LANGUAGE CHALLENGES IN INTERNATIONAL TECHNOLOGY TRANSFERS

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Abstract

This paper considers the role of language in technology transfer within multinationals. We challenge common assumptions in international business and technology management literature that technology can be easily transferred and that it is insensitive to language considerations. Drawing on linguistics and business literature we argue that technology transfer even between intra-multinational units is, at least partially, language dependent. Our arguments lead us to suggest four propositions for future research.

LANGUAGE CHALLENGES IN INTERNATIONAL TECHNOLOGY TRANSFERS

FROM "CHINESE WHISPERS" TO "BROKEN TELEPHONES"

The game "Chinese whispers" is one many people are familiar with although from its British title, not everyone may initially recognise it. In Finnish it translates to "broken telephones". It is extremely simple, involving the first person in a chain of people conveying a message to his/her neighbour in a way which is inaudible to anyone else in the chain. The final person in the chain reveals the message received to all the others. In this game there is physical co-location, one language, and multiple participants who are at least partially familiar if not close on personal terms. Yet more often than not, the final outcome is far removed from the message originally sent. Albeit the joy of the game is achieving an amusing result but the message is not intended to be deliberately altered down the chain. The message inadvertently gets muddled as people (mis)interpret what they heard. Consider now the distance knowledge and information must be transferred in the context of international business and the language challenges they must hurdle: people or teams in different locations, using multiple languages, who have perhaps never dealt with one another before. How much information and knowledge must get lost along the way? In the technological context, misinterpreted instructions in telephone installation and use may indeed lead to "broken telephones".

INTRODUCTION

It is widely accepted that in an era of competitive pressures based upon technological competence, the ability to gain access to technology is essential. Multinational companies (MNCs) in this respect have an advantage over solely domestic firms because they can tap into localised regions of agglomerated technological activity which are spread around the world. With the recognition that foreign subsidiaries can create and apply technological knowledge from the host country and share it with the rest of the group, research and development (R&D) activities have become increasingly decentralized within MNCs [Papanastassiou & Pearce 1997; Pearce & Papanastassiou 1999]. As a result, technological competence is distributed across many subsidiaries located in multiple language environments. However, whilst access to technology is necessary, it is insufficient for competitive strength. As important as access to new technologies, is the ability to utilise them strategically, which involves the effective transfer of technologies between the various parts of the organisation [Forsgren 1997]. This process is influenced by language considerations.

The issue of language has been approached from several different perspectives in prior research on international business, multinational management and export marketing. As Terpstra and Davis argue [1991: 35]: "the multiplicity of languages and the parallel diversity

of cultures in the world economy have a constraining influence on the operations of international business". However, neither the research considering the role of languages in international business, nor that considering technological competence has considered the role of language in the process of technology transfer. What has been examined is how companies in early stages of internationalisation face the challenge of responding to growing foreign language demands as they enter new markets whilst operating with limited resources [see, for example, Crick 1999]. Or, in mature stages of internationalisation, how the top management of multinational corporations need to develop strategies to deal with language diversity of multilingual subsidiary staff [Marschan-Piekkari, Welch & Welch 1999a; 1999b] in order to enhance internal control, co-ordination and communication. More commonly, the impact of poor language usage has been discussed in international marketing [see, for example, Ricks 1993]. Failing to consider the requirements of customer language may have detrimental consequences and hamper the development of a close customer-supplier relationship [Turnbull & Cunningham, 1981]. Moreover, at a general level, international business scholars tend to bundle language within the broad concept of 'culture' [see, for example, Hofstede 1984] and therefore it has received limited scholarly attention as a separate variable.

The purpose of this paper is to unravel the role of language in the transfer process of technological knowledge within multinationals. We believe that the literature largely overestimates the ease with which intra-MNC transfers of technology takes place. Even the less culturally sensitive elements of product and process embodied technology may not necessarily be easy to transfer because of the role language. In this conceptual paper, we draw on prior research in international management and linguistics and attempt to develop the concepts of language clusters and language distance. We aim to apply them to the study of technology transfers within MNCs in future and develop four propositions here for this purpose. This issue is important because hindrances in the transfer process may have knock-on effects on the application of the most current techniques to produce innovative products. In turn, in an age where technological prowess is closely tied to competitive strength even in some of the more mature industries, ultimately the firm's performance may be affected.

The remainder of this paper is organised as follows. We first briefly examine how language has been investigated in international business management. We then discuss the context of

technology transfers by reviewing the historical development of innovative activity within MNCs. Thereafter, we establish a relationship between language and its influence on technology transfer by examining both codified and tacit dimensions of technology. The section following that draws on linguistics and aims to develop key concepts which leads us to suggest four propositions on the basis of our analysis. The final section presents the main conclusions and discusses the limitations of our approach.

