices that could reconfigure, recombine and re-embed new learning to support knowledge work across a multi-professional supply chain. In Orlikowski's words this suggested the need to promote localisation practices that "produce and sustain a collective and distributed knowing" (2002, p. 253).

While some of the workers in the present study had highly professionalised accreditation paths, globalisation, the organisation of work in technology and its outsourcing contributed to an entrepreneurial approach, as home-workers competed (at a distance) for commissions and most of those in the industry had to sustain their own value by a constant up-skilling to remain competitive. The pressure for individual workers to keep up as part of global competition meant a constant watchfulness to acquire competence in the use of new technological tools, new language or new approaches to managing a freelance career. This pressure seemed to militate against the kind of deep learning that might be needed to evaluate systems fundamentally, or to seek improvements, and for some it seemed to detract from opportunities for critical reflection and evaluation.

Conclusion

The findings discussed above add to knowledge by suggesting important areas for re-theorising learning in digital work through a study of an as yet unexplored part of the digital workforce. They highlight the difficulty of accounting for professional learning in changing and unstable digital work using traditional theorisations. We show alternative perspectives, in macro-epistemics, for analysing machineries of knowing that underpin learning in work that is technologically mediated, outsourced and requires inventive survival techniques. We suggest that macro-epistemics sheds light on potential theoretical understandings of knowledge practices that constrain or support digital workers' professional learning in a context of rapid technological change. While the literature discussed above helps to conceptualise the conditions of digital workers, it appears that further application of concepts such as macro-epistemics may help to develop theories of knowledge practices that remain black-boxed (Nerland, 2010) and not susceptible to analysis.

In rethinking professional learning for localisers and other digital workers, we need to take into account how processes of work and learning are interwoven with social dimensions of outsourcing, digitisation and globalisation. These influences and their impact have to be understood as part of efforts to support and sustain knowledge practices (Knorr Cetina, 2001). Macro-epistemics explain learning that is distributed and mediated by material relations in the digital economy. However, new professional learning practices are needed to support collective and distributed knowing. These have to be adapted to a dynamic context as the knowledge required increases in complexity, encompassing technical skills, product, market and business knowledge, client relations and creative dimensions.

The localisation industry is a significant part of the knowledge economy and it is of concern that so little is known about an occupation that has an important, and largely invisible, role in globalisation. Since the completion of data collection there have been further developments in machine translation through refinements of translation technology and the use of controlled language that limits the range of vocabulary used in texts. At the same time, the open source movement and not-for-profit production of software has spread, while more localisation courses have developed in universities as part of growing commercialisation in higher education. In professional learning and global technology, there appears to be a disconnect between new economy companies that project images of modern, flat hierarchies and the lack of support for the professional learning of outsourced workers whose knowledge is essential to their business.

For the future, theories and practices that describe knowledge work have to take account of circumstances where building and maintaining knowledge is increasingly demanding and where the growth in the outsourcing of work means that organisations cannot draw upon employees' tacit knowledge to drive development and innovation. When the workforce is widely distributed, the motivation for the self-employed to expand their professional learning is more likely to depend on self-interest than on loyalty to a distant work-giver. From the organisation's perspective, outsourcing can mean that there is no corporate memory, and valuable knowledge and skills can be lost from one contract to another. This requires new concepts to define practices that support new knowledge and sustain it in work with complex and shifting technologies.

