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# Exploiting Information and Communication Technologies for Rural Development

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**Abstract** — This paper examines how information technology (IT) might be exploited to promote rural development; it also considers how IT impacts on the rural periphery. The appropriate adaptation of this technology for indigenous development is considered and whether it may lead to greater centralisation or decentralisation. It is suggested that much can be learned from the Nordic telecottage experiments to date, particularly in relation to the big challenge of diffusing this technology to SMEs.

## Introduction

Information technology (IT) is widely acknowledged as a major force in economic development, presenting both opportunities and threats for the rural periphery. This paper attempts to outline and explain recent developments in these technologies, placing them in an overall framework of economic development. It examines how these developments might influence rural areas, both in terms of how IT impacts on the periphery, and in terms of how the technology might be exploited to promote development in rural areas.

In the first place it is necessary to outline a conceptual framework of information technology within recent changes in economic development, and secondly to locate these developments within the context of rural development. One of the key questions at the heart of current discussions about information technology is whether it will bring about greater centralisation or decentralisation. The significant technological development has been the convergence between computer technology and telecommunications in the form of computer networks, and applications of this technology in the context of rural areas raises questions about appropriate adaptations for indigenous development.

Much of the attention in information technology, to date, has been focused on the technology side and there has been inadequate examination of the information component. A significant proportion of

research work in this area has been of a speculative nature, since the technology is still in the early stages of diffusion and little empirical analysis has been carried out. The debate about the potential of IT, therefore, particularly in relation to the periphery, tends to swing from the extreme of pessimism to that of optimism, with few clear insights into the cultural and political dimensions of its diffusion. From a rural perspective much more attention needs to be given to the cultural dimension of exploiting this technology, and there is much to be learned in this regard from the Nordic experiments with telecottages.

Information technology is increasingly regarded as an important tool for rural development, with emphasis being placed on ways of diffusing this technology to small and medium-sized businesses (SMEs), in particular. An important strategy in helping to bring this about is that of networking between small-scale enterprises in remote areas.

An investigation into the potential of information technology for rural development, therefore, raises a host of policy issues, some of which will be touched on in this paper.

## The information economy

A number of commentators on the current phase of economic development refer to it as 'post-Fordist', mainly because of the significant shift away from traditional mass production towards new possi-

bilities for dispersing production in small units. Increasing affluence and the emergence of a more sophisticated and discerning consumer society are transforming markets. There is an increasing emphasis, therefore, on the need for a flexible response to rapid shifts in tastes in the marketplace, and an accompanying shift from the principle of economies of scale to what is referred to as 'economies of scope'. By applying economies of scope the production of a continuous stream of different product designs at the same cost as an equal stream of identical products is possible (Gillespie *et al.*, 1989). In the new marketplace, therefore, there is a greater emphasis on innovation, creativity, quality and design, with information being regarded as the key resource. There is, therefore, a significant shift away from the traditional view of physical and material resources towards knowledge-based economic activities.

At the heart of these developments are the new information and communications technologies (ICT), which have been referred to as the 'permissive technology' and which are facilitating significant changes in the nature and organisation of economic activity. The most important technical development which has occurred in this area is the application of computer techniques to information engineering, with network connectivity being an essential feature of the new communications technology. What has been created, therefore, is a tool for facilitating interaction between organisations and people, and it is sometimes referred to as 'telematics'. What is implied by this term is that anything which can be computerised can be telecommunicated, and anything which can be telecommunicated can be computerised. The importance of this development is the facility for bridging significant physical and related organisational and cultural distances (Arnbak, 1990).

Computer networking, which once was only feasible for large companies, is now accessible to a much wider range of potential users. It remains, however, very much in the developmental stages and applications are still only marginal in many sectors. In the Irish context, as elsewhere, computer networks are mainly controlled by large organisations, including foreign and native multinational companies, government departments and semi-state companies (Grimes, 1992). In most cases these organisations employ 500 or more people and have widely distributed branches.

Information-intensive activities such as the financial services sector are major users of networks. Because of on-going problems of compatibility associated with establishing international standards for com-

puter architecture, interconnectivity between organisations is still very rare. This current lack of interconnectivity is a major obstacle towards unleashing enormous potential for linking dispersed operations within the spatial economy both nationally and internationally.

