

Forced to go virtual?:

Distributed cooperation of small software firms

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ABSTRACT

Within the service sector, the software industry has been among the prime movers in the process of offshoring work to new destinations. This is facilitated by the immaterial character of the products and their components and by the industry's inclination to use new technical opportunities for its own purposes as well. This paper investigates practices of virtual cooperation and team work in small and start-up software companies based in Austria. Evidence indicates that because of their niche strategies and the related conditions of their national context, these companies often depend on international cooperation which, in turn, often takes on a 'virtual' form.

Introduction

Within the service sector, the software industry has been among the prime movers in the process of offshoring work to new destinations (Huws 2003a). This is not really surprising given the fact that its products and their components are immaterial and transport is therefore not cost sensitive. Moreover, because they themselves develop information and communications technologies (ICTs), the actors in this industry are among the first to use new technical opportunities for their own purposes as well. This includes the hardware and software used for delocalised cooperative work. The standardisation not only of the technology but also of skills and qualifications on a global level considerably facilitates the relocation of work. However, offshoring, inter-firm networks and virtual teams cannot only be seen as opportunities that companies can take advantage of if they see fit. There is also a pressure to follow industry trends in order to remain competitive. In addition to emulating general trends, companies have a number of motives for forming intra- and inter-firm networks and establishing a variety of forms of virtual cooperation and work, including lower costs, access to skilled labour and proximity to foreign markets (Sass & Fifekova 2011:1598). While this is

obvious for corporations with a global reach, small firms are usually seen as oriented to local markets and integrated in regional networks. However, IT both as a product and as a tool, enables small firms to enter international markets, to look for talent beyond the home region and to pursue globally-oriented strategies of specialisation. Recently, a number of new companies, mostly small or medium-sized, have gone international soon after their inception (Kudina, Yip & Barkema 2008). These so-called 'born globals' are strongly driven by the mindset of their managers and the need to attract more business than they can get in their domestic markets (Eurofound, 2012). Since their capacities to establish subsidiaries abroad are often limited they are more likely to resort to virtual forms of cooperation and work in varied contractual arrangements. Their portfolio is characterised by a high level of innovation in the use of technology and/or exclusive design and they fill important gaps in global value chains (Eurofound, 2012).

In this paper we investigate practices of virtual cooperation and team work in small and start-up software companies based in Austria. Evidence indicates that because of their niche strategies and the related conditions of their national context, these companies often depend on international cooperation. This is in line with research on the internationalisation of SMEs, especially in small countries, that shows that the limitations of the domestic market are a strong motive to internationalise (e.g. Holmlund et al., 2007). It is therefore to be expected that small IT companies in Austria (unless they provide regional services) are likely to go both international and virtual.

In comparative terms, Austria is a rather small location for IT companies and by no means a key player in the international division of labour in the sector. There is no Silicon Valley in the Alps. Yet, it is an interesting case when it comes to looking at developments in inconspicuous countries, making it possible to analyse general tendencies in the IT industry. A very large number of Austrian IT companies specialise in (niche) products or services mainly for the home market but also partly for an international market. Some of them have subsidiaries (nationally or abroad), but are strictly controlled by the Austrian management (Flecker & Schönauer, 2012). Austrian companies took advantage of the transition to capitalism of Central and Eastern European countries in the 1990s which led to a marked growth in Austria's active foreign direct investment in general (Hermann & Flecker, 2009) and to relocation of software development activities for cost or labour-market reasons in particular. Among small and start-up software companies we find an additional path of internationalisation: they cooperate with customer companies in the development of new products and thus practice cross-border virtual cooperation, usually in a dependent position in these customers' value chains and networks.

In this paper we investigate why and how small companies and start-ups enter into virtual cooperations in two ways: by collaborating in inter-firm networks and by organising work in virtual teams. We do so by analysing three case studies of Austrian SMEs in the IT sector. Before presenting the case study findings we will briefly discuss the characteristics and challenges of virtual cooperation and describe the methodology of the study.

