

**Generative Growth, Knowledge Economies
and Sustainable Development:
Implications for Regional Foresight Policy**

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Introduction

This paper explores three ideas of importance for future regional development policy. The two that are reasonably familiar are *sustainable development* and *knowledge economies*. Both are key to recent European Union (EU) policy action lines. Here, a broad view of sustainable, regional development is taken (see below), meaning socio-economic and environmental, not just resource efficiency. Knowledge economies are also defined below. The third idea refers to the new concept of *generative growth*. While the EU has promoted ‘mobilisation of indigenous potential’ for two decades, it has failed by comparison with the US to raise the innovativeness of its small and medium-sized enterprises (SMEs). This paper argues this is because it focused too much on *technology* and failed to deal with widespread EU market failure in private innovation and entrepreneurship services. One crucial reason for this has been absence of regional or any kind of technology or socio-economic foresight capability.

It is clear that markets, being fundamentally responsive and opportunistic, rest on ‘herd instincts’ and Schumpeterian imitative or ‘swarming’ behaviour by entrepreneurs. This was shown particularly clearly in the recent dot.com and ICT débâcle. Markets express not foresight but ‘spontaneity’ (Hayek, 1945) and non-market institutions like the EU must compensate. But the EU sought to do this and, in effect, continues so to do by a narrow emphasis on technical scale issues that either failed, as with the abortive ‘European ‘information super-highway’, or produce disastrous and unsustainable policy instruments like the Common Agricultural Policy (CAP). However, there was failure to understand underlying developmental processes, infrastructures and methodologies that are producing generative growth elsewhere. Meanwhile, EU employment stagnates or goes, once more, into decline even though, simultaneously, job vacancies in ‘knowledge economies’ remain unfilled, testified by at least 2 million unfilled software engineering positions.

In what follows definitions will be augmented by empirical cases of new kinds of localised economic growth occurring in the kinds of less developed places so important to EU regional policy. It will be argued that, in varying ways, these cases mark responses to globalisation. These occur through the activation of knowledge-based creativity and interactive learning to innovate. In turn *generative growth* takes place in the spaces where innovative knowledge capabilities are applied. Occasionally, public policy has played a part in the processes to be discussed, though it is

seldom comprehensive in its design or application. While new regional development policy is 'generative' in intent, its style is supportive or facilitative rather than determinate or directive.

Policy must also be subject to knowledgeable and creative learning to develop policy capabilities. Some policy agencies are more conscious and attuned to the current premium placed on facilitating market transactions. This is so particularly where markets have failed, as is so obviously the case in less favoured regions and localities. A majority of policy agencies are struggling to absorb that 'market facilitating' message. A few of these are mindful of balancing market stimulation against the imperatives of moderating the negative effects of market failure and 'social exclusion'. To promote generative growth without social exclusion requires a new tool-kit, elements of which will create new demands upon the public purse, public policy and policy makers in equal measure. In a context characterized by irreducible uncertainties and even ignorance, regional technology foresight activities prove most useful when they treat technological innovation as embedded in socio-political processes. Also, at a time when the reform of European governance is a priority – as documented by the recent Commission White Paper – there is a need for developing methods that are more participative and allow for the involvement many actors (on Foresight and the *'Lisbon Strategy'*, see Clar et al. 2001).

In the section that follows key definitions are provided. In the next, lessons learned from the recent ICT, Internet and dot.coms business cycle, especially in Silicon Valley, will be disclosed. For a moment, the core factors of venture capital and management capability to commercialise laboratory knowledge was clearly revealed. Perhaps fully for the first time, we saw the highly dynamic heart of generative growth in a globalising knowledge economy, and then the bubble burst. Its sustainability proved questionable, foresight to anticipate the downturn was absolutely lacking. This is how markets function, such processes cannot be planned. Although the downside effects of this in time and space will not be examined as much here as elsewhere (Cooke, 2001a&b; 2002) they will be alluded to for their highly disequilibrating effects, caused by the geographical proximity associated with Schumpeterian swarming. In the subsequent sections, alternatives, less prone to producing socio-economic wreckage are explored. Finally a key role for regional foresight is mapped and its meaning for a new, more visionary, sustainable and participative policy approach is presented.

