A Communication Perspective on the
International Information and Knowledge System

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1. Introduction

I want to argue in this essay that the attempt to create a new, more encompassing, economics of information and knowledge activities in the wider sense would benefit greatly from the adoption of a ‘communication perspective’. Secondly, the analysis has to take into account, if not start from, the perspective of the world economy as a knowledge world system.

Adoption of a ‘communication perspective’ would lead to the explicit recognition of the three *interrelated* aspects involved in the knowledge communication process, i.e. knowledge creation, knowledge transmission, and knowledge absorption. Such a perspective would act as an integrating device for the very diverse literatures from many different schools of thought and paradigms which deal with aspects of this communication process, as well as a guide to model building.\(^1\)

The in many cases instantaneous flow of information across national borders is a new feature of the world economy. The world economy itself needs to be reinterpreted as an information and knowledge percolation system which strongly affects economic growth in all countries. At any particular time there are a multitude of sources of (new and old) knowledge, a multitude of channels through which information and knowledge flows, and varying degrees of readiness to absorb knowledge. The relative importance of each of these interacting factors differs between firms, sectors and countries, and also changes over time.

I suggest that any paradigm which purports to advance our understanding of the roles of information and knowledge in the economic system has to be measured against the requirements of modelling all constituent parts of the knowledge communication process, and of modelling its international dimension. The latter seems to be particularly challenging. Neither Paquet’s (1998) manifest for a new evolutionary cognitive economics paradigm nor Earl’s (1998) plea for new micro-foundations of

\(^{1}\) In regard to the latter see, for example, Fagerberg’s (1988) model of Schumpeterian technology-gap growth theory which explicitly tries to take the three aspects of the knowledge communication process into account.
macroeconomic phenomena directly addresses the international dimension. For example, how is the reluctance to make commitments in the face of an uncertain future highlighted by Earl related to institutional factors, and how does it affect, and is affected by, the constituent elements of the knowledge communication processes in a domestic and international setting? How do Post- and New-Keynesian Theory measure up in this regard?

Economic analysis in general has not been very successful in coming to terms with the complexity of the knowledge world system, instead providing analytical and empirical snapshots of some of its parts. However, there are many recent studies analysing certain aspects of this system. In the following I shall briefly discuss a few examples from the literatures on modelling of the information economy, knowledge diffusion, national innovation systems, and international knowledge spillovers. The aim is not to provide a representative survey of the state-of-the-art of relevant research, but simply to sketch the diversity of paradigms and plurality of approaches involved in the effort to analyse this complex system.

2. Information economy research

The profound changes in economic structure towards information-based economies were first measured and analysed in the pioneering studies of Machlup (1962), Bell (1973) and Porat and Rubin (1977). Since then economies have become to depend ever more on the creation, dissemination and use of information and knowledge, and there have been great advances in information related technologies. Lately, the term ‘knowledge-based economies’ has been in vogue, in particular in relation to ‘high-technology’ industries in OECD countries (e.g. OECD, 1996). However, I have argued elsewhere (Engelbrecht, 1997a,b,d) that the focus on information, communication and other high-technologies is too narrow, and that information activities in the wider sense, for example the public and especially private bureaucracies (the ‘management sector’), should be explicitly analysed and included in our models of the economy. In this context, the similarities between Porat and Rubin’s (1977) information economy model and Wallis and North’s (1986) model of the macro transaction sector have gone largely unnoticed (see Engelbrecht, 1997d). In order to advance the empirical measurement and analysis of the
transaction/information sector, institutional and evolutionary economists could benefit from the earlier information economy literature.

Moreover, although the New Institutional research program which emphasises transaction costs and property rights was initially conceived as an extension of mainstream neo-classical economics, retaining the rational choice assumption, major proponents of this school have recently indicated that further development of the approach requires taking on board lessons from cognitive sciences and evolutionary economics (e.g. Eggertsson, 1996). This is necessary in order to come to terms with issues of mental models and learning, and to explain the evolution, maintenance and decay of organisations and institutions. North (1994) himself, in his Nobel lecture, emphasises the need to dismantle the rational choice assumption of neo-classical theory to approach constructively learning issues, in fact suggesting an institutional/cognitive analysis. He also emphasises that there is no guarantee that beliefs and institutions that evolve through time will be ‘efficient’ and produce economic growth.

The above comments indicate that the New Institutional research program is beginning to merge with non-neoclassical paradigms. In terms of modelling of the information/transaction economy, this holds out the promise for a more realistic modelling of knowledge processes in a multi-sector, multi-country model of technological and institutional change. Evolutionary economists have long called for the development of such models in order to be able to do justice to their theoretical perspective (Fagerberg, 1988). There are, of course, many unresolved issues if one wants to pursue this path. For example, technological change has not yet been fully integrated into institutional analysis (North and Wallis, 1994).