Virtual cooperation and challenges to work organisation

Knowledge work has been subject to massive inter-connected change in recent decades. In companies where rapid technological change is commonplace, a project-based model for organising work has evolved and increasingly, work is influenced by dynamic inter-firm relations (Powell, 2001; Huws et al., 2009). To reduce labour costs and gain access to new labour markets companies have relocated work to new destinations, either establishing their own software factories in India, Vietnam or elsewhere or using opportunities for offshore outsourcing (Huws, 2003a). Within Europe, several CEE countries have become prime locations for the 'near-shoring' of software development. While geographical distance remains a crucial aspect in virtual cooperation, the emergence of inter-firm networks and increased cooperation of firms within a city or region has often resulted in spatially-separated cooperative work on proximate sites as well. In addition to gaining access to new labour markets in general, 'going virtual' may also be motivated by the demand for highly qualified and specialised staff. Overall, 'the software is such a vast universe' (Andrews et al., 2005:68) and virtual teamwork allows organisations to position specialists from different areas in the same team, regardless of these individuals' geographical location (Dubé & Robey, 2009). Virtual cooperation may therefore enhance functional flexibility both at the level of the company and within a team.

There are two major preconditions for virtual cooperation: information technology and organisation. Telecommunications infrastructures, information systems, databases and communications technology are crucial for remote work. In spite of the popular view that technology has made the world 'flat', an adequate technical infrastructure cannot be taken for granted (Andrews et al., 2005), as empirical work on geographically-distributed software development has shown (Flecker et al., 2007). In fact, the quality of technical infrastructure varies considerably between organisations, countries and regions.

Of course technology alone cannot solve problems of virtual cooperation. Communication via ICTs requires considerable social and communicative skills, as well as IT know-how. Management literature describes soft factors in general as contributing to a project's success even if their impact cannot be quantified. Based on their empirical work, Zoche and Joisten (2005:30ff) define seven factors which are of high importance for the initiation and functionality of virtual forms of work organisation: trust, transparency and openness; conflict management; learning ability and knowledge management; ability to use media-based communication and 'staging'; development and preservation of motivation; and culturally integrative measures. Dubé and Robey (2009:9) discuss virtual collaboration in terms of five paradoxes that organisations and workers need to manage:

Firstly, virtual teams require physical presence. Virtual teams are geographically distributed, but often enough find that they need face-to-face meetings at crucial times in the projects.

Secondly, the flexibility of virtual teamwork is aided by structure. Virtual teamwork is flexible, and members may work independently of time and space. However, this flexibility needs to be supported by structural mechanisms that coordinate team efforts.

Thirdly, interdependent work in virtual teams is accomplished by members' independent contributions. Teamwork implies interdependence among members working towards common goals. Yet in order to limit coordination needs, work is mostly divided into subtasks or modules that are actually carried out by individuals.

Fourthly, task-oriented virtual teamwork succeeds through social interactions. Virtual teams focus on tasks and results but nevertheless depend on social interactions in order to maintain focus and coordinate efforts.

Finally, mistrust is instrumental to establishing trust among virtual team members. Trust is necessary in virtual teams but not a given. It needs to be established incrementally, starting from mistrust and 'testing' trustworthiness.

It is because virtual collaborations and technologies remain socially embedded that they rely on basic organisational structures being in place both at the level of the company or inter-firm network and that of the virtual team. Modularisation of business functions and activities is often a precondition for geographical relocation of work (Huws, 2003b; Holtgrewe, 2012). This implies that work processes which were previously integrated must be split and clear interfaces designed between the resulting modules. At the team level, projects are often broken down into independent work tasks that are assigned to individual team members. This does not replace, but may limit synergy and task interdependence (Dubé & Robey, 2009). Another organisational strategy for reducing the complexity and interdependence of work processes is formalisation and standardisation in software development, documentation and data exchanges. This is why distributed work environments often lead to more 'bureaucracy through the back door' (Flecker & Meil, 2010; Flecker et al., 2013). Dubé and Robey (2009) point out that reaping the benefits of flexibility in virtual teams requires a great deal of structure in communication and processes, which potentially threatens their creativity, innovation and rapidity of response to organisational threats or opportunities. In addition, the standardisation of work, leading to deskilling of programmers, has been observed as a solution to the problems of high labour turnover often experienced by companies in India. While some companies aim to provide more demanding work and enhanced learning opportunities in order to retain staff, others rely on simplifying the work in order to be able to replace programmers quickly and thus cope with high attrition (Feuerstein, 2013).