Definition of Key Concepts

Since brief indications of the meaning of sustainable development and generative growth were already given, the idea of *knowledge economies* will be discussed first. As Dunning (2000) and Castells (2001) show, knowledge-intensive production became hegemonic towards the end of the twentieth century. In a recent piece of research their share of world trade was put at some 70% (Cooke & Simmie, forthcoming). Two-thirds of this is internationally traded financial services, a key knowledge economy activity, but software, media and other 'light GDP' activities make up the rest (Archibugi & Coco, 2001). These 'knowledge economies' are highly localised in cities and are thus different from 'Information Society' which despite suffering 'digital divides' is nevertheless more socially and spatially 'ubiquitous' in terms of consumption (Maskell et al., 1998) Thus 'knowledge economies' undermine confident predictions that the Internet spelt the 'end of geography' or the 'death of distance' to quote the title of Cairncross (1997). For, while it is nice having the Human Genome on our desktop PCs, it is something else to have the *knowledge* to do something useful with it. Such specialised knowledge exists only in a handful of places in EU economies, let alone the less developed countries. Genomics, like operating systems software, computer games software or multimedia imaging, is a knowledge economy industry. This is due to its key characteristic of creating productivity through *the action of knowledge upon knowledge* (Castells, 1996), rather than knowledge acting directly upon raw or processed materials.

Because of their scarcity, knowledge economies thrive under *globalisation*. This is the milieu within which localised knowledge clusters interact with global value chains managed by multinational corporations. It was, until recently, contested as to whether *globalisation* was a meaningful concept (Hirst & Thompson, 1996; Ruigrok & Van Tulder, 1995; Cooke et al, 2000; Dunning, 2000). But there is now consensus that it exists and is marked by a heightened organisational strength, extensively over the globe and intensively through global value chains. Thus production of goods and services is more deeply integrated for different stages of the value chain in a wider array of global locations than ever before. Global value chains are increasingly embedded in local value chains or *clusters*. Competitive advantage increasingly lies in firms, regions and countries coming to terms with these new realities, intensifying their direct and indirect capabilities for knowledge-intensive production, enhanced productivity, innovation and new firm formation that accompany integration of local and global value chains. Generative growth feeds off these interactions rather than being unproductively transplanted, as often occurs with 'redistributive growth', the style of incentivised and regulated movement of jobs and capital from locations where they were abundant to those where they were not. Theoretically it is an

evolutionary concept that moves beyond neoclassical constructs like ‘endogenous growth’. The latter, even with its more realistic acceptance of realities like ‘increasing returns’ and ‘imperfect knowledge’ remains wedded to a notion of the satisficing individual consumer and a reductionism in its analysis of spatial development processes that even one of its main progenitors admits is ‘simplistic’ (Krugman, 2000).

The evolutionary nature of *generative growth* takes account of individual and collective *learning* by firms and among enterprise support agencies. It is interested in but critical of certain determinisms that neoclassicists find sympathetic, like *path dependence*. In particular it is dissatisfied with non-explanations for economic phenomena like the effects of *chance* as deployed by leading figures in the path dependence school (Arthur, 1994). Generative growth evolves towards ‘disruptive change’ or ‘punctuated evolution’ as described by Schumpeter (1975). A market forms and firms ‘swarm’ around an innovation, usually in a clustered space, as a consequence of specialised knowledge application. There are two types of generative growth cluster: the pure ‘Knowledge Economy’ kind, and that better referred to as ‘Knowledge Upgrading’. The former is exemplified in, say, a genomics cluster, the latter in a premium food or design-intensive textiles cluster of the kind we will explore in the third main section of this paper. Generative growth often occurs where local and global value chains move into alignment. The key policy demand is foresight and to be sufficiently knowledge-capable to anticipate such alignments. This is *par excellence* the province of the entrepreneur, a skill for the toolbox of the policy maker as *collective entrepreneur*.

For as well as positive dynamic externalities such as early access to innovations, special investment expertise and cultural assets like ‘swift trust’ and ‘gift exchange’ relationships, there are non-sustainable, negative spillovers like congestion, pollution, long working hours, tiny workspace ‘cubicles’, uncertain compensation, high living costs and lengthy commuting that moderate the attractiveness of the model. However, these negatives also leave space for the judicious ‘collective entrepreneur’ to operate. But before exploring the downsides of extreme generative growth, we must extend this analysis to the question of sustainable regional development.

If sustainability is only concerned with resource efficiency it will fail to be taken seriously by markets that are regulated to favour exploitation of resources for profit. The socio-economic dimension of environmental management brings leverage because it involves people as consumers, something that causes markets to respond more directly. An example is the Global e-Sustainability Initiative (GeSI) connected to the Digital Future and Digital Europe projects. The Digital Europe

project was created with the belief that the use of information and communication technologies (ICTs) could reduce our impact on the environment and improve social inclusion. The project follows on from the successful Digital Futures project in the UK in 2001. The ICT industry has the following as its vision statement: *'Through the GeSI, we the ICT industry aim to help improve the global environment and to enhance human and economic development, and thereby make a key contribution to a global sustainable future'* (www.gesi.org). The challenge for the EU ICT industry is shown by response to the first question posed in the Digital Future website: *How much electrical waste is produced in the EU per year?* In 2000 the European Commission estimated that the EU produces six million tonnes of Waste Electrical and Electronic Equipment (WEEE) a year. A report by the Industry Council for Electronic Equipment Recycling put the UK figure alone at one million tonnes, 90% of which was largely ICT equipment.

