

How Can ICTs Support Rural Development

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Abstract. The development of Internet and small scale computing created the belief that ICTs would help the development of rural areas. In retrospect, these visions turned out to be too optimistic. Today, we experience rather dramatic centralisation trends. This is not because of ICTs alone, but we have seen that ICTs often support centralizing forces, rather than help local development. However, the academic discourse on these issues suffers from the lack of clarity and precise understanding of the ICT artefact. We have therefore developed an analytical framework by conceptualizing ICTs along three dimensions; how it is viewed, its use and how it impacts development. Our main message is that ICTs have to be used locally to foster horizontal collaboration, innovation and knowledge creation activities.

Keywords. Conceptualizations of ICTs artefact, rural development, ICT impact

Introduction

The visions for the implications of ICTs diffusion in society have been from the beginning of the computer area overall optimistic, if not prophetic. The computerized future of these predictions was marked by democratization and decentralization: computing power in the hands of everyone, “telecommuting” and work at home. Writers like Toffler (1980), Naisbitt (1982) expressed similar predictions, leading to the hope that ICT development could support local development.

Based on such visions, ICTs were seen as important means for strengthening regional development and help local communities. Various projects were initiated to stimulate economic growth at regional and local levels. However, most of these projects did not succeed in creating sustainable local enterprises. Since then, we have experienced massive diffusion and adoption of ICTs in all part of the economy. But at the same time, we have seen strong centralisation trends, both at macro level and in the different business sectors. There is thus a need to explore the role that ICTs may have in rural development and to offer a framework that can help such analysis.

Research Methodology

This study departs from two scientific discourses in the past; i) ICT and decentralisation and ii) ICT for rural development. The theoretical part is based on a limited literature review and document studies, including some recent literature on ICT for development, which then constitutes the basis when developing our analytical framework. This framework is applied in analysing the role of ICTs in rural policies. The empirical part is collected by analysing policy documents.

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1. Theoretical Perspectives

1.1. Revisiting the ICT, Centralisation and Decentralisation Debate

Of all issues raised in the debates of ICT and its impact on society, few have been more contested than those of computers and (de)centralisation. George and King, in their seminal paper from 1991, addressed the general question of computerization's effect on organizational decision authority structures – the factor generally regarded among organizational sociologists as the underlying issue in organizational centralization. The question was whether computerization would result in a greater concentration of decision authority at the top of the organization (centralization), or disperse decision authority down and outward in the organization (decentralization). Below, we will briefly review some of the arguments.

The first position, that computerization causes centralization or decentralization, originated by Leavitt and Whistler (1958), in predicting that the introduction of computerized IS would lead to the centralization of organizational decision authorities. Other studies supported this claim. They were shortly opposed by other researchers, e.g. Burlingame (1961) arguing that IS use was more likely to lead to decentralization of decision authority.

Both of these positions can be seen as a variant of a more basic assumption: that computerization causes changes in organizational decision authority structures. This view, which has been called the *technological imperative*, “... *views technology as an exogenous force which determines or strongly constrains the behaviour of individuals and organizations*” (Whistler, 1970 p. 585). But causal statements like the technological imperative imply a reliable pattern of cause and effect, so the unresolved question of which effect occurs plagues any articulation of the technological imperative. Thus, both logical arguments and empirical evidence that supported two contradictory positions, made it easy to argue that there was no inherent causal relationship between computerization and decision authority structure: there is no such imperative.

The “no-inherent-relationship” position was not the only way to account for the contradictory evidence. Instead of assuming that computerization caused particular decision authority structures to emerge, it made more sense to some researchers to assume that computerization activities would *reflect* the prevailing centralized or decentralized persuasions of the organizations in which they occurred. This view became formalized as the reinforcement politics argument, in which computing is viewed as a malleable technology controlled by the dominant coalition in an organization and used by that group to serve the interests of the status quo (George and King, 1991). Such view has been called the *organizational imperative* which “... *assumes almost unlimited choice over technological options and almost unlimited control over consequences [...] information technology is the dependent variable in the organizational imperative, caused by the organization's information processing needs and manager's choices about how to satisfy them*” (Markus and Robey, 1988 p. 587).

These perspectives, with its primary focus on the use of ICT in organization, are no less relevant when analyzing the role of ICTs for rural development at a macro level. However, in much of this research, ICTs is primarily regarded as simple artefacts, more or less seen as black boxes. That may be one explanation why there are so many apparently contradicting findings as we have seen above. Furthermore, our experiences during the last 25 years, not least due to the availability of Internet, are that ICTs very well can support all types of organizational structures. At the same time, these ICTs has been

decisive factors for a large number of innovations, both at micro and macro level supporting a “no-inherent-relationship” position.