As Hepworth (1989) has pointed out, the information economy is not a leveller with the inter-city requirements of MNCs and government departments driving the development of the 'electronic highways'. In the U.K. 60% of all data traffic is accounted for by 300 large companies, whereas in Norway 25 companies make up between 40 and 50% of the traffic. The needs of multinational companies, in particular, determine the spatial evolution of networks with between 80 and 90% of 'transborder data flows' being generated by intra-firm services.

Among the various applications which have been associated with information technology to date are the following: as a product innovation, as a distributional innovation, as a process innovation within manufacturing, as a process innovation in information production, as a transactional innovation and as a managerial innovation (Wiberg, 1989). Gradually these applications are becoming more diffused throughout the marketplace, and among the better-known applications are EDI (Electronic Data Interchange), EFT (Electronic Funds Transfer), JIT (Just-In-Time manufacturing), MIS (Management Information Systems), CAM/CIM (Computer Aided Manufacturing and Computer Integrated Manufacturing). Information technology applications can also be usefully differentiated into two groups of 'teledistributed' services: teleassisted services, where telecommunications is only a means in the production of the services (such as offshore data-processing of 'telework') and 'telebased' services where telecommunications solutions are an integral part of the service concept (Hetzell, 1990). Examples of the latter include databases, videotex, electronic mail, etc. Among the most successful applications of information technology to date has been the French Minitel development, which is a videotex system, and currently has about 2.5 million terminals in domestic use.

In this new technology, computer networks are the spatial systems for sharing IT. In the 1980s developments were mainly concentrated in LANs (Local Area Networks) which made possible intra-organisational computer networking. Such networking created automatic links between different units within an organisation, such as offices, factories and warehouses. With more recent developments in OSI (open systems interconnection standards) networks between organisations (WANs) will become more

widespread. Such developments have profound implications for relationships between cores and peripheries, since for the first time the need for capital and labour to be colocated is being effectively challenged (Gillespie *et al.*, 1989).

On its own, of course, this technology will not achieve anything, and it is necessary to conceptualise these developments within the broad context of economic and social relations within which they occur. An important element for consideration here is the political economy of computer networks, that is the ownership and control of this technology. The reality is that most networks are private and proprietary, and therefore access to their potential and to the information embedded within them is largely restricted within their controlling organisations. Within such private networks information can be seen as a firm specific asset to be exploited in order to enhance competitive advantages. Because of the significance of information, however, as a dominant component of change, and because information is such an intangible commodity, there are fundamental difficulties in conceptualising the relevance of these processes to economic development. There is also a serious danger that policy-makers might overlook the need to intervene in this important area of telecommunications, particularly in order to safeguard the interests of the periphery.

As far as the periphery is concerned, the provision of physical infrastructure for computer networks — although extremely expensive and in need of significant subsidisation — is the easier part, while the greater challenge is in creating a genuine community of interest between different parties who might form networks. According to Arnbak (1990) there is little justification for telematics applications without mutual acceptance, authorisation and validation of the need for common information by the connected parties. The diffusion of applications such as EDI and EFT, even in the more computerised countries is moving quite slowly, precisely because of psychological and cultural barriers, leading to questions about the suitability of such universal applications. Resistance to the adoption of electronic trading by SMEs can also be explained in terms of the significant costs involved in this technology. Part of the explanation for potential conflicts relate to what Arnbak (1990) refers to as the need to fuse the two widely different cultures of electronic data processing and telecommunications. Since telecommunications in many countries is provided by a state monopoly, the main concern is with the universal availability of standardised services, with the result that there is often a significant gap between the supply side of telecommunications and the demand

side for advanced services, which is usually made up of a variety of users.

The relationship between new communications technology and economic development, therefore, is complicated, and it is not clear whether IT creates a basis for development or vice versa. Within the European Community, however, the use of telecommunications services has recently increased by more than 7% per annum, and in the most advanced centres growth rates for data communications are more than 20% per annum (Arnbak, 1990). It has also been estimated that an investment of 1% in telecommunications infrastructure renders a contribution of 2% to the same GDP.