Business and policy forecasting by Digital Europe (www.digitalfutures.org.uk) reveals a deep contradiction in expectation by business that the EU will tackle 'agenda' problems while the ICT industry will enlarge markets. Thus team member Vidhya Alakeson forecasts that at:

'...the EU level, 2002 offers real potential. The review of progress made since the Lisbon European Council alongside the review of the EU's sustainable development strategy offers an opportunity for bridge building between the two agendas. However, whilst it looks likely that the potential of digital technologies for improved resource productivity will become a political priority, full integration of the two agendas will require greater vision',

While at the same time, team member James Goodman sees:

'...2002 is a pivotal year for the mobile Internet. In 2001 GPRS-enabled networks arrived along with more sophisticated internet-enabled handsets. The mobile telecoms industry is looking for significant take up and proliferation of mobile Internet products and services, especially among businesses, for 2002',

and:

'...2002 will be the year of broadband. A panoply of initiatives at the European, national, regional and local levels are aimed at stimulating the roll out of broadband Internet access to people and businesses. Society and the economy will move towards a dependence on the Internet that will make assessing the sustainable development impacts a less speculative affair: expect a growing body of evidence on the relationship between Internet usage and labour and resource productivity',

In other words, business and policy foresight in the ICT field are extremely short range, the Commission has researched and communicated the scale of its ICT industry's bad sustainability impact on waste generation, but the headline forecasts stress business aspirations and sustainability as a possible by-product on its terms. No mention is made of recycling, sustainability targets to be achieved, only productivity. This tells us that sustainability is the EU's and industry's 'Achilles

heel' for without adequate foresight and regulatory powers to enhance sustainability performance industry will only pay lip service.

New Learning from Innovation in Silicon Valley

We see this mentality most clearly in the ICT industry of Silicon Valley, which is both environmentally and socio-economically careless. But it exerts a fascination because when fully functioning, it shows great institutional capability for exploiting knowledge economies, inducing generative growth and mastering globalisation. The question is can we have the three of these and sustainability in the broader sense? And to what extent can Foresight be influential in bringing about such a synthesis? In the past, consultants and policy transfer commentators on the subject of Silicon Valley were fascinated by the technologies involved rather than the mundane matters of management, money and 'more legal details'. The most interesting, if painful, lessons learnt from the recent past (i.e. up to March 2000 when the dot.com downturn began) concern not technology but the mode of organisation of the localised innovation process. It is now better understood that this process occurs through a chain reaction involving multiple intermediaries. It is now clearer who those intermediaries are and what services they provide (see Moon Lee et al., 2000; Kenney, 2000). Despite the major downturn in ICT in Silicon Valley as everywhere else through 2001, sufficient has been written about the processes fuelling the Internet communications boom for there now to be a reasonably clear picture of the most recent form taken by its 'innovation growth engine'. Summarising, we can say that the following are central institutional features:

- Basic research, knowledge generation and application capability of the kind normally found centred in advanced private research or leading edge public research laboratories. In Silicon Valley, exemplars are Xerox Palo Alto Research Centre (PARC) and Stanford University, PARC being less visible in the 1990s than earlier, and venture capital more visible in search and selection of innovation than before (see below),
- Venture capital is crucial as the means by which ideas that have been screened and selected are given a chance to fly as commercial products or services. Business angels are key at the initial stage; venture funding for second stage and stock market flotation. However, it is clear that finance is only part of the story and that the hands-on *management* skills that equity investors bring to firms in which they have invested is at

least as important. This extends to cluster-building activity where portfolio firms are advised on, for example, local inter-trading,

- Law firms are important as gatekeepers, advising firms on appropriate investors, counsellors assisting entrepreneurs to access other services, and sources of contacts for many things ranging from recruitment to contract manufacturing. Many law firms practise relatively little *formal* law with technology businesses. Moreover they often take payment in equity rather than fees. They therefore constitute, as ‘knowledgeable attorneys’ a second source of external business know-how,
- Specialist consultants in business and technological services ranging from management accountants rather than simple auditing accountancy services, head hunting services and specialist engineering, software, new media, and regulatory advisers or property development services, including specialised public provision,
- A local value chain of firms that can conduct, for example, contract manufacturing, design and fabrication, and various fairly prosaic supplies like logistics, or exhibition organisation and specialised catering services (Bahrami & Evans, 2000).