LANGUAGE IN INTERNATIONAL BUSINESS MANAGEMENT

Scholars have largely neglected language issues in international business [Marschan et al. 1997]. Some discourse on the socio-economic political implications of multilingualism has been recognised by governments and supra-national institutions,[i] but within the context of the firm, only periodic interest has arisen in the last 20 years or so, particularly outside the US [Hofstede 1984; Holden 1989; Terpstra & David 1991; Marschan-Piekkari et al. 1999a, 1999b; Yoshihara, 2000]. One reason for this might be that the study of international business developed in the American context and the predominance of the use of English by American corporations led to the inadvertent exclusion of language considerations within multinationals. The cultural and linguistic diversity in Europe may have raised the profile of the role of languages in this region. Similarly, despite its meteoric rise as an economic power in the 1970's to the mid 1990's, only Japan speaks Japanese and its language is notoriously difficult to learn. And perhaps in recognition that Japanese penetration into the European and US markets would be impeded by a lack of communication, many more Japanese business managers learnt English.

In the extant literature, linguists conducted most of the discussion on the role of language in business. Educationalists largely concerned themselves with the problems associated with language teaching in management education and professional development programmes [Voght & Schaub 1991] where language skills are important because of their potential influence on cross-cultural business negotiations [Stoever 1979; James 1992]. This is supported the growing number of undergraduate courses combining international business and languages. Unfortunately, the linguists views on language are sometimes too discipline specific to be of much use to the scholar of international business and

management. Holden [1989: 2] argues that linguistic scholars' principal methods of classification[ii] are:

> "only of limited applicability if we are to gain a clearer idea of the function of language and the role particular languages with respect to activities...the business scholar's view of language and languages must first and foremost be pragmatic: that is to say that it must be concerned with the use of language in context. The scholar's task must be to try and understand the purposes to which people as members of firms and organizations put language to achieve their objectives".

Where language has been given most attention in international business per se, is in the arena of international marketing where poor language usage has often comic, but occasionally tragic, effects [see, for example Ricks 1993]. More seriously, both outcomes serve to affect corporate profit margins and development of close customer-supplier relationships [Turnbull & Cunningham 1981]. In particular, small and medium sized companies may not possess the necessary resources to deal with growing foreign language demands as they enter new markets [see, for example, Crick 1999]. In more mature stages of internationalisation, top management of multinational corporations tend to have available resources but the challenge of co-ordinating and controlling communication flows across a linguistically diverse and geographically scattered workforce is considerable [Marschan-Piekkari et al. 1999a; 1999b]. To facilitate internal communication flows, MNC top management may adopt a common company language, which often is English. While top management may feel comfortable to communicate with their counterparts in English, the majority of staff below top management may be non-native speakers of English. For top management, the issue of language diversity may seem resolved, but beneath the surface, a number of hindrances and bottlenecks in internal communication flows may remain, affecting also knowledge transfers within the MNC.

TECHNOLOGY AND THE MULTINATIONAL CORPORATION

The twentieth century has witnessed accelerated technological progress. This has affected the competitive business environment in several interconnected ways. Improvements in communications, transport and infrastructure have given companies access to more input resources and more consumers. The same technologies have created well-informed and more demanding consumers. Companies are under pressure to become more technologically

6

competent in a wide range of technological areas to produce new and better products. Simultaneously, the scientific base is growing and new sciences like biotechnology have emerged. These breakthroughs have 'pushed' as many new innovations onto the market via firms, as market demand has 'pulled' innovations from firms. As a result, technological complexity is increasing [Rycroft & Kash 1999] and firms are more "multi-tech" [Granstrand & Sjölander 1990]. Indeed, firms can be seen as the sources of innovation and growth [Cantwell & Fai 1999].

A feature of the technological environment is that different types of technology are internationally dispersed. The modern multinational company (MNC) is ideally suited as a vehicle for both the accumulation of dispersed technologies and the diffusion of these technologies from one location to another. Innovation and the diffusion of technology and knowledge may not only originate from the headquarters [as in older theories of international production like Vernon, 1966] but increasingly from a wide network of foreign subsidiaries [Kogut & Zander 1993]. Cantwell & Piscitello [1999] support this view by showing empirically that the strategies of internationalisation and technological diversification have occurred as simultaneous complements in recent years rather than as strategic substitutes as in the past.

Historically, however, for reasons of interaction with home market customers and intellectual property protection, the traditional centre for technological development within the MNC was a highly centralised R&D laboratory. However, within the more general strategic and structural evolution, the role of the R&D laboratory has also changed. With the recognition that local and creative subsidiaries can access and apply technological knowledge from the host country and share it with the rest of the group, R&D has become relatively more decentralised within the MNC and this trend has grown substantially in quantitative terms [Papanastassiou & Pearce 1997; Pearce 1999; Pearce & Papanastassiou 1999]. Nevertheless, R&D laboratories are the formalised centres for research and development and much innovative development takes place less formally in other stages of the production process. For example, the impetus to innovate may come from the factory floor when difficulties from moving from prototypes to full-scale production might arise, or from the acquisition of new inputs which subsequently require complementary innovation in

downstream activities. As a result, many foreign production subsidiaries now enjoy greater independence and autonomy and have, since the 1980's, attracted academic interest as an explicit unit of analysis [see, for a review, Birkinshaw & Hood, 1998; Holm & Pedersen, 2000].