As economic activity is increasingly characterised by specialisation and a greater division of labour, information technology enables local businesses to be connected directly to national and international production systems, making it possible for them to respond to market changes at short notice. Integrating such outlying areas into the larger marketplace, however, could expose the weaknesses of some areas to increased competition. Computer-based delivery systems for information-intensive activities such as banking, insurance and business services could have drastic implications for peripheral areas through the closure of remotely located branches, and through weakening the regional competence profile by removing the scarce supply of associated skills.

In conceptualising the role of IT in economic development, it has sometimes been asked whether we should begin with the solutions or with the identified needs. It is not easy, however, to determine the relation between needs and solutions, and in many cases the formulated needs are the result of a long process which has been stimulated by an awareness of possible solutions (Hetland, 1990). Telematic field trials in Norway have helped to concretise possibilities which at the outset were difficult to conceptualise. The objective of these trials was to arrive at technical solutions which would satisfy social needs in the best possible manner.

One of the problems associated with devising effective ways of exploiting information technology is the fact that too much emphasis has been placed on the 'T' of IT and there has been a general neglect of the role of information generation, capture and transmission in economic development (Hepworth, 1989). As society becomes more complex, there is a growing need for access to information, which is now regarded as the key resource in all economic sectors. It has been suggested that the modern manufactur-

ing plant is in need of information as much as a financial institution, and that 'making markets' is what much of the information economy is about. Computer networks are described as the new arteries along which the life-blood (information) of economic activity flows in the information economy (Hepworth, 1989).

### **Centralising or decentralising**

While the spatial pattern of computer networks and data communications has been strongly biased towards the urban core, information technology has enormous potential for economic decentralisation. Most researchers, however, point to the paradox of IT and the 'thesis of ambivalence' with regard to centralisation and decentralisation strategies. It is generally held to be too early yet in the diffusion of this technology to discern possible scenarios with any degree of certitude. One possibility is for more centralised structures with a greater gulf between the core and the periphery (Boisard, 1990). The second possibility is for all centres to achieve a greater degree of autonomy because of the greater uniformity of tools which the technology will make available to them. In the case of JIT inter-organisational networks, however, it would appear that they are leading to spatial agglomeration tendencies around cities. Hepworth (1990) points out that the information economy is dominated by major cities, although a transformation of information space is widely expected during the 1990s.

In the current stage of post-Fordist economic development there are definite tendencies towards decentralisation from hierarchies to markets (Hepworth, 1989). That is, the former hierarchical structures of large bureaucracies in business and in government are no longer suitable for the flexibility of new production and distribution systems. In the early stages of computer operations there was significant concentration of the 'control technologies', because only headquarter operations could afford this expensive technology. More recently there has been a break-up of this type of hierarchical organisation. Thus there has been a growing importance of information activities in all regions including peripheral areas. Relations between the core and the periphery have, therefore, undergone significant transformation, and there has been a considerable blurring between manufacturing and services.

Among the various paradoxical issues raised by the impact of information technology is the extent to which this technology can be a substitute for face-to-face contact. Some authors suggest the increased

trend towards face-to-face contacts in the current phase of economic activity, while it is also suggested that improvements in this technology may reduce the need for direct personal contact. According to The Netherlands Economic Institute, while the chances of using telecommunications to disperse services from the western developed parts of The Netherlands should not be rated too highly, there were yet some prospects of dispersing routine activities which were not dependent on face-to-face contacts (Telecommunications in Rural England, 1989). Hepworth (1989) suggests that we can expect an extremely complex picture of organisational and spatial tendencies, resulting from computer network innovations, rather than a simple dichotomy between centralisation and decentralisation and between vertical integration and disintegration.

Qvortrup (1989), in an analysis of the Nordic telecottage experience, warns of the danger of 'superficial' decentralisation, that is, a *de facto* social centralisation covered by a purely 'electronic' decentralisation. Although the electronic infrastructure makes decentralisation possible, he suggests that in all probability it will not be accompanied by the decentralisation of firms, administration units and social networks.