References

- Bell, D. (1973). *The coming of post-industrial society*. New York: Harper Colophon Books.
- Crump, N. & Latham, Y. (2012). Analysing change in an Accident and Emergency Department: organisational routines as ongoing and emergent sociomaterial accomplishments. *New Technology, Work and Employment*, 27(1), 52-64. <http://dx.doi.org/10.1111/j.1468-005X.2012.00277.x>
- Eraut, M. (2007). Learning from other people in the workplace. *Oxford Review of Education*, 33(4), 403-422. <http://dx.doi.org/10.1080/03054980701425706>
- Esselink, B. (2000). *A practical guide to localization*. Amsterdam: John Benjamins Publishing.
- Evetts, J. (2003). The sociological analysis of professionalism, occupational change in the modern world. *International Sociology*, 18(2), 395-415.
- Felstead, A. (1996). Homeworking in Britain: the national picture in the mid-1990s. *Industrial Relations Journal*, 27(3), 225-238. <http://dx.doi.org/10.1111/j.1468-2338.1996.tb00771.x>
- Fenwick, T. (2012). Co-production in Professional Practice. A Sociomaterial Analysis. *Professions and Professionalism*, 2(2), 1-16. <http://dx.doi.org/10.7577/pp/v2i1.323>
- Gilbert, N. (2009). *Researching social life* (3rd ed). London: Sage.
- Guile, D. (2010). *The learning challenge of the knowledge economy*. Rotterdam: Sense.
- Hegde, V. (2012). The market for mobile app localization heats up. *Common Sense Advisory*, 20th November 2012.
- Jensen, K. (2007). The desire to learn: an analysis of knowledge-seeking practices among professionals. *Oxford Review of Education*, 33(4), 489-502. <http://dx.doi.org/10.1080/03054980701476055>
- Jensen, K., Lahn L.C. & Nerland M. (Eds.) (2012). *Professional learning in the knowledge society*. Rotterdam: Sense.
- Jonvallen, P., Berg, E. & Barry, J. (2011). The development of contract research organisations in Sweden: health care, privatisation and new-liberalism. *New Technology, Work and Employment*, 26(3), 196-209. <http://dx.doi.org/10.1111/j.1468-005X.2011.00269.x>
- Kelly, N. & Stewart, R. (2011). The Language Services Market: 2010. An annual review of the translation, localization, and interpreting services industry, *Common Sense Advisory*, May 2010.
- Knorr Cetina, K. (1999). *Epistemic cultures: How the sciences make knowledge*. London: Harvard.
- Knorr Cetina, K. (2001). Objectual practice. In T.R. Schatzki, K. Knorr Cetina & E.von Savigny (Eds.), *The practice turn in contemporary theory* (pp. 175-188). London: Routledge.
- Knorr Cetina, K. (2007). Culture in global knowledge societies: knowledge cultures and epistemic cultures. *International Science Reviews*, 32(4), 361-375 (originally published in *The Blackwell Companion to the Sociology of Culture*, 2005, Eds M. Jacobs & N. Hanrahan).
- Knorr Cetina, K. (2010). The epistemics of information: A consumption model. *Journal of Consumer Culture*, 10(2), 171-201.
- Lave, J. & E. Wenger (1991). *Situated learning: Legitimate peripheral Participation*. Cambridge: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511815355>
- Malcolm, I. (2013). Conceptualising the knowledge work of digital professionals through Knorr Cetina's ideas of macro-epistemics and information knowledge. *Studies in Continuing Education*, 35(2), 131-145. <http://dx.doi.org/10.1080/0158037X.2012.736378>

- Malcolm, I., Davis, S. & Johnstone, R. (2003). *Study of the supply chain for localisation in Scotland*. Stirling: Scottish CILT.
- Marks, A. & Scholarios, D. (2007). Revisiting technical workers: professional and organisational identities in the software industry. *New Technology, Work and Employment*, 22(2), 98-117.
<http://dx.doi.org/10.1111/j.1468-005X.2007.00193.x>
- Marks, A. & Huzzard, T. (2010). Employability and the ICT worker: a study of employees in Scottish small businesses. *New Technology, Work and Employment*, 25(2), 167-181.
<http://dx.doi.org/10.1111/j.1468-005X.2010.00246.x>
- Nerland, M. (2010, June). *Professional learning in new ecologies of knowledge*. Paper presented at ProPEL Symposium, University of Stirling, UK.
- Nerland, M. & Jensen K. (2010). Objectual practice and learning in professional work. In S. Billett (Ed.) *Learning through practice, professional and practice-based learning* (pp. 82-103). Dordrecht: Springer.
- Orlikowski, W. J. (2002). Knowing in practice: Enacting a collective capability in distributed organizing. *Organization Science*, 13(3), 249-273.
<http://dx.doi.org/10.1287/orsc.13.3.249.2776>
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.
<http://dx.doi.org/10.1017/CBO9780511803932>