Such studies have contributed to our understanding about subsidiaries' strategic importance and contribution to the MNC, their degree of integration with /independence from the rest of the MNC [Gupta & Govindarajan 1991; Nobel & Birkinshaw 1998], and their development paths [Birkinshaw & Hood 1998]. A key finding is that the foreign subsidiary may in fact act as a driver of technological activities within the MNC. It may even develop into a "centre of excellence" [Forsgren, Holm & Johanson 1992; Holm & Pedersen 2000]. Previous findings show that a subsidiary's close relationship with customers and suppliers in the local business environment plays a decisive role for developing such a high level of competence [Forsgren, Johanson & Sharma 2000].

Subsidiary centres of excellence can control access to a resource and yield political power in relation to the headquarters and the rest of the MNC. However, a defining factor to occupying a position as a centre of excellence is that a competence is not only created within the subsidiary, but perhaps more importantly, that it is being used by other units within the MNC [Holm & Pedersen 2000: 5]. Given that these subsidiaries are embedded in multiple language environments, a tremendous communication challenge is involved in employing a strategy that encourages globally linked innovative activity. In the hype of technological knowledge management within the MNC, it seems that the question of the role language in this transfer has been largely neglected. We seek to address this in our examination of the language aspects of technological transfers within the MNC.

TECHNOLOGY AND BARRIERS TO ITS TRANSFER

Technology transfers are assumed occur both within and between firms and indeed between firms and other institutions (e.g. universities, research organisations etc.), but what do we include within the term 'technology'? There have been discussions that define technology distinctly from science [Archibugi 1992]. Essentially, the distinction is that technology is the

application of science for commercial ends. To some extent technology is embodied within both inventions and innovations, but again, distinctions between inventions and innovations have been made on the basis of the commercial impact innovations have [Schumpeter 1942; Pavitt 1988]. However, technology does not just refer to the parts of innovations that are embodied within products and processes but also the know-how required to use them effectively.

Technology therefore consists of two elements - codified and tacit knowledge. The latter is firm specific, gained through group learning experiences and makes technological transfer between groups imperfect. Because the tacit elements arise though group experiences, this means that technology is intrinsically linked with organisational issues. For us then, we interpret technology in the widest sense possible in this paper. It encompasses innovations based on feats of physical engineering and those based on organisational and managerial innovations. Often these three will accompany each other. The assumption of a fairly unified corporate culture within the MNC should lead to easier and fuller technological transfers than transfers between two independent enterprises [Kogut & Zander 1993]. Thus, MNCs are likely to have advantages in the international transfer of technology over purely domestic firms who are transferring technologies via the market or quasi-market arrangements like joint ventures because the process remains within the firm and the receiving party can therefore absorb higher levels of tacit knowledge in the transfer.

In some respects, the enthusiasm for the benefits of a truly integrated transnational strategy [Bartlett & Ghoshal 1989] has lead to the presumption that all MNC units desire technological transfer. Technology transfers is perhaps also considered to be relatively easy to conduct because a great deal of technology is embodied within physical products and processes, which can be easily transported across national boundaries. On the other hand quite a number of barriers to the transfer of technology have been highlighted in a range of literatures.

The first of these barriers would be the tacit elements of technology. It is rare that technologies in the modern age are so simple that they can be transferred without being

accompanied by the requisite tacit element. Without the development of tacit knowledge to accompany transfers of codified knowledge, technological transfers are difficult.

At the same time, multi-tech firms do not use technologies in isolation, but generally within systems of some sort. Either a new component has to be integrated into a physical system – e.g. the semiconductor onto an electronic circuit board containing resistors, memory chips etc. - or the process technology has to be integrated into the wider production system. The recipient party must therefore possess the 'absorptive capacity' [Cohen and Levinthal 1989] to integrate technologies together.

Moving towards organizational barriers, resistance to technology transfers might arise for several reasons. Birkinshaw and Ridderstrale [1999] introduce the term 'corporate immune system' to describe forces that resist initiatives originating from subsidiaries of multinational corporations. Typically, subsidiary initiatives are often viewed with suspicion or even hostility at various levels and locations of the multinational. Following this line of thought, Birkinshaw and Ridderstrale [1999] suggest that subsidiary initiatives can be regarded as alien elements in the organisation system that the 'corporate immune system' seeks to suppress and destroy. At a more general level, this is consistent with the Not Invented Here (NIH) syndrome suggesting that one part of the organisation believes it possesses a monopoly of knowledge in its field. This leads it to reject new, unknown ideas presented by outsiders [Katz & Allen 1982]. Such an environment is hardly conducive to transfer of technological knowledge across units.

Another impediment to transfer is that technological knowledge developed in one subsidiary may be customer, supplier or even competitor specific and thus irrelevant to another unit [Forsgren 1997]. There may not be demand for local solutions beyond the home country of the subsidiary. On the other hand, there may be few incentives for the subsidiary to act as a 'giver of new knowledge within the MNC' [Forsgren 1997: 74]. The interests between units may collide and the existing command structure supported by financial control systems and profit orientation may operate as hindrances in transfer processes.