2. ICT Seen as Instrument for Regional Development

The development of telecommunications and democratisation of computing through the development and small scale computers paved the road for technological optimism during the 1980s. Toffler (1980) hold that industrial-style, centralized; top-down planning would be replaced by a more open, democratic, decentralized style which he called “*anticipatory democracy*”. Nora and Minc (1981) predicted that “*a massive social computerization will take place in the future, flowing through society like electricity providing access to computer power for everyone regardless of space and time.*” In a post-industrial society, people could live and work everywhere, regardless of space and time, and still be connected to a global economy.

These arguments possessed a sort of technological imperative, viewing ICTs as exogenous forces that would lead persons or organisations to act in ways that could help rural economies. However, others refused these rather optimistic visions, claiming that the implications for rural development are open: Hepworth (1989) provided a at that time good survey of the research field, and concluded that the use of ICTs could lead to i) increased vulnerability for changes outside the sphere of influence for the local community, ii) increased centralisation, and division of knowledge in the population, and iii) reduced local democracy and autonomy.

Gillespie and Goddard (1990) argued similarly that adequate telecommunications are a necessary, but far from sufficient mechanism for regional development. They go further in saying that “improved communication and better trade relation with fewer barriers provide a better competitive climate for stronger rather than weaker economies”. These arguments may be closer to an organisational imperative, or may be power reinforcement’s arguments. A number of later studies provide arguments along the same lines (e.g. Rogers, 1995; Qvortrup, 1997; OECD, 1997). Jansen (1998) concluded, in his study of ICT diffusion in rural areas, that ICT networks may very well support centralisation of information handling through vertical integration of local businesses into national and international corporations. He identified alternative trajectories, characterised by building horizontal networks allowing for development of local knowledge and competence that are necessary for maintaining, even extending local industries.

2.1. The “End of Geography” Version of the “New Economy”

Without a doubt, the strongest thesis that has been advanced with respect to the impact of the “new economy” on the balance between centripetal and centrifugal forces is that the latter will come to predominate, once the major reason for agglomerated spatial forms is rendered obsolete through distance-shrinking technologies. In the 1990s, the advent of the Internet excited commentators to speculate upon spatial outcomes, with, inter alia, Negroponte (1995), stating that “*the post-information age will remove the limitations of geography*”. Others asserted that “cities are leftover baggage from the industrial era”, and the “death of distance. More recently, scholars as e.g. Gillespie, Richardson and Cornford (2001) arrive at different conclusions in claiming that there are, however, a number of inter-related reasons that help to explain why ICT appear not to inevitably undermine existing urban agglomerations. These include the metropolitan

bias in telecommunications infrastructure provision; the role of ICT in contributing to the strengthening of “global cities”; and the persistence, despite electronic networks, of what has been termed “the compulsion of proximity”. Gillespie et al (2001) suggest that ICT-based innovations in the organisation and delivery of service activities could have potentially radical implications for the locational dynamics of services. These innovations, notably the tele-mediation of service delivery through telephone call centres and the Internet – are making possible the “industrialisation” of services production and, at the same time, are making many routine services locational “footloose”. However, such use of ICT implies while the jobs are located locally, the strategic control reside in the corporate headquarters, strongly supporting a centralistic power structure.

2.2. *ICT in the Developing Countries*

The literature on ICT for Development field (short ICT4D), which discusses the diffusion and adoption of ICT in developing countries, resemble must of the former debate on ICT and rural development in general. According to Rickard Heeks (2008) “*The Internet sparked a generalized upsurge of interest in ICTs, including a reinvigorated interest in how ICT might be applied in developing world. Similar to the model that had been rolled out in the European and North American periphery during the 1980s, was the rural “telecottage” or “telecenter”. This model could be installed fairly quickly; provide tangible evidence of achievement; deliver information, communication, and services to poor communities; and no least provide sales for the ICT companies in wealthy countries*”. The next step for ICT4D was to look at service delivery for the poor. Today, a priority for ICT4D “2.0” will be conceiving new applications and new business models that can use the growing ICT base of mobiles, telecenters etc., to create employment. However, the technical, organizational and competence infrastructure is itself major factors for creating large gaps between centre and periphery (Heeks, 2008). Thus, the ICTs both resemble and extend the divides that existed when this was mainly a digital divide challenge in the western world.