It is notable that neither sustainability nor public regulatory criteria have any obvious presence here but that the overwhelming majority of these elements of the innovation support infrastructure are private. These smooth market interactions with forms of ‘social capital’ that draw on aspects of shared culture that are more collective than purely competitive. Although these may be rather more superficial than apologists for a highly ‘communitarian’ culture might wish to convey, nevertheless at least according to Micklethwait and Wooldridge (2000) they consist of the following norms:

- Tolerance of failure where a firm going bankrupt is seen as a learning process rather than a stigma for the entrepreneur in question,
- Tolerance of ‘treachery’ in the sense that entrepreneurs expect today’s collaborator to be tomorrow’s competitor, and quite likely the following day’s partner again,
- Risk-seeking of a restless, ‘hypercompetitive’ kind where the aim is to develop disruptive innovation that, albeit temporarily, dominates the field and realises very large, rapid returns on investment,
- Reinvestment in the cluster, a ‘civic interest’ in bringing on new disruptive entrepreneurs and earning profits from ‘angel’ investments in the process,

- Meritocracy where due acknowledgement is given to the quality of knowledge, ideas and innovation rather than status group membership,
- Product obsession or a mentality that seeks continuous improvement and discounts excessive working time as the means to secure permanent innovation

Some of these conventions look towards sustainability criteria like tolerance, civic interest, and reinvestment in the community but individual not collective entrepreneurs.

Disruptive Production, Disruptive Consumption

It seems that without external regulation, based on firm knowledge derived from legitimate and acceptable foresight exercises, entrepreneurs will not promote sustainable regional development. To repeat, only if customers engage in ‘disruptive consumption’ patterns will markets respond without regulation. And of course, regulation is a form of ‘disruptive consumption’. Evidence in support of this view comes from recorded views of typical ICT entrepreneurs who survived the dot.com ‘meltdown’ But first to be noted in relation to broader sustainability concerns is that workers have borne the brunt of the recession both in jobs and in stock options made worthless as share values plummeted. Yet in May, 2001 Guy Kawasaki, CEO of garage.com and former Apple Fellow and ‘evangelist’ of Apple to software developers in the 1980s saw the downturn as ‘a lull’, while the vice-president of Intel Capital observed that ‘.... technology is like cabbage. When it gets old, it rots’, meaning new investment will ultimately always be required. It was also claimed that a degree of seamliness had been restored to Valley culture by the downturn; ‘ Valley veterans...were offended by the orgy of greed and speculation of the dot.com frenzy. They are glad to see it gone. Amassing personal wealth has long been part of the Silicon Valley story. But it used to be a by-product of entrepreneurship, rather than its primary goal’ (Kehoe, 2001, 22).

Nevertheless, the downside aspects of both the pre- and post-boom discontents of working life in the cluster need recalling. First, there is the ‘wreckage of hundreds of start-up companies’ and the human waste involved in ‘a business culture in which jobs are tied to revenues’. These layoffs are structured so that the lower ranks are fired first. Even before the downturn occurred negatives like; difficult commutes, high living costs, pollution, working conditions involving 60-hour working weeks, tiny workspaces or ‘cubicles’, modest wages, and the routine nature of most work were compensated for by the anticipation of high returns from stock options. Once the value of these declined, sometimes to infinity, and the system of ‘rating and ranking’ workers on performance

turned into a job-culling mechanism, the sacrifices no longer seemed worthwhile. In the first half of 2001, 107,000 persons were made redundant in California, compared to 14,300 in the equivalent period of 2000 (Gardner, 2001).

What about two other key cluster institutions, venture capitalists and lawyers? Silicon Valley venture capitalists, according to observers were ‘...managing their portfolios differently, aggressively culling their weakest companies.... emphasising classic portfolio management techniques to diversify their risk, dividing their investments among companies in different industries at different stages of development and at different stages of risk’ (Abrahams and Luce, 2001, 20). Hence, from indirectly promoting growth and clustering through specialisation in the upturn, most moved to risk-spreading diversification and cluster unbundling in the downturn. Not all were equally prone to this strategy, the largest and most successful, like Kleiner Perkins had bucked the trend by specialising investments in the one sub-sector that seemed immune, and the narrow field of optical networks. VantagePoint venture capitalist Alan Salzman said ‘these sectors rotate. In the early 1990s it was biotech; then specialised retailing; next were the dot.coms; now it is optical networking. In any one year, the best fund will be a narrow one. Someone will always win the lottery’ (Abrahams and Luce, 2001, 20).