If new know-how emerges in the process of cooperation in the course of software development (Fuchs-Kittowski & Reuter, 2002), possibilities for standardising work and even planning processes are often limited. Even the standards themselves may require interpretation before team members can make sense of them, creating a need for extensive communication (Rittel & Webber 1984). According to the management literature, organisations usually follow three strategies to deal with this situation: codification, personalisation and socialisation (Hansen, Nohria, & Tierney, 1999; Noher, 2001). Codification might include the introduction of intranet platforms which offer relevant information, for example; personalisation might include the assignment of certain topics to designated experts who act as contact people for specific problems; socialisation could involve encouraging team members to become part of communities of practice and use them for exchanging experiences.

In the remainder of this paper we explore virtual cooperation in software development, focusing on small and start-up companies. The case study findings presented below were selected to provide insights into a range of constellations in which companies establish cooperation over distance either to include remote workers or to link up with their client companies.

Research method

To ensure anonymity, the three case studies¹ on information technology are presented using fictional company names: HealthIT, ValueIT and MobileIT. The case studies were carried out between 2007 and 2011. The data analysed here were derived from qualitative research including semi-structured interviews with employees, works council representatives, management staff and relevant sector experts as well as field work including visits to company sites. HealthIT is an Austrian start-up company specialising in the development of health-related applications for smartphones. The company's staff consists of the two founders, two employees and several freelancers. An interesting aspect of the dynamics of this case is that the company is turning back from an attempt at international relocation of programming, but nevertheless retains a cost-saving and innovation strategy. ValueIT is an Austrian software company which develops and sells products for the financial sector, employing about 100 people in seven countries. Of special importance for its division of labour is the cooperation between Austria and a subsidiary in Serbia, where most of the programming is located. MobileIT is another Austrian start-up company developing an application for smartphones. The company employs 16 people and is managed by the founder and an additional chief executive. MobileIT cooperates with large customer companies all over the world. By developing a stable relationship with its employees and trying to keep fluctuation low, the management's strategy, among other things, is to protect the company's know-how.

Varieties of virtual cooperation in small firms: the case studies

These three examples provide insights into different forms of virtual cross-border cooperation. The case studies focused on the reasons for going virtual and cooperating across organisational and national boundaries and on the structures that emerged when they did so. Both *ValueIT* and *HealthIT* have cost saving strategies which, in combination with the need to employ highly-qualified staff, led to relocation of work and virtual cooperation, with varying success. In the case of *ValueIT* this took the form of cooperation with a subsidiary in Serbia, in the case of *HealthIT* the co-operation was with freelancers all over the world. The third case, *MobileIT*, is an example of a company that entered into virtual cooperation with international customer companies because the local market for its product was too small to safeguard the future of the company.

Emulating transnational corporations – the case of ValueIT

ValueIT is an instance of virtual cooperation which is based on relocation of work to low-cost countries. It applies the logic of the extended work bench. *Value IT* was

¹ The case studies were conducted as part of the project: 'Dynamic of transnational value chains in Austria's IT industry' funded by Austrian National Bank's Anniversary Fund (project number: 13609).