2.3. *A Need for More Precise Concepts*

A major problem with this discourse is the lack of precision. E.g. decentralisation is fuzzy concept. Firstly, it can mean administrative decentralisation, meaning that operations within an organisation are transferred to a lower level in an organisation, while the decision making power is kept centrally. Secondly, one can emphasise the political dimension of decentralisation, which implies that the authority to define goals is moved from higher to lower levels of authority. Thirdly, it may mean deconcentration of resources, such as businesses and departments, from centres to the periphery.

It is obvious that ICTs can easily support all types of organisational patterns. Thus it is a strong need to open the “black box” and to be more specific about what type technology that is in question. Sein and Harindranath (2003) suggest three different set of conceptualizations of ICT: how it are viewed, its use and how it impacts development. Their ICT *use* categories are: “as a commodity, as support for general development activities, as an economic driver and for specific development”, while their ICT *impact* is conceptualized into first, secondary and tertiary effects.

Their ICT *views* are broadly based on the classification proposed by Orlikowski and Iacono (2001); the tool, computational, ensemble and proxy views, but not the

nominal view. However, we do not necessarily subscribe to all Orlikowski and Iacono's specific view categories, which have been extracted from how researchers have conceptualised ICT in their own research. While we find that the tool, ensemble and partly the computational views as fruitful, the nominal and proxy views provide little insight into the multidimensional character of ICTs. Rather, we build on an analysis of actual functions that ICTs have in organisations Jansen (2012). Our "view" categories are thus: *tool*, *information infrastructure*, *service* and *expertise*.

Our "tool" view is similar to that of Orlikowski and Iacono in understanding ICT as an engineering artefact as value-neutral artefacts, expected to do what its designers intended them to do. A tool is a substitute for labour; it has no value beyond its capability to support the necessary production or administrative processes. Our second view, as *information infrastructure*, is to be understood as the basic technical and organization capabilities, including information resources that are necessary for supporting various application systems and solutions across organisations and society at large, partly corresponding to an Orlikowski and Iacono's ensemble view. Further, our *service* view implies to see ICTs as more autonomous, being able to carry out independent task or functions, borrowing from both the computational and ensemble views, in that it may include organisational and social aspects. Finally, our *expertise* view assumes that ICTs can support various knowledge creation activities, e.g. to collect, process and mediate information and knowledge. "Big data" is one illustration of this view. In that respect, it comprises a number of aspects that are included in the proxy view. We will, however emphasize that our four views are not exhaustive in that they embrace all possible view ICTs, being generic and enabling.

Our framework builds on Sein and Harindranath (2003); we include both the view, use and the impacts dimensions. However, as our perspective is somewhat different: to analyse the role of ICT for development in marginal areas inside countries, we also need to modify their other dimensions. Our "use" conceptualizations, being *production*, *management and control*, *innovation and knowledge creation activities*; do only partly correspond to Sein and Harindranath' suggestions. Production implies operational activities, both related to physical and administrative activities, including their commodity use, while management and control may belong to development activities, and innovation and knowledge creation can be seen as an economic driver. Along the "impact" dimensions, our three categories *efficiency*, *effectiveness* and *transformation* roughly correspond to their first, secondary and tertiary impacts, but provide more specific meanings.

Our framework is illustrated in Fig. 1.

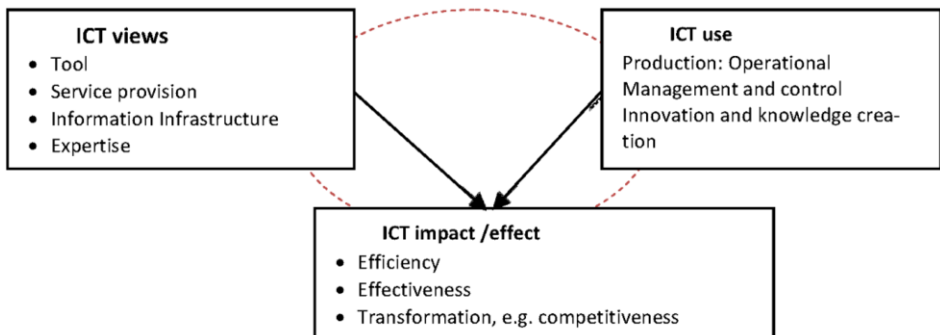


Figure 1. Framework for analysing ICT-policies in rural areas.