Silicon Valley law firms also made redundancies in 2001, smaller in number than technology businesses, with the largest layoffs in the hundreds and most in the tens. But there was pessimism in the sense that litigation was anticipated because of investor claims that the upturn led to inadequacies in due diligence. Lawsuits by entrepreneurs and investors against lawyers with big equity stakes in start-ups (taken as payment for services in lieu of fees) were also anticipated. By contrast, there was also optimism that the ‘economy culture’ would not fragment into a flood of litigation because the business model was welcomed by start-ups as saving some ‘cash burn’ while linking the interests of clients and attorneys more closely than the normal arm’s length exchange relationship. In other words, both key elements in the innovation support infrastructure are sanguine about the robustness of the equity investment business model, recognise that the returns being realised in the upturn were unsustainable, and expect a return to the norm of well below the 40% per year at the height of the boom (Eaglesham, 2001,19). Views from the industry, unlike those from economists, reported by expert observers taking soundings at various points throughout 2001 were positive but chastened, pointing to ‘... elements of the information technology revolution that are unfinished. These include the transition to broadband Internet access in homes and the computerised translation of languages. The optimists argue that such changes could spur a fresh

wave of technology spending by companies and allow more efficient ways of working' (Luce and Kehoe, 2001, 20).

It has been argued thus far that a simple model of innovation whereby venture capital induces start-up businesses from research laboratories underpins the Silicon Valley cluster experience. However this is not the exemplar of a sustainable generative growth model, rather it is the product of a herd expression of short-term opportunism. Are there regional development models that mitigate the negative aspects just described while sustaining strong equity-based generative growth? Sweden offers a strong candidate that on the surface appears to combine the best of both worlds. Corporatism and State 'feather-bedding' of industry are obvious points for critical examination regarding the economic development model applied in Sweden. But the model has evolved and there is interest in a new version observable in Karlskrona's 'Telecom City', which may have overcome the problem of over-dependence on a few global firms and State subsidy in developing local value chains.

In Sweden, a history of corporatism has been translated into a specific form of value chain animation involving 'national champions' partnering the state as the financier stimulating academic entrepreneurship from public universities. We can next turn to an assessment of this in light of future growth challenges comparing different ways of exploiting 'knowledge economies' where some initially have no 'national champions' as in the Israeli equity approach that adapts a Silicon Valley 'offshore' model to evolve initial stimulus by public venture capital when faced with market failure. Equally, others upgrade core knowledge, like the striking arrival on the global fashion-design scene in the still lagging rural region of Galicia in Spain, and build on local-global value chains in innovative ways. The Australian wine region of Barossa has some such affinities, as will be shown. We will contrast the hierarchical, corporate value chain approach of Sweden and the equity model pioneered in Silicon Valley against the more public, pure 'knowledge economy' entrepreneurship in Israel and the 'knowledge upgrading' models in Galicia and Barossa. Our aim shall be to see which best serves the generative growth opportunity that is the centrepiece of 'knowledge economies' confronted with future challenges to regional development under conditions of globalisation.

Corporate-Led Academic Entrepreneurship in Sweden

Various pieces of national legislation in the 1980s gave Swedish universities a 'third task' academic entrepreneurship obligation, building upon even earlier government efforts to create their version, as near as they could, of the Silicon Valley generative growth phenomenon. Thus Kista, an industry science park since 1972 located between Stockholm and Uppsala, has Ericsson as the centrepiece, employing some 12,000 of the 29,000 on site. Mjärdevi Science Park at Linköping has Ericsson and Saab, while Ideon at Lund has AstraZeneca research laboratories employing some 1,200 R&D staff (Brown-Humes, 2001; Jones-Evans & Klofsten, 1997; Jonsson, 2001). This model, which also operates in Finland and from which Nokia has benefited, for example with text messaging, which was invented by a Finnish science park spinout firm, spreads risk for early stage firms who can learn rapidly about scientific leads and customer requirements, gaining contracts from both.

In Kista, Nokia has 300 employees and global lead firms like Microsoft, Intel, IBM, Sun, Novell, Adobe, Siemens, Oracle and Hewlett Packard are joined by some 400 mostly academic spinout SMEs. Arriving later than Ericsson and IBM were numerous academic research institutes like The Royal Institute of Technology, University of Stockholm, Swedish Institute of Computer Science, Swedish System Development Institute and Industrial Centre of Microelectronics. They interact as a system of innovation linked also through learning networks like Soft Center to other systems and software science parks in Sweden and the US. Kista is, however, not a fully-fledged cluster because it is vertically networked into Ericsson's global mobile telephony value chain, nor does it possess a full range of innovation support services on site. Although it is also experiencing the telecommunications downturn and Ericsson announced 1,000 redundancies for Kista in May 2001, it is not so badly affected as Silicon Valley because it was not dependent on Internet businesses and is far more of a services than manufacturing centre. Interestingly it has one of the lowest income spreads for engineers and programmers (\$3 between high and low, compared to \$20 in Japan and the US in 2000) as well as surprisingly low wage costs for such occupations (\$24,000 and \$22,000 compared to \$68,000 and \$ 64,000 in Japan and \$60,000 and \$54,000 per year in the US in 2000) in an otherwise high living cost economy. Comparatively generous welfare payments and working time legislation mean the stress factor is less than Silicon Valley for those laid off as well as those in employment in Kista. Thus Kista offers what appear to be superior social integration

possibilities, reflecting Sweden's higher prioritisation of those aspects in the wider society. Despite this, it is worth noting that by 1998 European Venture Capital Association statistics showed Swedish venture capital investment as a percentage of GDP was third in Europe at 0.17%, behind only the UK (0.39%) and Netherlands (0.24%).