Even at the more basic level concerning the substitution between capital and labour within economic theory, resistance to technology transfer may result from the fear of job losses.
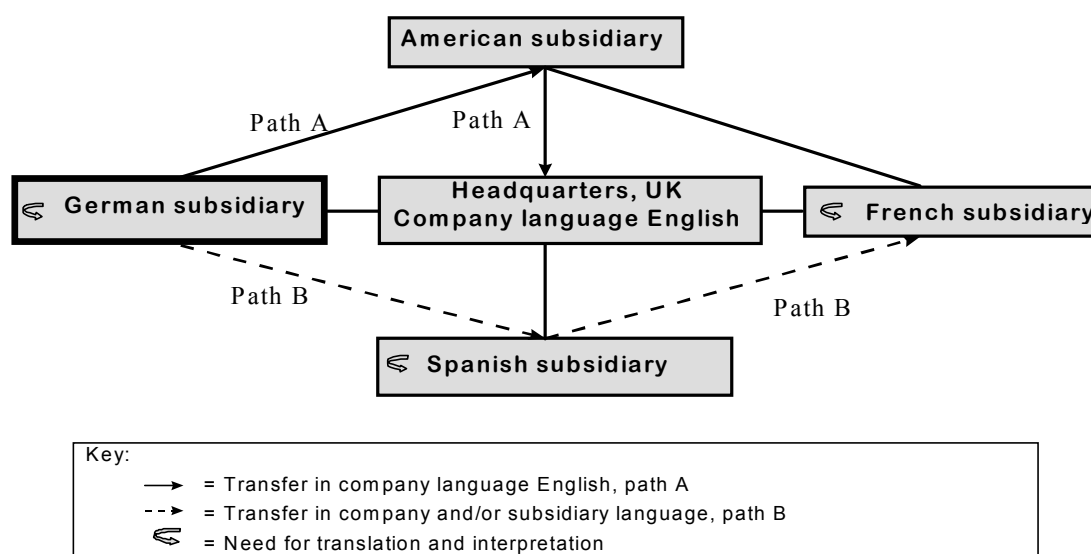
Finally, an overlooked barrier is language. In this paper, we argue that the process of technology transfer within MNCs – between headquarters and foreign subsidiaries as well as directly between overseas units – is very much influenced by language. Our discussion will show that language affects both the codified and tacit elements of technology.

LANGUAGE AND ITS INFLUENCE ON TECHNOLOGY TRANSFER

As described earlier, in the modern MNC, technological competence is distributed across many foreign subsidiaries located in various geographical areas and embedded in multiple language environments. Obviously, not all innovative activity is transferred to other units and thus exposed to language considerations. It seems sensible to assume that a bulk of technological knowledge developed in subsidiaries is only useful for the local business environment and thus not interesting for the rest of the firm [Forsgren 1997]. However, some technological knowledge may be highly useful for other units. Assuming that these units are both willing to share and receive such knowledge, communication and language issues may now come into play.

Earlier research acknowledges the central role of communication to effective technological activities within the MNC [De Meyer 1991]. In their study of 110 international R&D units from 15 MNCs, Nobel and Birkinshaw [1998] identify four different types of communication lines for foreign R&D units. First, there are vertical lines of communication with headquarters. Second, there are horizontal lines of communication with other R&D units of the MNC. Third, there are horizontal flows to other functions, notably manufacturing and marketing within the same subsidiary. Fourth, there are communication flows to external parties such as customers, suppliers and local universities. Figure 1 illustrates a network of subsidiaries in various countries and a headquarters unit located in the UK. These units are interconnected through knowledge transfers which flow vertically (headquarter-subsidiary) and horizontally (inter-subsidiary).

Figure 1. Language paths in transferring technological knowledge
within the multinational corporation

As Figure 1 shows, the German subsidiary is the source of knowledge transfer in this example. If it follows path A to the American subsidiary, then to headquarters in the UK, the transfer is likely to occur in English. The bulk of translation and interpretation will take place within the German subsidiary. However, there may be a need to recognize the 'world of Englishes.' As George Bernard Shaw [in Terpstra & David 1991: 21] once said: "Britain and America are two nations separated by a common language." A shared language does not necessarily ensure full and perfect transfer of information. Had the headquarters been located in a non-English speaking country such as Finland, the transfer would have involved an additional interface between the common company language, English, and the parent country language, Finnish. In contrast, path B excludes the headquarters and demonstrates knowledge transfer between the German, Spanish and French subsidiaries. This entails multiple translations and interpretation between subsidiary and/or company language with possible loss of information.

Set against this background, a common company language is unlikely to fully resolve the communication challenges involved in the process of transferring technological knowledge between units. Instead, one can foresee multiple phases of filtering, translating, coding and de-coding in knowledge exchanges within the firm. For example, the supply of technical

knowledge in the common company language may be limited. As a result technological knowledge within the company may be fragmented into isolated pools of expertise. Subsidiary staff may not have the relevant language competence to translate and document their local knowledge in an appropriate form for internal transfer. Consequently, much of the subsidiary knowledge will remain untapped from the perspective of the rest of the MNC. Moreover, the demand for technological knowledge may also be limited, as staffs within the MNC are not aware of other units' knowledge. And even if they were aware, they may not be able to access it because of language problems. What may happen is that technology transfer becomes partially determined by language skills rather than by a genuine need for knowledge. In such circumstances, staff who can comfortably speak each other's languages and who understand each other at a cognitive level, liaise with and through, each other even when formal business needs would require liaising with somebody else. Thus, the transfer process of technological knowledge, particularly the most tacit elements, may follow its own language path regardless of the common company language.