### **The rural development focus**

The diffusion of information technology, particularly that associated with data communications, is largely an inter-city phenomenon with much of the development being concentrated in economic core areas. The supply of VANs (value-added services) is dominant in core areas, with the core exporting these services to the periphery. In the case of the U.K., for example, 75% of LANs are located in or near London (Gillespie *et al.*, 1990). Information technology presents rural areas both with threats and possibilities. The main threat is that of 'tele-colonialism', whereby outside interests exploit the resources of the periphery, either in terms of 'sucking out' its market potential, or by exploiting its skills by means of teleworking. Dillman *et al.* (1988) indicates how the adoption of IT in rural communities may not be a guarantee of economic growth or of the strengthening of socio-cultural conditions. Among the examples he gives of the elimination of jobs from rural communities resulting from the introduction of IT is the penetration of fast-food chains at the cost of local restaurants and centralisation of economic transactions by the rural branches of national and international banks.

This technology, however, also presents enormous potential for overcoming the major disadvantage of

remoteness which curtails development in the periphery. Remoteness from markets, from decision-makers and above all from information resources can be ameliorated by means of information technology. The major problem or challenge for rural areas is how to create the necessary demand for the various advanced services associated with IT in a small-scale dispersed market. Wiberg (1989) asks whether acceptable profitability or efficiency can be reached in sparsely populated areas by a regional organisation of geographically spread small-scale plants. He sees the development in remote areas being restricted mainly by the supply of people with knowledge, with technological skills, and who have access to information and entrepreneurs. It could be argued that the lack of demand in peripheral areas for advanced telecommunications services is partly due to a lack of awareness of the potential of IT for enhancing competitiveness. Surveys of SMEs in the northeast of England have revealed a growing awareness of the advantages of this technology since the mid 1980s, but also a definite tendency to lag behind core areas in their propensity to telecommunicate (Gillespie and Goddard, 1990). Much of the improvement which took place among SMEs during this period was restricted to greater use of FAX machines.

A major question for rural development policy, therefore, is how to discover ways of helping small-scale operations to connect into the information economy. In many cases such connections may be by means of multinational companies subcontracting work to SMEs. This development raises the issue of what type of development is desirable in the periphery. By adopting this technology remotely located SMEs could end up being 'locked into' the networks of large organisations; by failing to adopt it they could find themselves 'locked out' of potential markets (Hepworth, 1989). Rather than perpetuating a dependency form of development associated with branch-plant economies, many researchers suggest the need for a strategy which would result in indigenous development and greater regional autonomy. This is where the need to create a networking culture between SMEs in remote areas is of paramount importance, and where locally oriented networks and locally inflected service offerings can help to underpin indigenous development.

Efforts to date, however, to promote closed user-group value-added telematics networks have not always been successful (Gillespie *et al.*, 1990). Difficulties have been experienced in devising networks and applications which meet the potential users' real as opposed to hypothetical needs. Difficulties have also been experienced in trying to embody the complex and unequal power relation-

ships which exist between firms into networks that suit everybody. The experience to date, therefore, suggests the need to consider distinctly different telecommunications requirements for distinctively different forms of economic development.

### Information economy in rural areas

Because of the strong forces of economic concentration, rural society throughout the European Community has been undergoing fundamental changes, resulting in an urgent need to attract new forms of economic activity to rural areas to substitute for the decline in agriculture. 'The Future of Rural Society' (CEC, 1988) was an important statement about the vital functions of rural areas. It confirmed the need to preserve the countryside, not only as areas of agricultural production or as recreational areas, but as areas with a multitude of business and cultural possibilities based on the social structure of village communities. The future of these areas, however, depends very much on the diversification of rural economies, which is dependent on the attraction of small and medium-sized enterprises. Among the barriers to rural development, however, is the geographic and socio-cultural distance from markets and decision-making centres, the lack of easy access to information, the lack of public services, training programmes and training facilities for the workforce, and the lack of links with other firms. Among the many different solutions to these problems is the provision of high-quality telecommunications services, which would diminish the impact of distance (Qvortrup, 1990).

The role and potential of the new information and communications technologies in rural areas is still quite poorly understood and this is related to their slow rate of diffusion in these areas. Nevertheless, Qvortrup (1990) insists that it is highly important to demonstrate, not only that there are pressing needs for telematic services among rural populations, but also that these needs can be met at a reasonable cost within a general telecommunications strategy. Johnston (1992), however, notes that the commercial prospect of recovering the cost on investment in IT infrastructure is a significant problem for rural areas.