Table 1. The expected relationship between conceptualization of ICT view, ICT use and ICT impact

ICT View	ICT USE		
	Production	Management and control	Innovation & knowledge creation activities
Tool	Efficiency	Efficiency	Less relevant
Infrastructure	Efficiency and effectiveness	Efficiency, some effectiveness	Support innovation
Service	Efficiency and effectiveness	Efficiency and effectiveness	Help transformation
Expertise	Effectiveness	Effectiveness	Transformation

In their analysis, Sein and Harindranath (2004) claim that that a national ICT policy must address the need to make move from the lower to the higher rated categories, which in our terminology imply to shift focus from production and management to innovation and knowledge activities, which then aim at increasing the impact from efficiency to effectiveness and transformation. The proposed relationships between these conceptualizations are illustrated in Table 1.

Departing from a tool view, ICTs is seen as substitute for previous manual activities, thus the impact on production is mainly to increase speed or capacity, which implies improved efficiency. Similar effects will be found in management and control actions, while the tool perspective is less relevant in innovation activities. An information infrastructure view can support both efficiency and effectiveness effects in that large ensembles of ICT-based resources and information in particular are made generally available, which also can help transformation. The service view can also increase effectiveness both in operation and in management, and help more innovative activities; in that ICT-based services can support cooperation and knowledge sharing in various ways. Lastly, an expertise view clearly supports both effectiveness and transformation.

This framework has thus to be validated through further empirical testing.

3. Discussing the Framework

3.1. *The Role of ICTs in Past Rural Policies*

The previous optimistic visions lead to a rather strong belief that ICT would help to resist the negative trends in regional development that had been observed for a number of years, both in many European countries and elsewhere. In Scandinavia, it was much focus on maintaining vital rural areas, and a number of initiatives were launched, e.g. building telematics infrastructure, to support local ICT-based centres and distant teaching, telemedicine etc.

Evaluations of these programs (Qvortrup, 1997; Jansen, 1998) showed that the effects of the program were limited, not least in a long term perspective. The strategic orientation of the efforts was in general weak, in that competence development and capabilities to accomplish organisational changes had been lacking. The impact on the local economies was very limited. The main exception was the telemedicine projects, which stimulated collaboration and competence building between the involved parties and in this way caused organisational changes (Jansen, 1995).

These efforts did not counteract the general trajectory of change in the economy, dominated by vertical integration into centrally controlled organisations. We have wit-

nessed rather a massive diffusion and adoption of ICTs in all parts the economy; new technologies have been implemented successfully in most branches of local economies, in spite of often weak local infrastructures and support functions. However, various studies also showed that a large majority of local enterprises became strongly integrated into national networks and organisational structures. Small efforts have been done to stimulate the development of horizontal networks between small and medium-sized enterprises in the region. Thus, the local synergy effects and knowledge development that could stimulate innovations were limited (Qvortrup, 1997; Jansen, 1998; Gillespie et al, 2001).

3.2. The Current Role of ICTs in Rural Economies

Today, it seems to be a general trend that rural areas experience in general stagnation. A statistical analysis from EU DG Regional Policy Unit (EU 2010) shows that it has been stronger population decline in rural areas than in average. In Norway, in spite of a significant general population growth during the last 15 years, 2/3 of the municipalities have seen a population decline.² An even stronger trend is observed in Sweden.³

We do not at all claim that diffusion and use of ICTs are the cause of these development trajectories; we clearly see that penetration of ICTs is a prerequisite for development in all parts of our societies. Some would argue stronger, that without the massive adoption of ICTs in rural area, we would have witnessed even more dramatic migration patterns. We do however claim that the way ICTs are deployed are strengthening stagnation in rural areas, illustrated by some recent observations. Below we are revisiting some of the type of means and measures that were initiated 15–20 years ago and discuss whether such efforts are still relevant.

Building ICT infrastructure is seen as very important for regional development, and governments are still providing support to efforts aiming at building sufficient broadband capacity in most rural areas. Distant work gained significant ground among information workers in the 1990s. What remains however, are mainly “call-centres” and similar low-skilled work-places. Otherwise, it has rather become a type of *flexible work organisation* where employers are offered the flexibility to work from home one or more days during the week, while still commuting to the main office the other days. Consequently, the strategy for small, rural communities has changed from offering local work places based on telework to support sufficient broadband capabilities and other facilities that may it feasible to work from their home or cottage. This will, however, in general have limited impact on the local economy. Furthermore, distant teaching was one of slogan in the past, but has been replaced by *flexible learning*, which is not seen as a specific mean for promoting rural development.⁴ Telemedicine was rather successful in the earlier pilot projects in the past, and is today an important part of health service provision as ICT is becoming integrated in all parts of the health sector. However, seen from rural development perspective, it seems that telemedicine no longer do constitute an effective mean in itself.