founded in 1995 and produces and sells software for the visualisation of financial data. The company established a subsidiary in Serbia for software programming right at the beginning, and conducts hardly any development work in its Austrian headquarters where only about 15 people work. Using an international division of labour and capitalising on low labour costs abroad was thus a constitutive part of the business strategy of the company from the outset. In addition to low labour costs, the move also allowed for access to a highly-skilled workforce during a boom period in the IT industry when the labour market in Austria became comparatively tight. The company can thus be said to have been 'born European'. Although at that time there was a large choice of possible locations in Central and Eastern Europe, *ValueIT* has become closely bound to this particular location not least because of its successful and intense cooperation with the Serbian subsidiary. The company management rules out any further relocation to low-cost countries such as India giving several reasons: the longstanding good working atmosphere that prevails in its existing virtual cooperation; spatial proximity; the high skill levels in Serbia (where there is an excellent technical university); and low labour costs. Although the two organisations cooperate primarily on a virtual basis, management emphasises that access by plane is very easy. Project managers explain that face-to-face kick-off meetings, usually held in Vienna, are of great importance for long projects. In addition, joint summer and Christmas parties strengthen the social cohesion of teams and are deemed to be important for the success of projects.

Although the collaboration is close and people have been well acquainted for many years, the virtual team structures at *ValueIT* are very hierarchical. The six team leaders are located in Vienna, while coding is carried out in Serbia by about 50 programmers. Project leaders know the staff in Serbia well and can decide easily who would be the right person for any given task. In the words of one manager:

In principle, customer requests and new projects are generated in Vienna. Afterwards we look at who can do the project management in Vienna and who has the know-how in Serbia. (ValueIT,1,4)

The general team leader in Serbia has little involvement in the projects' business, and project leaders in Vienna coordinate work directly with programmers in Serbia. Forms of virtual cooperation with their team members vary according to individual preferences: some prefer emails; some use text messages or video-telephony via Skype; and others prefer to talk on the phone. Video conferences are used when several people need to communicate to reduce travelling. Project leaders have the authority to tailor the organisation of virtual cooperation. *ValueIT* makes strict demands about how work must be delivered only at the interfaces between tasks. In contrast to programming, error-correction has very standardised procedures. Developers use an Issue Tracking System across the organisation which helps to organise tasks and communication and is also used for the documentation of work.

The programmers in Serbia need very specific know-how in IT and financial management and *ValueIT* promotes a lot of internal and external training. Individual programmers are part of specialised teams but the company supports changes of teams to increase members' competences through some optional job rotation. Fluctuation of staff is very low at the Serbian subsidiary. Nevertheless, in recent years, some highly-

qualified programmers have moved to Vienna and were rehired as team leaders by *ValueIT*. Emigration of qualified staff and the ensuing loss of knowledge is a risk in the established virtual team cooperation. So far, *ValueIT* has offered some relocations/promotions but is still under pressure to invest in the recruitment and training of existing staff in Serbia.

The failure of an established virtual network – the case of HealthIT

While the case of *ValueIT* provides an example of a smooth, long-standing virtual cooperation, the *HealthIT* case shows that this cannot be taken for granted. *HealthIT* is an Austrian start-up company founded in 2010 which is developing a specialised health application for smartphones. This is not sold to end-users; the customers for it are international companies producing medical devices who offer the application as a service to patients using their products. When development started on the product, *HealthIT* cooperated with a set of highly specialised freelance programmers all over the world and employed only two people in Austria. This was made possible by drawing on the founders' previous contacts. The aim of this cooperation was to reach as much functional flexibility as possible, while keeping costs predictable and fixed costs low. Whilst these freelancers were well paid, they carried the risk of possible declines in business.

The task of the freelance programmers was to execute work orders coming from the product development team in Austria. However, in spite of previous successful cooperations, the global decentralisation of programming had to be cancelled after six months. Management did not succeed in organising the complex and dynamic phase of product development with a distributed team. This is attributed to a lack of modularisation of the work during the creative process of product development.