It is interesting to note that much of the EC literature on the prospects of IT in rural areas tends to see agriculture as one of the last sectors to benefit from telematic services. The most recent EC programme, ORA (Opportunities for Rural Areas), does not address the use of telematic systems in the agricultural sector. The North American experience, however, while acknowledging that agriculture is

frequently not the most important activity in many rural areas, has placed considerable emphasis on the potential of IT for bringing about significant changes in this sector (Dillman, 1985). Initiatives, to date, both in Ireland and in France to promote the use of videotex services in agriculture have been rather disappointing, raising questions about the priority of providing such services and also about the ability of farmers to adopt this technology (Harkin, 1988).

### **Networking between SMEs**

In order to create a demand in peripheral rural areas for advanced telecommunications services, it will be necessary to create a culture of 'networking' among SMEs. Creating the environment for easy, complex and innovative interaction between firms has been suggested as a major role for regional policy (Christenson *et al.*, 1990). With the shift away from linkages based on physical resources towards competence and knowledge-based networks, it is imperative to promote this important form of flexible organisation. One of the reasons for networking is to benefit from competence embedded in other firms. By the establishment of networks, information channels are created resulting in inter-firm co-operation in areas such as R&D and marketing, thereby reducing transaction costs. Interaction between firms can result in new products, processes and business ideas. One of the main reasons for inter-firm networking is the need for balance between conditions of local production and international competition. The Swedish experience in this area has indicated very positive results with evidence of greater trust and solidarity than opportunism, despite the normal existence of power relations (Christenson *et al.*, 1990).

Swedish Telecom have also designed a policy to bring about greater uptake among SMEs in less favoured areas. The 'Demotel' project emphasises learning-by-doing and tries to bring about closer buyer-supplier interaction. Experience from this project to date has identified the issue of information flow as one of the most important barriers to diffusion of IT, and one of the least understood by policy-makers (Carlson, 1990). In the course of the Demotel project a problem arose in relation to new applications which often embodied software-specific features and proprietary information. According to the terms of reference of Demotel other users were given access to whatever information was generated.

### **The Nordic telecottage**

Although information technology has been diffusing

quite slowly and unevenly throughout Europe, a number of places stand out in terms of the level of success attained to date. The Nordic countries stand out mainly for the pioneering ventures of applying information technology in remote locations. Inspired by the initial experience in Sweden, about 65 telecottages or telematic centres have been established in the most peripheral parts of Denmark, Norway, Sweden and Finland. From a technological point of view these centres are in many cases quite modest, consisting of a few personal computers, printers, a modem and facsimile machine. The most important element, however, is the IT consultant who looks after the training aspects of the centre. The idea behind these centres is to provide IT apparatus within a central location in isolated rural communities, with the objective of counteracting remoteness (Qvortrup, 1989).

In essence the telecottage is a social experiment and initially it depends heavily on public funding. In many cases, the objective in the longer term is to become a local profitable enterprise. The focus of activity is to show how the new technology can be used in district-related information services, to create new employment and to strengthen local business by providing access to advanced telecommunications services. A major advantage of the centralised provision of these services is the reduction of the cost barrier, since initially individual enterprises would find the costs prohibitive. A second important benefit is the provision of IT training in a communal setting, thereby reducing the qualification barrier. In addition to providing important infrastructure for local enterprises, the telecottage has also become a support centre for the administrative and data processing needs of public service activities, such as health-care and agricultural advisory services. The cultural and educational needs of the local community are also catered for by these centres. 'The Future of Rural Society' (CEC, 1988) pointed out that the Nordic teleservice centres were probably the most comprehensive, the most well-developed and the most interesting example of this type of initiative.