An analysis of these initiatives using our framework shows:

² http://www.regjeringen.no/upload/KRD/Rapporter/Rapporter2013/Engelsk_analysekap_meld_2.pdf.

³ See <http://www.dn.se/nyheter/sverige/glesbygden-toms-pa-folk-i-allt-snabbare-takt/> Published 01-18-2012, In English: Rural areas are drained of people.

⁴ See R:1/2011: <http://norgesuniversitetet.no/om/skrift/12011-digital-tilstand-i-hoyere-utdanning-2011>.

Table 2. The impact of some rural development initiatives

Initiatives (ICT view)	ICT USE		
	Production	Management and control	Innovation & knowledge creation activities
Distant work etc. (Tool view)	Some efficiency	Some efficiency	No impact
Video-conferences, IT-investment (Infrastructure view)	Efficiency	Efficiency and some effectiveness	Negligible impact
IT-services (service view)	Some efficiency, minor effectiveness impact	Efficiency, minor effectiveness impact	Some support to innovation
Telemedicine (expertise)	Efficiency and effectiveness impact	Some efficiency, minor effectiveness impact	Help transformation

3.3. Rural Economies in the Network Society: Growth or Absorption?

Recognising the general centralisation trends in many societies, how can the use of ICTs help develop more vigorous rural communities? A recent EU-report (Karlsson et al, 2010) point out that ICT will have profound impact on regional development, but however in various ways. The adoption of ICTs allows the reduction of transaction costs and leads possibly to more efficient markets. In addition, the spread of ICTs is changing the labour market by generating new ICT occupations and at the same time changing the requirements for non-ICT jobs. Location choice is increasingly becoming governed by access to particular skills, technology, and knowledge as well as entrepreneurial talent and venture capital.

From the experiences in the past, we have seen that most policy initiatives were focusing on ICTs as infrastructure or as tools for achieving efficiency or better quality of existing products and services. These are necessary, but not sufficient conditions in order to help rural communities. The strategic use of ICT that can stimulate innovations and thereby strengthen local economies is essential. A major element of innovation processes is the ability and skill to combine information and knowledge from various sources with previous experience. This underlines the complex and highly nonlinear set of relationships between the various implications of ICT diffusion and adoption, as planned and non-planned, desirable and undesirable. Furthermore, the many elements of the innovation system and the innovative capacity of a regional economy facing the competitive pressures of globalization, represents a major challenge for policy at the regional, national and European level (Karlsson et al, 2010).

The European Network for rural development (ENRD) pays special attention to the ICTs by supports the development of ICT businesses, services, skills upgrading and broadband in rural areas in various ways as investments both in hardware and software are eligible in all programs. Such initiatives are of different types; i) basic services and infrastructure, ii) support the use of ICT in existing industries and iii) upgrading human capital and “e-skills”. This includes building broadband infrastructure and basic services (ICT service centre, e-services, ICT-tools stimulating co-operation etc.) along with the diffusion of ICT-equipment, and furthermore business creation. This is necessary, but not sufficient conditions for development of rural development.

Heeks (2009), in his report to OECD, points to the development from “ICD4D 0.0 to ICT4D 2.0”, characterized by a shift of focus from data processing to service and

Table 3. Illustration of the analytical framework applied on selected ICT-based rural policies

ICT View	ICT USE		
	Production: Operational	Management and control	Innovation, knowledge activities
Tool	<i>Policy measure:</i> No specific; marked-driven ICT diffusion <i>Impact</i> efficiency	<i>Policy measure:</i> No specific; marked-driven diffusion <i>Impact</i> efficiency	<i>Policy measure:</i> Upgrade e-skills, training, etc. <i>Impact:</i> no specific
Information Infrastructure	<i>Policy measure:</i> Support broadband building, etc. <i>Impact</i> Efficiency and effectiveness	<i>Policy measure:</i> Secure availability and stability <i>Impact</i> Efficiency and effectiveness	<i>Policy measure:</i> Support development of new services <i>Impact:</i> Facilitate transformation
Services	<i>Policy measure:</i> Support use of new services <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Spur development of new services <i>Impact</i> efficiency and effectiveness)	<i>Policy measure:</i> Support innovative use of ICT <i>Impact:</i> Stimulate transformation
Expertise	<i>Policy measure:</i> Support access to information resources <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Development of knowledge network <i>Impact:</i> Effectiveness	<i>Policy measure:</i> Support innovative projects <i>Impact:</i> Spur transformation