Decentralised work sounds sexy (...) but it has its limits. The limits make themselves felt if you start a new product and if you want to develop something and if you do not even really know what it will be in the end; if the core team is interdisciplinary and if you first have to do the team-building. (...) We often altered our decisions. One week we thought that this is cool and then we talked to people and realised that it was not that great. If it is decentrally organised this becomes hell very soon. (...) This is like a startled bunch of chickens. (HealthIT,1,4)

The lesson learned for management was that success in the relocation of work and the implementation of virtual cooperation relies on several preconditions. As one informant put it: 'Outsourcing is possible, if you have a separate module, if you know what you want, what the output should be, then it is great, then it works' (HealthIT,1,5). The failure to define modules and tasks precisely enough in the early stages of product development by the Austrian team in this start-up caused a lot of confusion.

Consequently, *HealthIT* returned to centralised working. The company still employs freelancers as long as they work from the company's office for at least three days a week. For the organisation of work, the team reverted to a very basic system of paper sheets pinned on different boards. Physical aspects are central to this process, with sheets being moved from one board and repinned to another according to the status of

a task. Programmers choose their tasks autonomously, and work is controlled through continuous reporting.

In spite of this striking spatial centralisation, *HealthIT* still relies on virtual cooperation in one sense: its programmers are embedded in a global, cooperative culture of distributed problem-solving and advice along open-source principles, and *HealthIT*'s experts use their networks and virtual communities when they cannot find a solution to a problem or need some input from outside. Thus, social networks are informally used for 'default' functional flexibility in the development process:

He asks within his network, that's how it is in this culture. Among themselves they don't charge anything. (...) He asks his colleagues from outside: 'I have this and that problem, make a suggestion!' (...) This is the open-source culture, the web culture, you don't find this in classic IT like IBM and co – I don't think so. But everything that has developed during recent years, has developed within this culture, and we are rooted there as well. (Manager HealthIT, 1,9)

By its absence, the case of *HealthIT* shows the importance of clear modularisation of work as a precondition for successful relocation of work. When tasks are outsourced to highly-qualified experts, neither the standardisation of procedures nor the codification of information is possible or necessary so long as modules and interfaces are adequately defined. However, in a phase of innovation and conceptualisation, networked virtual collaboration reaches its limits. Despite this, a high level of local integration of work processes complemented by a professional and helpful virtual network was achieved, although with the use of freelancers contractual relations remain loose.

Virtual cooperation with a large client organisation: the case of MobileIT

MobileIT is similar to *HealthIT* in its size and product portfolio, with the difference that at *MobileIT* all programmers are part of the development process from start to finish and know-how is generated in, and distributed to, the whole team. The company's strategy is to protect the organisation's know-how by keeping personnel turnover low and binding staff to the company. *MobileIT*'s management highlights the integration of different parts of the work as a task for the company's core staff, with a deliberate strategy of not outsourcing to freelancers. The company is located in a rural area, so it is more difficult to find qualified staff than in a big city. Long travel times might make *MobileIT* unattractive from an employee's perspective. This is another reason why, from the company's point of view, the retention of qualified staff who are willing to live in or commute to a rural area is important.

At the time of the investigation, the collaboration with *MobileIT*'s main client, a large telecommunication provider located in Germany, mostly involved the further technical enhancement of existing software (a smart phone application) and second-level support provided by *MobileIT* to the client. The reason for virtual cooperation in this case was simply the need to collaborate with a client who was not located in the same region. Hence the working context of *MobileIT* can be characterised as transnational, with strong ties to Germany.

In terms of cooperation strategies *MobileIT* seeks to protect its own know-how in order to stay as independent as possible, especially because it is in a rather weak position

in relation to its big German client. However, as a small enterprise, it has the advantage of being able to act and react much more quickly and flexibly than the client and, paradoxically, frequently ends up compensating for the client's management deficiencies. It is occasionally a challenge to identify the responsible person at the client company and to filter demands emanating from its different departments. Such difficulties are reinforced by the fact that the project manager assigned by the client to this contract does not have an IT background and is therefore unable, except to a very limited extent, to filter these demands from other departments. Consequently, such demands are often forwarded directly to *MobileIT* whose CEO sometimes acts as a 'buffer':

You have to bring the right people together, to get the organisational things going.