Being near Stockholm means that access to specialist investment and innovation support services in proximity to the science park is good, especially as there was, like elsewhere, a surge of venture capitalist firm formation in the late 1990s. Thus research into support for biomedical and polymer innovation in Sweden was able '...to identify only a handful of firms active in 1996-98, some of them foreign' (Braunerhjelm & Carlsson, 1999; Braunerhjelm, Carlsson, Cetindamar & Johansson, 2000; Carlsson, forthcoming) whereas by 1999 at least 93 such companies had been identified (Vinnova, 2001). The latter study notes also the substantial public venture capital funding from the likes of Nutek, the Swedish Business Development Agency, while the former studies compare the service rendered being limited to finance, compared to that in the US where venture capital supplies 'Money & Management' expertise. However, although Sweden has evolved a more socially inclusive form of enterprise culture, the geographical imbalances between core and periphery in the provision of equity investment remain to be addressed (Edlund, 2001). Thus despite the presence of a national innovation support organisation, Nutek, that understood the importance of finance to innovative firm formation, its public investment funds did not operate satisfactorily, especially in the regions. Learning from that experience, Nutek has been supplemented by a new Swedish Agency for Innovation Systems, Vinnova, one of whose key tasks is the building of regional and sectoral innovation support architectures, including innovation funding. The importance of private equity investment in this is recognised and, as we have seen, there has been a growth in size of the Swedish venture capital industry that should facilitate strengthening of regional venture capital.

An interesting modern development that breaks, to some extent, from the vertical, corporate model somewhat is that of Karlskrona's TelecomCity cluster. This is located in a peripheral, declining, former naval dockyard location in the south-east of Sweden. This city has been turned around from suffering population decrease, high unemployment and loss of college graduates at the beginning of the 1990s to a place that has generated 4,500 new, knowledge economy jobs at a rate of 600-700 a year and reversed the declining trend. The key features are fivefold:

- Leadership – three men, CEO Jan Kark, of local small firm EP Data (50% owned by Ericsson) specialising in telecom software, the new polytechnic director, Per Ericsson, and

the local economic development head Tage Dolk came to agreement around the idea that IT could revive the local economy,

- Vision – with support from mayor Mats Johansson who accessed public resources and produced political backing for a common vision of TelecomCity, a strategic commitment to transform the city into a leading *international* centre for telecoms research and services.
- Cluster Drivers - the vision attracted Nordic Tel, Sweden's third mobile network, subsequently acquired by Vodafone, to set up its headquarters after winning its licence. Ericsson, Nokia, Sun and HP followed with research and service facilities.
- Networking – there is a division of labour among the different expert groups but an association, the TelecomCity Membership Association that strengthens business support and competence development. Telecoms education is a major specialisation in the college, including in-house training of employees. Start-up knowledge-based businesses are assisted by the city's economic development arm
- Social Environment – social inclusion, e.g. of youth in 'TelecomCity Club & Co' to enrich the living environment, not least because telecom software employees are in demand and highly mobile. Hence *homo sociologicus* is catered for.

Key to this narrative is the policy-enhancing observation that clustering need not be mysterious; it can be designed and built from new, in this case in less than ten years. Still questionable is how generative in terms of robust market-facing start-ups this cluster is, given there is greater reliance on public than private equity investment, and whether TelecomCity can attract that and other necessary marketised support services to ensure cluster sustainability.

An Equity Investment Model Implemented in Israel

We have seen that the Swedish approach to designing technology complexes by linking university research to corporate exploitation through subsidising spinout activity is a success up to a point. It represents a 'Knowledge Economy and Social Inclusion' rather than a 'High Tech and Homelessness' developmental model. Sadly, apart from Finland, it may be unique, as the following account of the Israeli variation of High Tech and Homelessness (for the Palestinian minority) that characterises the remarkable, but possibly unsustainable, achievement of the first three of the four criteria set out above in a knowledge cluster north of Tel Aviv.

The specific location is in the Herzliah Corridor on the Tel Aviv to Haifa road, where data security software predominates, an industry in Israel where employment grew from little above zero to many thousands in the 1990s (Teubal, 2000). The model involves as a key theme the role of 'Silicon Valley offshore' but it is 'generative' because the crucial knowledge behind the core software technology was intrinsic to Israeli research and military applications. Hence, the software application was also indigenous, being in the data security niche, otherwise known as Internet 'firewalls'.