Obviously, this raises the question whether full transfer is even desirable. One may speculate that as a result of slack and potential misunderstandings, new interpretation and adjustment takes place. This may lead to unintended but highly innovative solutions.

Language in Transferring Codified and Tacit Technology

Language can act as a barrier to transfer in both the codified and the tacit elements of technology. For example, in the case of codified knowledge, the form of this codification is important. International symbols for power sources, resistors, chemical compounds may facilitate technological transfers. Similarly, the Latin names given to biological species etc. allow experts from within the same field (or at least someone with the relevant scientific/engineering training) to communicate limited amounts of knowledge in the codified form of diagrams and blue prints. However, blue prints and diagrams in themselves often communicate very little without accompanying documentation. Most products embodying technology require some sort of manual to inform the recipient how to set up and operate the artefact (for example, consumer products which are sold internationally). In the most simplistic case of pure assembly, the instructions are often diagrammatic e.g. IKEA furniture. Products with slightly more complex operating procedures are normally accompanied with

instructions written in perhaps two or more languages (for example, scientific calculators). Here relatively simple information has to be transposed from one form to another through the process of language translation and even then the true meaning can be confusing [Fraser 1999a]. In Finland, for example, a bathroom notice apparently read "To stop the drip, turn cock to right" [Ricks 1993: 76]. This is amusing and whilst unfortunate, the meaning is still comprehensible. However, in the case of more complex industrial machinery misleading or incorrect translations could be fatal as they were in the Middle East where faulty translations in some equipment handling instructions led to the injury and death of several construction employees [Ricks 1993: 75].

Moreover, the language the product documentation is written in may affect the amount of, extent or speed with which, codified knowledge that can be transferred. For example, the diversity of Indian languages hinders the penetration of software, as only five percent of the population have sufficient English language skills [Talacko 2000]. Similarly, an Irish software engineer working for an indigenous company in Japan related anecdotal evidence to us. He mentioned how the Japanese had difficulty implementing new software brought out by American companies because the manuals were always written in English. Moreover, with the pace of software advancement in the 1980s it was too time consuming to translate the documents formally into Japanese. The job of this software engineer was partially to learn how to implement and operate the software and then teach the Japanese employees how to use the programmes. The local personnel would then engage in a process of learning by doing. Of course in the case of written documentation, the time and cost factors may be beneficial by acting as a "filter" through which only the most important pieces of information pass through in which case the language barrier may be seen in a positive light. This example is a case in point where even codified knowledge faces language as an impediment to technological transfer.

In the case of tacit knowledge, technological transfer is necessarily imperfect and much of it is exchanged through interpersonal interaction. For this reason, many MNCs send trouble-shooters on short foreign postings to solve technical problems on the spot in foreign subsidiaries. However, assembling international teams for example, of highly qualified engineers rests on the assumption that the members of these teams can communicate

effectively with one another. On the one hand, "international" symbols and the "technical and scientific language" aspects of the work will facilitate their interaction. On the other hand, the national languages they speak to each other in may impede it. Interview data with the head of the corporate technical training center from the Finnish multinational, Kone Elevators, illustrates the difficulties of forming coherency and understanding amongst a team. This manager said that over several years, Finnish senior installation persons have been sent overseas to train local subsidiary staff as part of an elevator project, but technological knowledge has been transferred to a very limited extent. These technical experts have concentrated too much on the elevator project itself, stayed in the country for a fairly short time and not collaborated enough with local staff language. A related problem here is that technical knowledge and the ability to communicate, especially in a foreign language, are not necessarily 'neatly packaged' in the same person [Marschan-Piekkari et al. 1999a]. Linguistic competencies may not be embodied within technical staff and translators may not possess the requisite technical language. Even in cases where technical knowledge and foreign language ability are embodied in the same person, constraints on their language fluency in their second tongue will impede the extent to which the details can be articulated [Yoshihara 2000]. When communicating in a second language it can appear that a highly skilled person's IQ is lowered dramatically and that the difficulty in communication will mean that fewer ideas are expressed understood and exchanged[iii] [Yoshihara 2000].

Thus, whilst it is generally recognized that "R&D people with different cultural backgrounds and styles of thought [are] perceived as beneficial for creativity and speedier problem solving" [Granstrand, 2000: 47] in this context, it seems that the language aspect is often ignored. Moreover, as a considerable share of knowledge transfer within the MNC takes place between technical and non-technical personnel representing different educational backgrounds and subsidiary units, information exchanges from the language perspective are likely to be further complicated.

Our previous discussion has established a relationship between the transfer process of technological knowledge and language. At this stage, we would like to move beyond a descriptive analysis towards an attempt to conceptualise and quantify language implications for this process. MNCs by definition cross cultural and language boundaries but they are

likely to differ as to the 'language profile' (i.e. composition of subsidiary languages, common company language and parent country language). In one MNC, subsidiaries operating as 'centres of excellence' may be located in a particular language cluster while in another firm, the units contributing to innovation may be language-wise very dispersed. The dynamic interplay between languages and staff's competence to operate in various idioms is likely to influence the delicate process of technology transfer within MNCs. In order to gain a better understanding of this process, we need to develop appropriate measures and tools for the purpose.