(...) These [difficulties in collaborating] cost time and money, a lot of communication, many emails and misunderstandings (...) You can't plan such things: there is a technical problem, the application doesn't work or the server is broken. In case of emergency you have to react, which often means that I am at the office Friday afternoon and Saturday. Such things make it really difficult and I envy colleagues who have their defined weekly workload and then go home. (MobileIT,2,12-14).

Collaboration can become especially challenging when departments that initially were not part of the project state wish to join it, to raise objections or to introduce new ideas. In addition, there is an issue of competition, since the German client has an internal IT department which (partly) develops similar products to the *MobileIT* product. This puts *MobileIT* into a difficult situation: on the one hand, the project manager in charge wants to acquire new projects and deepen the collaboration with the German client; on the other hand, he has to tread very carefully not to compromise the good relationship.

Here competition emerges and you have to be very careful when you say 'we want to integrate this and that in the future'. In Germany [MobileIT's main client], there is a whole department or a whole team doing exactly the same thing as we do. This makes the situation very dangerous. (MobileIT,2,11)

Maintaining a good relationship is especially sensitive because smart phone applications are quite easy to copy, which makes the maintenance of business relationships crucial. Good personal relationships are critically important to collaborations: the better the project members get to know each other personally, the more confidence and mutual understanding grow. *MobileIT's* cooperation extends beyond the the German company's own internal organisation to its wider network, because *MobileIT* was assigned the task of inserting the data of one of its client's affiliated firms into a common application. In this case, mediated through the original client, the affiliated firm showed considerable trust in *MobileIT*, which facilitated the collaboration (of course, *MobileIT* had to sign a statement of data privacy).

This case also illustrates the fact that variations in technical tools that do not present a seamless working environment for virtual collaboration within transnational projects. As a consequence, sub-optimal standard software is often used. The main means of communication used with the *MobileIT's* main German client are emails, Skype phone calls, usually using Shared Desktop simultaneously, and weekly phone conferences. More integrated project management and/or communications software,

which in *MobileIT*'s managers' view would facilitate the collaboration, is hindered by internal restrictions imposed by the client company. The project manager and CEO we interviewed says that he prefers 'indirect' communication tools (such as email), to more 'direct' tools (such as phone calls, video conferences etc.) because the former allow the receiver to react when he/she is available and, moreover, create a 'comfortable' distance from the client.

Discussion and conclusion

The cases presented in this paper cover different modes and histories of outsourcing, relocation and virtual collaboration. *ValueIT* offers a classic instance of an early international division between Austria and South-Eastern Europe; *HealthIT* illustrates the revision of an over-ambitious virtualisation of work in which the application of open-source organisation modes to early commercial product development failed; whilst *MobileIT* is an example of a development collaboration with a large client in which traditional company boundaries are retained. Such trans-local collaborations and divisions of labour are common practice among small IT businesses in a small country which nevertheless develop products for larger, international markets, and while *ValueIT* retains its straightforward but stable hierarchical 'born European' offshoring configuration, *Health IT and MobileIT* can be regarded as genuine 'born globals'. Their management had prior international and virtual experience and provide examples of enterprises 'with a global vision, and ... a collection of capabilities at the strategy and organisational-culture levels of the firm that give rise to early adoption of internationalisation and success in a broad range of foreign markets' (Knight & Cavusgil, 2010:137; see also Kudina, Yip & Barkema, 2008). With their small size and young age they offer their clients both innovative capacity and considerable flexibility that even compensates for the management challenges of a large client. It is significant that entrepreneurs and staff in both *HealthIT* and *MobileIT* are highly skilled and educated and command above-average wages (see Eurofound, 2012). The reasons for their global outlook are in line with those of larger companies extending their value chains and passing on risk: they seek to make use of lower cost and highly-skilled workforces, use freelancers who can carry a higher share of the risk of fluctuations in business or, alternatively, create a reliable source of loyal, local, permanently-employed staff. In addition, the nature of the companies' products plays a part in requiring increasingly complex collaborations: software products are becoming part of elaborate bundles of products and services and may not be sold to their end users but receive their revenues from telecom and other service providers, medical product companies etc. Conversely, large businesses may outsource innovative functions or pitch start-ups against their own internal software development units, as in the *MobileIT* case.