production. The goals have changed from efficiency to growth and development, and correspondingly to move from focus on the potential of technology to how we can apply ICTs to make it useful with greatest development impact. By mapping these different policies onto our framework as outlined below, we may better understand the possible impacts of these different policy initiatives.

We may conclude from the table that the ICT policy measures most often will imply efficiency impact, but few, if any of the policy initiatives will contribute to innovative activities on its own. Thus, an ICT strategy must be an integral part of the overall policies, but in a way that also can favour rural economies, in terms of competence building, support to utilise own resources, and to define a framework that help development of vital businesses (Barrios et al, 2008). Some suggestions can thus been made as premises for future rural technology policies.

Our analysis indicate that diffusion of ICTs (as tools) and the establishment of ICT infrastructure alone are more likely to entail centralised information handling than the development of local systems and increased value-adding activities locally. ICTs should not be seen merely as a tool, infrastructure and services that can increase efficiency, but also as a mean for cooperation and knowledge creation as basis for innovation.

There is thus evidence for that the diffusion of ICTs may follow different trajectories, both to exploit and impoverish rural areas, as well as to support competence build-up and knowledge creation activities. In general, we know that increased knowledge is the most important factor in order to benefit from the potential of new technologies. The vertical integration of local businesses into national structures may entail the local loss of essential knowledge about important processes in the value-addition chain. *Information* in itself is becoming the key strategic resource on which the production and delivery of goods and services in all sectors of the world economy will depend. A key strategy for a rural economy is thus to get access to, and as far as possible, to control the information created in the utilisation of the resources in the region and by that to stimulate the development of knowledge and competence through various types of learning processes. It is then important to maintain and develop the organisational and cultural context which can act as a basis for local knowledge creation and innovations.

These arguments do not imply that the ICT tools and infrastructures, supporting vertical connections to centrally controlled networks will have negative implications only for rural economies. As has been illustrated in this paper, such relationships are clearly a necessity for rural development, but such adoption patterns must not be the dominant types of ICTs use. A variety of trajectories for the diffusion of ICTs to rural areas may be supported and vertical governance structures have to be complemented by horizontal network between enterprises and individuals that can communicate and collaborate on equal premises, and in that way benefit all parties.

4. Conclusions

Our discussions have illustrated a rather evident fact; ICTs on its own do not favour rural areas. Geography does matter, and in spite of that ICTs ability to span distances, new technologies cannot compensate for the disadvantages that rural areas do possess in terms of lack of relevant knowledge and competence resources, etc. George and King (1991) conclusions “*that context and power structure dominates and takes form through management action in a manner best accounted for by reinforcement politics perspective*” seem to be still valid. In order to understand the impact of ICT, we need to understand the many dimensions of the ICT artefact as well as how it is used, which also imply to address mechanisms at different levels.

At a *macro level*: to explore how and to what extent ICT-based infrastructures can support growth in local economies. So far, ICTs seem to have contributed less to the creation of businesses and value creation locally etc. How to reverse such trends? Barrios et al (2008) states that “... certainly, infrastructure remains a key point, specifically, telecommunication infrastructure, for promoting regional development of innovative ICT activities. At the same time as policy efforts support infrastructure building, they should also promote ICT labour skills and the use of advanced ICT as these factors can improve the attractiveness of regions. However, policies promoting ICT diffusion must be part of broader industrial policies.

At an *organizational level*: A major trend in private businesses as well as in public agencies has been centralization, where ICT has been an excellent mean. Few public agencies have “outsourced departments or tasks to rural areas. Can such policies be changed? A major challenge is thus to implement means and measures that stimulate the establishment of horizontal networks.

At an *individual level*, to make life sufficient attractive in rural areas, were ICT to a large extent will help, when other premises are acceptable. Easy access to various networks through social media is expected to be an important factor, as its use is independent of space and time. It may have significant impact on people social and cultural identity. But they may not help people living remote if no other conditions are acceptable or viewed as favourable for other reasons.

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