DEVELOPMENT OF KEY CONCEPTS

Language Clusters

In the effort to develop an appropriate definition of and measure for 'language clusters', we referred to the discipline of linguistics. There are estimated to be in excess of 3,000 languages and up to three times as many dialects in the world. However, relatively few languages serve as languages of business on an international and supra-national basis [Holden, 1989].

In linguistics, the notion of relationship and similarity between languages is a vague concept. As Meetham [1969: 471] points out, linguistic similarity "can only be made explici-analytically in the form of limited statements made separately for the levels of phonology, morphology, lexis etc.…The outcome of any linguistic comparison will be conditioned by the items selected and the criteria applied." Despite disagreements among linguistics, they commonly divide languages into four levels: (1) the level of syntactics (e.g. grammar and basic meanings of words, (2) the level of phonetics (e.g. sounds of words), (3) level of semantics (e.g. 'polite' language vs. 'formal' language vs. 'slang'; the connotations and denotations of words), and (4) the level of pragmatics (e.g. which communication strategies are commonly used in different situations of interaction such as negotiations, parties and funerals). Even in the case of phonetics, for example, similarity may be problematic, as similar sounds do not necessarily convey the same meaning across different languages.

From the perspective of international business management, the level of pragmatics is most closely related to the cultural element of language. For example, in high context cultures such as Japan, the social and temporal context of communication is the key to understanding the

intended meaning of the message. It also influences the choice of appropriate communication strategies for knowledge transfer. In contrast, in low context cultures such as the United States, communication tends to be more explicit by nature and contain fewer contextual elements. For such reasons, we believe that the subtleties embedded within the language element of culture deserve to be extracted.

Linguists have a standardized grouping of language families based on their genealogy (historical relationships, genetic or areal)[iv]. For example, Katzner [1975] presents a chart of language families of the world, an extract upon which we can draw as a starting point is given in Table 1. As Table 1 shows, we have identified six clusters of languages at the level of subgroups that we use as our primary level of analysis with the exception of the Germanic subgroup where we divide the languages into branches. These six clusters of languages will be applied to multinational corporations and their subsidiary units across the world in later research.

Table 1. Language families

Family	Subgroup	Branch	Major languages as clusters
Indo-European	Germanic	Western	1. English, German, Dutch, Flemish
		Scandinavian	2. Swedish, Danish, Norwegian
	Hellenic		3. Greek
	Romance		4. Italian, French, Spanish, Portuguese, Rumanian
	Slavic		5. Russian, Polish, Czech, Bulgarian, Slovenian
Uralic	Finno-Ugric		6. Finnish, Hungarian

Source: Adapted from Katzner [1975: 2-3]

In Table 1, the languages we have selected were chosen because of their importance as business languages and their use in the most significant (in economic terms) countries within Europe. For the purpose of business communication, Holden [1989] constructed a tripartite

17

typology and identified the number of languages that fall into these types. These can be interpreted as follows: (1) there are six principal *languages of market contact* – the language used to communicate with market intermediaries such as foreign subsidiaries and exert control over their activities; (2) *market languages* – the language used in the host country to communicate with local suppliers, distributors and customers; and (3) twenty-three *languages of marketing value* – languages essentially used by the marketing department to establish contacts with potential customers. The languages of Table 1 correspond to a large degree with the key European languages of marketing value identified by Holden [1989], except we have also included Flemish and Rumanian[v]. Most fall into the Indo-European family, in that each of the languages can be traced back through branches and subgroups to this one family. Note, Finnish and Hungarian are unrelated to any of the Indo-European languages, and are in a completely separate language family - Uralic[vi]. This grouping of languages at various levels of the 'family tree' allows us to get a general sense of linguistic proximity. It allows us to start building an ordinal measure of language distance rather than a quantifiable cardinal measure just as in the measurement of the neo-classical economic concept of utility.

Language Distance

Development of a measure for 'language distance' provided challenges from the outset. According to experts in the field of linguistics, there is no quantified measure of language distance and many problems are associated with efforts to develop one. Only recently has any attempt to quantify linguistics been made [Heggarty 2000].