In the case of the Norwegian telecottages, field trials have for a number of years provided important insights into the process of IT diffusion in the rural periphery, and in their essence they provide the nucleus of a policy for rural development (Hetland, 1990). Rather than on issues to do with hardware or software, these field trials have mainly focused on the organisational issues or 'orgware'. The experience to date has seen an emphasis on teleassisted rather than teledistributed services, mainly because of the fact that the local basis of experience and competence restricted technological applications to

less demanding areas. Norwegian telecottages are attempting to provide interesting and highly skilled work for young populations in remote areas. Most of these areas import their highly skilled services from urban centres and lose the majority of their better-educated young population to these centres. The role of these telematic centres is to help rural areas compete for skilled service activities by strengthening the local IT infrastructure and skills.

The achievements to date of these field trials may be modest, but they provide very useful indications based on the practical difficulties encountered in attempting to introduce IT applications to remote locations. A major contribution of the field trials was in the area of marketing, with an attempt to identify various possibilities for services in the interplay between the technological possibilities and the needs of the marketplace. An original ambition of the centres was to become 'service exporters', but this proved too demanding and had to be toned down (Hetland, 1990). Most field trials opted for a self-reliance or import-substitution strategy, with the municipality being the most important market for work. They signed an agreement with the local authority to provide services on a business-like basis. The public sector is the most important market for new technology in Norway, and if municipalities are prepared to think locally in purchasing goods and services, they can play a significant role in helping small enterprises become established (Hetland, 1990).

The Norwegian field trials experienced considerable difficulty in gaining entry into the remote work market, despite what the technological solutions suggested. Most of the trials got more involved in local markets rather than in regional or national markets, mainly because of high transaction costs. Such costs are connected with planning, negotiations, follow-up, control and conflict-solving transactions (Hetland, 1990). The experience is that the more standardised the service being provided, the more important it is to keep transaction costs low, whereas the more unique the service being provided, the less effect such costs exerted on its profitability. Thus a standardised service such as word-processing in the form of remote work was only successful to a limited extent, and in the case of one field trial such work had to be abandoned.

A primary objective of the Nordic telecottages was to build up networks, in order to strengthen creativity and the ability to innovate, and also to make contact with the market. Networks of competence were created by co-operating between the 65 or so telecottages scattered throughout the Nordic periphery, and one of the resultant services is

a 24-hour translation service in 10 languages, based on a telefax network. A regional database has also been established to unite the Scandinavian telecottages to compete with sophisticated data centres in large cities for high quality work. The Norwegian telecottage experience found that where a rural community tried to establish an enterprise based on local competent personnel, it demanded an extensive degree of networking and a long period to become established in the market. Because of the relatively long period necessary for establishing such an operation, it was suggested to award a 'networking grant' to help build up the necessary network.

### French experiments

Similar experiments have been carried out in France with what are termed 'multimedia complexes', the purpose of which is to build 'bridges' to transform national applications of IT into feasible projects for rural areas. The experience in France has been greatly aided by the fact that Transpac, the French packet-switching service, has location-independent connection charges with a dense network of access nodes. In 1985, the French regional development authority, DATAR, initiated a policy of establishing such centres to counteract the potentially negative consequences for business and tourism resulting from a reduction in administrative, banking and educational services in rural areas. Among the objectives of the strategy employed were the following: to take over repetitive tasks from scarce administrative personnel, to establish new service industries including teleworking, to improve facilities for tourists, to use redundant centres and schools for distance-learning facilities, to bring national and international events to the local population and to help export the regional cultural identity to other regions and countries (Bensaid, 1990).

The same principle of providing a centralised IT service, which characterised the Nordic telecottage also operated in the French multimedia centre, since it was felt that SMEs and households could not afford to purchase these services on an individual basis. The French centres would appear to be more sophisticated than their Nordic counterparts, with a typical centre having a cinema, computer centre and distance-learning aids. Centres have on-line connections with public facilities such as schools and libraries in the locality, which enables them to either use the facilities of the centre, or supply some product to it. Such centres are expected to speed up the diffusion process of new communications techniques and by providing access to the most advanced

services, enable rural communities to attract new economic activities to their areas. Since such centres are a relatively recent concept in regional development, it is expected that they will take some considerable time to become established.