3. Knowledge transmission

There are different views about the relative importance of the transmission aspect of the knowledge communication process. Antonelli (1997) presents an analysis of the properties of information networks which is very similar to the communication perspective advocated in this essay. He emphasises the creation of localized technological knowledge, without focusing explicitly on the international aspects of
the knowledge system. Using the concept of information percolation processes, he argues that the amount of technological knowledge in an economic system is determined by the resources devoted to knowledge creation and absorption, as well as the extent to which effective communication takes place. He further argues that despite the tremendous advances in information and telecommunication technologies, the quality of communication channels (the quality of connectivity) might matter less than the degree of absorptive capacity (the quality of receptivity), and that it might be more effective to try to modify the latter compared to the former (ibid., p. 79). This also receives support from ‘mainstream’ economics research (see, for example, Jovanovic, 1995, Eaton and Kortum, 1996).

On the other hand, David and Foray (1996) argue that science and technology policy has focused for too long on the generation of new knowledge, at the detriment of the innovation systems capacity to effectively and efficiently distribute knowledge. ‘Knowledge distribution power’ is seen as a key determinant of a country’s innovation system which has to be addressed by appropriate technological infrastructure policy, e.g. the promotion of the protection of intellectual property rights, the development of uniform protocol and format standards, support of training in the use of electronic information systems, the facilitation of exchange of technical information through reference standard institutions, helping firms to construct new forms of coordination etc. (ibid., pp. 108-111).

3. National innovation systems

The transmission aspect of knowledge communication processes is only one element of the knowledge system. Its importance will differ between firms (and countries), and also vary over time. A wider perspective which includes other institutional characteristics which affect all three communication aspects seems more appropriate. A step in this direction is provided by the literature on ‘national systems of innovation’ (NIS) (see, for example, Nelson, 1992, 1993, Lundvall, 1992, Edquist, 1997). The aim of the fifteen country studies in Nelson (1993) is to illuminate institutions and mechanisms supporting innovation (in the broad sense), to assess the similarities and differences across nations, and to assess how they seem to matter.
NIS studies are almost exclusively descriptive, written largely from an evolutionary and Schumpeterian perspective (only recently have efforts begun that try to quantify such systems). They contain a refreshingly large dose of what Nelson and Winter (1992) call ‘appreciative theory’, i.e. theory which is qualitative, not formal, and which is closer to the underlying complexity of the ‘real world’. This enables analysts to capture many more variables and forces than formal theory could ever hope to. As Romer (1993), who is credited with initiating new growth theory in the 1980s, has pointed out, appreciative theory is needed to help us pin down the important causal relationships and feedback mechanisms to guide formal modelling. However, the literature on NIS can best be interpreted as providing information on the national features of the knowledge communication processes. It has to be linked more explicitly to the international knowledge system and its communication and network features.

There has been some debate about the importance of ‘national’ systems of innovation in the age of globalization. Nelson (1992) argues that while they are becoming more similar in some respects, they are retaining distinct national characters. Similarly, Groenewegen (1997) argues from an institutional perspective that there is room for a variety of capitalist systems to exist side by side, which have different strengths and weaknesses and different paths of development. Others have emphasised the differences between NISs of developed and developing countries. In short, NISs still seem to be characterised by great diversity. There is no universal innovation system, let alone a universal type of capitalism.

Given bounded rationality and the evolutionary nature of the knowledge world system, there is no mechanism inherent in the system for selecting a ‘most efficient’ system configuration. Moreover, Paquet’s (1998) evolutionary cognitive approach implies that knowledge is not only objective and social, but often subjective and idiosyncratic. Nelson (1992) hints at something similar at the marco-level when he argues that the impact of differences in national systems of innovation are often seen as ‘unfair’ by other nations. For example, western governments and firms have complaint about the role of MITI, the U.S. government has been critical of European government’s involvement in Airbus etc. Nelson (ibid.) also points out that it will be difficult to agree on international ground rules for government policies bearing on
industrial innovation. How can the different ‘national’ perceptions about the role of the state in the economy, traditions and cultures be reconciled to ensure the effective functioning of the knowledge world system?

5. International knowledge spillovers

The development since the mid 1980s of ‘new growth theory’ which, in contrast to the older neo-classical growth theory of the 1950s, endogenises technological change has led to theorising about international knowledge spillovers, particularly R&D spillovers. Recently, two influential empirical studies have estimated the contribution of international embodied R&D spillovers to total factor productivity growth in developed (Coe and Helpman, 1995) and developing countries (Coe et al., 1997). Both studies find that countries benefit greatly from such spillovers. However, these ‘mainstream’ studies concentrate on only one of the many knowledge spillover channels. For example, the role of general human capital in the absorption of knowledge spillovers is either not addressed (as in the study for developed countries), or is modelled in a simplistic and unsatisfactory way.² I have argued elsewhere (Engelbrecht, 1997c) that general human capital is important for the absorption of knowledge spillovers other than embodied R&D spillovers.