These companies' value chains and networks are shaped by power relations and dependencies, their specific forms determined by the modularity or relationality of each configuration. Value chains have been shown to take different shapes in a continuum of organisations, networks and markets, and inter-firm relations can be described as hierarchical (as in the case of *ValueIT* and its subsidiary), relational (*Mobile IT*) or transactional (*Health IT*) (Gereffi et al., 2005). By contrast *HealthIT* is able to do its own

thing, delivering a finished product through a very lean structure, involving freelance work embedded in a culture of professional and collegial exchange and problem-solving, *MobileIT*'s managers need to be more diplomatic, handle collaboration and competition and compensate for their large client's management deficiencies and, for this, deliberately use employees with a long-term perspective. Apparently 'born globals' do not necessarily use precarious employment, but the need to maintain strong customer relations suggests a more conservative approach, as in the case of *MobileIT*.

Dynamic value chain research argues that standardisation, modularisation and codification of knowledge (Polanyi, 1967) are preconditions for outsourcing and offshoring. Indeed, successful virtual cooperations depend on such modularisation of work, and codification of knowledge plays a role as well. However, the work of highly-qualified experts is still only standardised to a very limited extent. As long as the interfaces between modules are standardised, workers and project managers have considerable discretion in the ways they work, assign tasks and communicate. The crucial issue in geographically-distributed virtual cooperations appears to be the precise definition of the interfaces between modules rather than the standardisation of the work itself (see also Mayer-Ahuja, 2011:43). This only works to a limited extent, because 'the ongoing need for knowledge workers to (re)interpret, negotiate and make sense of codified bodies of knowledge is not codified away and cannot be' (Holtgrewe, 2008:3). Management strategies thus need to balance the codification of workers' knowledge and the circulation of uncoded knowledge through formal and informal interaction, by means of workers' mobility (Ramioul, 2012:188) or retention. The evidence supports Barrett and Mayson's conclusion that 'the logic of formalisation can be enabling or constraining and therefore formality and informality are not either ends of a continuum' (Barrett & Mayson, 2008:7). SMEs, in particular, need to offer employees a certain degree of autonomy, and as Dubé and Robey (2009) have shown, this autonomy and virtual collaboration are facilitated by clear structures. Boocock et al. also recommend SMEs to '...clarify reporting relationships, establish parameters for individual autonomy and investigate the extent to which employees are able to solve their own problems' in order to improve work design and problem-solving processes (Boocock et al., 2008:414).

In these configurations, the social side of collaboration is not replaced by purely contractual relations. The personal knowledge and social skills of project managers complement IT and management skills. Face-to-face encounters play a part in all the cases we studied but their benefits are used most intensively in *HealthIT* which, paradoxically, has the most flexible employment contracts. This case shows that loose contractual relationships are not incompatible with very integrated work processes.

The landscape of communication technologies and management tools supporting collaboration is also more heterogeneous than we would have expected. While workers and managers are certainly aware of the adequacy and etiquettes of different media for different purposes, much is left to situated negotiations of practices and also individual preferences for oral or written, synchronous or asynchronous communications.

With a case-study methodology dedicated to small companies in a small country, it is not surprising that the contextuality of varied paths of outsourcing and collaboration

across spatial and organisational boundaries comes to the fore. However, investigating this variation also clarifies the basic patterns of virtual collaboration: the hierarchical, contractual or relational character of value chains that create increasingly complex bundles of products and services, the balance between competition and collaboration, and the role of skills, expertise and collegiality in articulating work across time and space.
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