### The United Kingdom

Among the most interesting examples of the promotion of IT in rural areas in the U.K. is the Highlands and Islands Initiative in Telecommunications, which is a joint public/private sector programme launched by British Telecom and Highlands Enterprise (formerly, The Highlands and Islands Development Board). Since the Highlands and Islands would have been the last part of Britain to benefit from ISDN (Integrated Services Digital Network) because of low business volume, the HIDB paid £5m to gain early access to this advanced service infrastructure, thereby giving the Highlands and Islands a five-year advantage over the rest of the U.K. To date two initiatives, Crossaig, a company providing value added services for publishing houses and BT's Remote Telephone Enquiries Programme, are making special use of ISDN and illustrate the value of this investment in promoting teleworking as a means of rural economic development (CEC, 1991). The employment record to date, however, has been very modest and the development agency is acutely aware of the need for a strong marketing programme to achieve a greater degree of economic relocation.

### Policy issues

Among the various difficulties faced by policy-makers in relation to the diffusion of information technology into rural areas is the need to justify major infrastructure expenditure in telecommunications when the potential benefits are speculative and may never materialise. In addressing this issue, Parker *et al.* (1989) remark that while a fibre optic cable will not be installed in rural areas unless there is economic justification for it, no economic justification may materialise unless the cable is installed. In other words, we cannot measure missed opportunities. In the European context, however, although infrastructure for advanced telecommunications services involves enormous expenditure, there has been significant investment in this area, and the problem for diffusing IT is now seen more in terms of inadequate demand for services in lagging areas, rather than any significant deficiency in infrastructure.

Within the European Economic Community there is increasing competition for new investment as regional governments become more concerned

about the centralisation of economic power in the metropolitan heartlands (Hepworth, 1989). Related to this economic centralisation is the spatial bias of telecommunications networks which is likely to exacerbate regional disparities. As regional governments seek to establish an electronic bridgehead to the metropolitan heartlands, in order to exploit advanced telecommunications, it would appear that some regions may be condemned to a future of cumulative peripheralisation. The major EC policy to date to counteract these trends is the STAR initiative, whose aim is to introduce advanced telecommunications services to those regions lagging behind. The period of the programme included 1986–1991 and the 50 regions involved are virtually all Objective 1 regions according to the ERDF (European Regional Development Fund) classification.

Under the STAR programme 1500m ECUs were allocated, with 780m provided by the ERDF, and the remainder from the public and private sectors at national level. About 80% of the funding went towards advanced telecommunications infrastructure and the remainder to applications (i.e. feasibility studies, promotion activities and demonstration projects). Small and medium-sized enterprises (SMEs) were the main target population, since such firms were unlikely to benefit from IT if left to their own devices.

There has been little critical assessment of the STAR programme to date, although a further extension of the applications side of the programme, known as TELEMATIQUE, has been launched. The main danger of the STAR approach, which involves speeding up the integration of less favoured areas (LFAs) into telecommunication networks, is that it could provide easier access for external economic interests to the periphery who might have a competitive advantage over local interests (Gillespie and Robins, 1989).

The most recent EC initiative in promoting telematics in rural areas, ORA (Opportunities for Rural Areas), has a limited budget of ECU 14m up to 1994, which reflects a concern not to disperse resources (Johnston, 1992). Among the various projects will be a comprehensive analysis of experience with telematics in rural areas, which will allow the reasons for successes and failures to be identified. The core of the research will focus on the development of common specifications and demonstrators of telematic systems to support rural tourism, local and regional administrations, small business and teleworking. The R&D is unique in that it brings together telecommunications network operators, equipment manufacturers, telematic service pro-

viders, rural development agencies and user organisations in an integrated set of research actions.

An important issue in telecommunications policy is the aim of the European Commission to liberalise the market for advanced telecommunications services. The provision of basic telephony is likely to remain as a monopoly of the national telecommunications authority, but they will be forced to compete for their market share in the provision of services. This change in policy could have serious repercussions for peripheral rural areas, since traditionally service provision has been closely linked to a policy of cross-subsidisation from the core. Private suppliers of advanced services would be unlikely to give much consideration to that 10% of their potential market in low density and dispersed populations. Although there are many negative consequences deriving from a state monopoly providing such services, it will be essential for policy-makers to ensure that peripheral areas do not suffer any serious negative consequences due to market liberalisation.