These studies also neglect any meaningful analysis of the absorptive capacity of countries. Country-specific effects are netted out, and results are obtained for the ‘average’ country. Only very recently have there been first attempts within the mainstream formal literature to look at the more ‘fundamental’ country-specific determinants of growth (Sachs and Warner, 1997, Hall and Jones, 1997). This suggests, however, that in future aspects of ‘national systems of innovation’ and ‘social infrastructures’ will increasingly be incorporated into mainstream formal analysis.

² This is symptomatic of the difficulties mainstream analysis has in empirically verifying a positive role for human capital in the growth process (see, for example, Pritchett, 1996).
There are many mechanisms by which knowledge is transferred between countries and by which information networks, both formal and informal, are developed and sustained. They include multinational companies, foreign direct investment, business trips and international conference attendance, international consulting services, education and training received abroad, migration of skilled people, imported books and journals, purchase of patents and trademarks, trade associations, reverse engineering, and last but not least the role of electronic information transfers (phone, fax, the internet).

The impact of each of these international knowledge transmission channels is likely to differ and, as pointed out by Romer (1993, pp. 558/9) requires separate modelling. However, he further comments that no international agency publishes data series on the local production of knowledge and the inward flow of knowledge (Romer, 1994, p. 20). In fact, appropriate indices for many of the knowledge transfer mechanisms are only now being developed (OECD, 1996).

Some progress has recently been made in modelling more than one knowledge spillover channel at a time. For example, Engelbrecht (1997c) incorporates embodied R&D spillovers and disembodied knowledge spillovers, whereas Keller (1997) presents a model which includes trade related (embodied) and trade-unrelated (disembodied) R&D spillovers. However, simultaneous modelling of more than a very few of the international transmission channels awaits further research. Analysts of international knowledge transmission channels might also benefit from the larger and more developed literature on domestic intersectoral knowledge spillovers. The creation of new inter-industry knowledge spillover measures is currently quite a lively industry. However, one has to agree with Romer (1993) that it is unlikely that all knowledge transfer mechanisms can be measured quantitatively, and that there is a need for more ‘appreciative’ theorising in order to judge the importance of what he calls ‘idea gaps’ and their causal relationships in the economic growth process.

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3 See, for example, the recent special issue of *Economic Systems Research* edited by Pierre Mohnen (1997).
Finally, it should be noted that by mainly focusing on results for the ‘average’ country, current mainstream empirical research on knowledge spillovers tends to portray the knowledge world system as being very beneficial for the receiving countries, i.e. as a kind of gift provided by the major R&D performing countries to other countries. It has been argued that R&D (and other knowledge) spillovers can sometimes be negative (see, for example, Mohnen 1996, pp. 51-53). Mainstream research has yet to test whether this applies in some countries, and what the country-specific policy requirements might be to prevent or reverse such an outcome.

6. Concluding comments

The aim of this essay has been to show that advances in the analysis of the roles of information and knowledge in the economic system are occurring on many fronts, by analysts employing many different paradigms. While readers will find some schools of thought and paradigms more helpful than others in analysing the evolving knowledge world system, there seems to be increasing cross-fertilisation of ideas. To preclude certain contributions, for example because they are obtained from a mainstream neo-classical perspective, would hinder the development of new promising syntheses of diverse approaches. We need a plurality of approaches. To quote North (1994, p. 366), ‘we certainly have not put all the pieces together yet’. Currently, there seems to be a trend towards a synthesis and extension of some aspects of (especially) evolutionary, institutional, cognitive and new growth theory. This combination of diverse ideas to create maybe a new paradigm should itself be seen as an increasingly dominant feature of a knowledge-based world systems.

Secondly, I have argued that a communication perspective is needed to provide a unifying scheme for the analysis of this complex reality. In the knowledge world system, competitive advantage at any particular point in time depends on the appropriate ‘mixture’ of the components underpinning the communication perspective. These different aspects of knowledge-intensive production are path-dependent and to a certain extent country specific, and they will contribute in different degrees to the competitiveness of firms and countries. An inappropriate ‘mixture’ or ‘knowledge system profile’ can quickly lead to loss of competitiveness. Last but not
least, the analysis of information and knowledge flows in this system cannot be isolated from sociological and political factors, requiring inter-disciplinary analysis.

REFERENCES


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