In other work based on insights from an in-depth study of a Finnish multinational, Kone Elevators, Marschan-Piekkari et al. [1999b] introduced the term 'language distance' between headquarters and individual subsidiaries to explain organizational isolation within the multinational corporation. On the basis of an alternative typology to Holden's [1989] - parent language, common company language and the subsidiary language - these authors suggest that strategically important information is primarily exchanged in the common company language (English) or the parent country language (Finnish). In this way, language distance is a function of subsidiary staff's fluency in these languages creating a sense of remoteness and disconnectedness from, or closeness to, headquarters. Subsidiary staff, who are able to operate in the common company language and/or parent company language, can actively
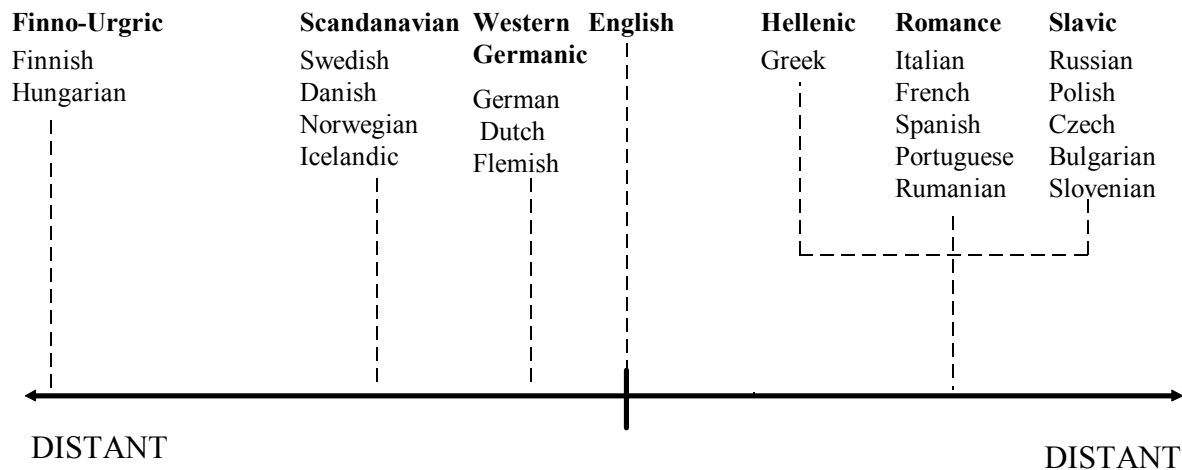
18

engage in information exchanges with headquarters and sister units. In contrast, staff outside these language clusters may have unequal opportunities to be considered full members of the corporate 'family'. This suggests that the possession of language skills has political connotations. It may strengthen the power base of the subsidiary unit because it provides access to more information and politically useful information. As a result, not only might a hierarchy of subsidiaries arise, but also a hierarchy of languages [Marschan-Piekkari et al. 1999b].

It is worth noticing that the concept of language distance has parallels with earlier studies on internationalisation processes that introduced the concept of psychic distance [Johanson & Wiedersheim-Paul 1975; Johanson & Vahlne 1977]. Psychic distance was defined as a factor preventing or disturbing the flow of information between the firm's home country and its foreign market. These factors included differences in language, culture, political systems, level of education, and level of development between the two countries. Psychic distance resulted in a bias towards favouring culturally similar and familiar markets. It generated uncertainty about international expansion and thus affected the rate and patterns of internationalisation. Although this body of literature acknowledged language as an integral component of psychic distance, it did not investigate the impact of language on internationalisation processes as a separate variable [Marschan-Piekkari et al. 2000].

In Figure 2, we have tried to develop some sense of ordinal distance from the English language based on what we perceive to be 'mutual intelligibility'. Mutual intelligibility is when effective vocal communication can be established between two speakers[vii] [Meetham 1969: 243]. We have chosen English as the language from which to measure the relative distance of other languages for two reasons: its dominance as the major business language in the world and its status as an 'international lingua franca'. "A lingua franca is any language which is used as a means of communication among people whose native languages are mutually unintelligible; whether this lingua franca is the native language of either of the two people or a 'neutral' third language…. *international languages* [are] languages which, by virtue of their large number of native speakers, cultural dominance and, usually, geographical spread, have become a media of communication in all spheres among national groups"

[Meetham 1969: 480]. We have placed English in the middle because of its roots with Western, Hellenic and Romance subgroups.

Figure 2. Distance between English and major business languages

Finno-Urgric	Scandanavian	Western Germanic	English	Hellenic	Romance	Slavic
Finnish	Swedish			Greek	Italian	Russian
Hungarian	Danish	German			French	Polish
	Norwegian	Dutch			Spanish	Czech
	Icelandic	Flemish			Portuguese	Bulgarian
					Rumanian	Slovenian

DISTANT   DISTANT

The linguist's language families or clusters enable us to sense that Swedish is closer to Danish than it is to German and that its distance to German is less than the distance between Swedish and Greek. Unfortunately, it does not really allow us to know whether the distances between Swedish and Greek are greater or less than that between Swedish and Italian, Russian and Finnish. Whilst Figure 2 provides a useful conceptualisation of an intangible concept, we use this tentatively as a first approximation for ordinal linguistic distance from English. We have yet not ascertained whether the Slavic languages are more remote from English than the Hellenic or Romance branches, but because the Finno-Ugric subgroup represents another family of languages we are happy to consider it to be the most remote.

DEVELOPMENT OF PROPOSITIONS FOR FUTURE INVESTIGATION

This paper argues that technology transfer between units of the MNC is (at least partially) language dependent. Having set the foundations for our interest in this research area, we have developed four propositions:

> *Proposition 1:* In transfers between parent and subsidiary unit, if the parent company language is different from the common company language, the process of technology transfer is likely to be more imperfect.