The most challenging policy requirement, however, is to ensure a greater uptake of advanced services among SMEs in less favoured regions. Telecommunications policy, therefore, needs to be harnessed to other initiatives in order to enhance the quality of the information environment in the less favoured areas. A major problem in this respect is the lack of skills and expertise among government authorities who are frequently incapable of establishing a meaningful dialogue necessary to bring about the implementation of a networking culture within a region. The reality is that many of the older generation of policy-makers have not kept pace with technological developments, and the key to change is in education and training. There is a need for professional amateurs who can make informed decisions regarding local needs, and who can build bridges between the various policy spheres, which hitherto have developed along separate lines. Experience with the STAR programme to date indicates the need for new organisational structures to deal with developments in information technology.

While much of the attention of this paper has focused on the relatively advanced rural areas of Europe, it should be noted that increasing attention is being given to seeking ways of transferring positive experiences in these regions to rural areas in the developing world. In particular the International Association of Community Tele-Service Centres (CTSC) is examining the possibility of transferring the Scandinavian concept of CTSC into rural communication in the developing world. The hope

has been expressed that the 'village dish' bringing information via satellite may mean that less developed areas may not have to be wired in order to receive vital information, and that such developments might help to stem the tide of rural migrations to cities of the developing world (Janelle, 1991). There is some evidence to suggest that Third World locations are beginning to compete with peripheral areas in the developed world as sites for teleworking or low skilled 'back office' operations (CEC, 1992).

### Conclusion

Any attempt at understanding the current 'post-Fordist' phase of economic development must take cognisance of the significant role being played by information and communications technology. The most important development in this technology to date has been the convergence of telecommunications with electronic data processing in the form of computer networks. The resultant 'telematics' technology provides the basis for an enormous variety of applications ranging from electronic trading to spatially distributed manufacturing processes. The current stage of development in this technology is largely focused on intra-organisational networking but this will gradually be overtaken by networking between organisations. The flexibility which this enabling technology facilitates in all aspects of economic activity has brought about such a transformation in business organisation, that the end result is frequently referred to as the 'information economy'.

The relevance of information technology for rural development must firmly be placed within this global perspective. It is too early yet in the diffusion of IT to predict with any certainty whether this technology will lead to greater centralisation or decentralisation of economic growth. The absence of empirical analysis to date has led to much speculation, but there is sufficient evidence suggesting significant potential for decentralisation. Despite what the technological possibilities suggest, however, decentralisation is unlikely to occur in the absence of well-thought-out policies supported by significant public investment. The diffusion of IT, therefore, presents many paradoxes and future scenarios are ambivalent, but the clear message to policy-makers is to give serious attention to this new tool for regional development.

The diffusion of IT to date has been strongly influenced by large organisations in both the private and public sectors, and consequently in many countries investment in infrastructure has been concentrated in the core areas of economic activity. Policy-makers who are concerned with enabling

rural areas to benefit from information technology have a two-fold role to play. Firstly they must ensure that rural areas do not suffer any deleterious effects from policy decisions at national or international levels. Clear pointers have already been given about the dangers of contributing to a dependency form of development in the periphery, by speeding up the infrastructural integration of the periphery into global networks, in the absence of clear policies of how this infrastructure can be exploited for indigenous development. It is imperative, for example, that outside interests are not facilitated inadvertently in exploiting the market potential and scarce technological skills in the periphery.

On a more positive note policy-makers must focus on the need to reduce both cost and skills barriers, particularly among SMEs in rural areas, so that they can enhance their competitiveness by exploiting IT. The most impressive efforts in this respect have come from the telecottage movement, whose focus has clearly been on indigenous development. While the results of these experiments to date are quite modest in terms of employment creation, they have considerable experience to share with other regions who are currently lagging in adopting this technology. One clear area of policy development, which has already been identified, is the need to create a networking culture among SMEs. Experience from the telecottage experiments indicates the practical obstacles towards establishing enterprises in remote areas by means of exploiting IT. Networking is the flexible means of organisation which would allow a reduction in transaction costs in areas such as R&D, marketing and other information-intensive activities. The challenge of establishing these networks should not be underestimated: information technology, however, can play a significant role in bringing them about.

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