In companies that originate from countries whose natural language is not also a lingua franca (such as Finland, the Netherlands, Portugal etc. as opposed to the UK, France and Spain) the parent company language is likely to differ from the common company language. Another language layer is added to knowledge exchanges within the MNC and there is potential for any transfer to be imperfect to a greater degree than one where the translation and interpretation interfaces are fewer.

> *Proposition 2:* Mutual understanding and a shared language will be facilitate the ease of technology transfer.

If two units (parent-subsidiary or subsidiary-subsidiary) within the multinational share a common language, say French, then the common use of French should facilitate and lead to more frequent/fuller technology transfers between them. In communicating with a third unit which does not share the French language, technology transfers are subject to more language transformations and will be less perfect and possibly less frequent than between the two that do share French.

> *Proposition 3:* Flows of technological knowledge will be more frequent between subsidiaries within the same language cluster, than between language clusters.

To elaborate on proposition three, given the greater mutual intelligibility between the languages within the Romance family (French, Italian, Spanish, Portuguese etc.) rather than with the Finno-Ugric family, we would expect subsidiaries located in these linguistically clustered countries to communicate more frequently and more easily with one another than they would with subsidiaries located outside their language cluster e.g. Finland. We also expect subsidiaries within a language cluster, but speaking different languages to communicate less easily and frequently than if they all adopted the same language to communicate in (e.g. adopted a common company language).

> *Proposition 4:* Flows of technological knowledge will be more frequent, the closer the language clusters.

This proposition suggests that subsidiaries belonging to, for example, the Romance family are likely to exchange technological knowledge on a more regular basis compared to units of the Germanic family where the languages have developed in their own directions.

CONCLUSION

The purpose of this paper was to unravel the role of language in the transfer process of technological knowledge within multinationals. Drawing on earlier work in international management and linguistics, our literature review shows that language in technology transfers within the MNC is an important but overlooked issue. Many failures or successes of technology transfer have probably been hidden behind the discussion about codified versus tacit nature of technical knowledge and the common underlying belief that scientific technical language is understood similarly across borders. However, the language competence of staff in different parts of the MNC is likely to interfere with such activities as translating, filtering, understanding, and utilizing technological knowledge.

Critics of our approach may argue that the language factor is secondary to that of culture and does not deserve independent research. We have already agreed previously that language is embedded within culture, but argued that it has become overlooked in its own right. We also acknowledge that the decision to transfer knowledge from one site to another may be less to do with language issues than it is economic and political motives. Indeed language-planners in socio-linguistics themselves write that " 'language problems cannot be solved by attention to language alone' [Neustupny 1983: 2] since language alternatives are embedded in the social, economic and political context in which they function" [Christian 1988: 195]. But within international business, the social economic and political contexts are well attended to and language elements have largely been ignored. Our efforts here are a beginning of an attempt to address this imbalance.

Another counter argument suggests that language challenges can be easily overcome through the use of translation services. However, as illustrated in our earlier software examples, the translation of documents is costly and time consuming. Also because of inadequate briefing, for example, the quality of translations may be affected [Fraser 1999b]. It requires professionalism and a lot of competence to accurately translate business documents into another language, as words and phrases are often not identically paralleled in different languages and the translator must use his/her discretion. A related issue here is confidentiality. Some internal company documents may be too sensitive to be taken to an

outside translator which increases the need to develop in-house language competence [Marschan-Piekkari et al. 2000].

Nevertheless, technology does not merely consist of written documentation and it must be recognized that despite the transferability of its codified element (blueprints, instruction manuals, videos etc.), technology's partially tacit nature arises from cooperative learning within teams that is hard to transfer. Even if there is training given by personnel experienced with a particular technology, the context of the learning by the party being trained is situation specific and hence the tacit element of the technology transfer will be differentiated in each case. In this sense technological transfers have been well documented in academic literature on technological innovation and competitiveness. The consideration of language as an impediment to the transfer of knowledge however, brings different dimensions to the problem.

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[i] For example, an International Round Table seminar was conducted by the European Institute in Washington DC in 1992 entitled "Multilingualism in Europe and the US: A communications challenge for transatlantic relations and global business" .

[ii] These are taken by Holden (1989) from Comrie (1981) and are genetic affiliation; typological relationships and areal distribution.

[iii] This was expressed in a conference session at the Academy of International Business - UK Chapter, 2000: "The Multinational in the Millennium: Companies and Countries, Changes and Choices".

[iv] Typological relationships are based on the structural characteristics of the language; genetic relationships result from the divergence of an original unit (found in language families, due to loss of contact among the members; areal relationships are based on the geographical location of the languages. Meetham (1969, p472, 486).

[v] In addition Holden [1989] identified five key non-European languages of marketing values; Arabic, Chinese, Indonesian, Japanese and Korean. We would seek to include these languages into our research at a later stage. Also Holden included Serbo-croat, whereas we have replaced that with Slovenian in the European languages.

[vi] Other languages belong to this language family, but are rather less well known - Estonian, Mordvin, Udmurt, Mari and Komi, hence we disregard them in this paper.

[vii] Mutual intelligibility is considered to be subject to considerable limitation among linguists, but serves us well enough in our analysis as it suggest some level of cognitive understanding, even though we acknowledge that a linguistic scientist might be less satisfied with its employment in his own field.