- First, the Weizmann Institute of Science was key as the invention source of what became a world standard encryption algorithm. Israelis then pioneered the technology, mainly in the Israel Defence Forces and Mossad, the security service.
- A combination of military downsizing following the Camp David accords in the early 1990s and an influx of post-Soviet refugee scientists and entrepreneurs led first-mover firms to specialise in anti-virus, software protection and encryption technologies and included Carmel Software, Iris, BRM and Eliashim.
- At this stage there was no venture capital in Israel. Funding for entrepreneurship was accessed through the Office of the Chief Scientist's Industrial R&D Fund supported by a 1984 R&D law that allowed 50% grants for commercial exploitation of scientific research. Firms like Algorithmic Research and NDS were set up in the emerging Herzliah Corridor.
- A second key development stage saw the emergence of 'firewall' firms (1990-96). With the arrival of the Internet in this period, demand for encryption engines mushroomed, and world-leader firms like Checkpoint, Memco and Aladdin were founded.
- At this time also (1991), the Israeli government set up a public venture capital firm called Yozma, which was instrumental in the evolution of the Israeli venture capital industry.
- The third key stage of development coincided with the privatisation in 1997 of Yozma. By that date the number of venture funds had risen in number from 1 to 70, many originating in the US, and some one billion dollars were available for start-up and later stage equity investment.
- As well as ties with the US venture capital industry becoming more pronounced, this was the point from which those that had reached the stage of making a successful initial public offering (IPO) began to be listed on Nasdaq, while US companies also acquired many non-IPO firms.

- This represented the fulfilment of two key strategic priorities articulated within Israel's system of innovation. As noted, one related to a perceived need to enhance the effectiveness with which firms moved from start-up to subsequent 'implementation' phases.
- The second imperative was to enhance the creation of global high technology firms. Firms also function as a cluster, with a specific security software sub-cluster. Of 19 such firms studied by Teubal, Avnimelech & Gayego (2000), 47% were around Tel Aviv, and 41% in Haifa.

Thus initiating a public venture capital firm to facilitate exploitation and commercialisation of an indigenous technology massively enhanced a model of 'generative' growth. This shows public regional development initiative in a good light. However, Teubal & von Tunzelmann (2000) note that while Sweden limits the un-checked negative aspects of growth by social inclusion, then Israeli high tech clustering success seems to have been bought at the expense of serious social deterioration and something approaching civil war at home with horrific global implications abroad.

Localised Global Value Chain and Applied Knowledge Economy Clustering in Galicia, Spain

This is one of Spain's less favoured regions, located on the northwest Atlantic coast, sharing geographical and cultural similarities to the other Atlantic Celts further north. Remarkably, in a matter of ten years it has become Spain's leading fashion clothing production region with a globally successful retail outlet 'Zara', comparable to but already outstripping Benetton. Although the beginning of this development goes back to the 1980s, when a series of companies decided on a joint promotion disseminating the "Galician fashion" concept, causing what was called the "boom of Galician textile sector", this is not the whole explanation. Of greater importance has been the manner in which full establishment of the industry benefited from an improved financial regime from Spain and the EU, stimulating greater competitiveness from the companies, their foreign marketing activities, managed cooperatively with serious planning and joint action. But even more important has been the rise to prominence of a regional group of designers of national and international reputation (Revilla Bonnin, 2002).

Most firms are small and medium-sized businesses leveraging their design knowledge and production flexibility to follow market trends. However, large companies, such as Grupo Inditex,

Adolfo Dominguez, Caramelo, Mafecco, Lonía Textile, Florentino, and Knitting Goods Montoto have, through their buying strategies and links to global value chains dynamised the sector. The regional cluster rests on the co-existence of large firms in touch with national and global markets and small firms operating in localised production systems involving local value chains. The integration of local and global value chains seems to be the most important feature explaining rapid growth. This is also of importance to policymakers whose understanding of these processes needs to be flexible like the response of firms to market shift:

- Inditex-Zara was founded in the city of La Coruña at the beginning of the 1960s. It began as a modest textile company, Confecciones Goa, established by Amancio Ortega,
- Twelve years after Confecciones Goa first entered production, Amancio Ortega opened in La Coruña, calling the new firm Zara. The chain was a real ‘event’ promoted as a ‘democratisation of fashion’,
- This combined with an interactive organisational innovation whereby electronic point of sale facilitated analysis of consumer tastes, as with Benetton. But Zara used it for later transmission to the design department of the group, where they could be translated into the next new fashion lines on the market,
- The firm integrates all essential processes for the final fashion product, from the basic processing of raw material and its later conversion into textile products, to their arrival at the Zara stores and other, different commercial branches,
- Once a Zara chain has been fully established, the Group sets up other chains to meet demand from distinctive segments of the fashion market. Thus, whereas Zara supplies general fashion, Pull & Bear is a fashion chain catering for young men’s clothes, Complementing this, Massimo Dutti establishments are for high-income consumers, while the Kiddy’s Class chain sells children’s quality clothes. Finally, Brettos is a chain of stores for young urban, professional women,
- The production process begins with the reception and processing of raw material in the Group’s Sabón industrial park in the municipality of Arteixo. From here, the cut pieces of fabric are subcontracted to supplier companies spread throughout locations in Galicia and the north of Portugal. The Sabón distribution centre is where the orders of each store are received and global shipments are prepared,
- Company growth has depended on careful forecasting and monitoring of market trends based on high quality knowledge of customer demand preferences. This involves a mobile

team of designers who travel periodically to the fashion capitals, monitoring design innovation and absorbing tacit knowledge concerning the design preferences of the main international designers,

- Innovation arises from the integration of tacit with codified knowledge provided by the processed customer preference data obtained at the point of sale in the stores. Armed with this mix of structured information the design department establishes the colours, fabrics and forms of the new articles. In 1999, the group had a turnover of US\$1.6 billion, with profits of 153 million, and a total employment of 15,576 workers. Between 1999 and 2000, the group doubled its staff, the amount of business increased by 60%, net profit by 109%, and the group has opened 200 new stores worldwide.

This is clearly a fundamentally private enterprise in a milieu of like-minded fashion clothing enterprises that have targeted the ‘quick fashion’ market pioneered by the Italian fashion industry. Forecasting, monitoring, analysis and creative design knowledge are combined in a regional cluster that successfully links local and global value chains and has produced generative growth in a less favoured region. The role for policy has been facilitative, mainly subsidising early stage market studies and stimulating the integration of regional and international production and marketing networks, not least by constructing a major highway from La Coruña to Vigo through the heart of the production cluster.

Barossa: Rural Knowledge Economies

In recent league tables of competitiveness from the World Economic Forum and *knowledge economies* from OECD data, Australia does not feature in the world’s top ten. However, as Table 1 shows Australia currently ranks fourteenth in the OECD-based ranking. Without absorbing space criticising the methodology (which, by treating FDI as an indicator of strength when it may be the opposite) this is a ranking among Germany, Japan, France and Italy on which, if politically desired and institutionally feasible progress can be built. One industry that has shown generative

Knowledge Economies: Country Rankings					
Rank	Country	Points	Rank	Country	Points
1	Switzerland	52	14	Australia	19
2	Sweden	44	15	Luxembourg	16
3	USA	40	16	Austria	15
4	Ireland	38	16	France	15
5	Netherlands	33	18	Denmark	13
6	Hungary	31	19	Norway	12
7	Belgium	29	20	Italy	10
7	Canada	29	21	Czechia	8
9	UK	28	22	Iceland	7
10	Finland	27	23	Poland	6
10	S. Korea	27	24	New Zealand	4
12	Germany	26	25	Portugal	1
13	Japan	20			

Table 1: Knowledge Economies: Leading Twenty-Five

Source: *Financial Times*, 29/10/2001 based on OECD data www.oecd.org/sti/statistical-analysis N.B. Indicators: Knowledge-intensive Manufacturing & Services; Patents; Recent Labour Productivity Growth; Knowledge investment; IT spending; Venture Capital; FDI Manufacturing & services; Proportion of Foreign Students

growth is wine production. South Australia now accounts for 60% of Australian wine exports. It is an illustration of globally successful clustering in a rural setting primarily because of its ‘knowledge economy’ innovation in production processes.

- The key innovation by the Wolf Blass Company was stainless steel maturation tanks. This created a new industry standard for consistency and quality, enabling mass-markets to be supplied with an initially premium standard product at an affordable price.
- Secondary innovations such as the toasting of oak chips to allow for oaked or unoaked variants, and the cost reduction from using oak veneer in barrelling followed. The success of the technological innovation led to major increases in external demand for stainless steel containers, valves, control systems and sensors as well as internal demand for bottling plants, glass and corkage.

- Linkage to the regional university where specialist courses in all aspects of oenology is available within easy reach. Educational ‘export income’ is also earned through attracting students from the rest of Australia and overseas.
- Cluster promotion through the activities of the Barossa Regional Development Agency (BREDA).
- But it is the ‘linkage’ from this local value chain through producer-driven global value chains like those managed by Southcorp, owners of the likes of Hardy and Orlando, or buyer driven value chains that built the market,
- Diversification of the cluster with linkage to gourmet cuisine resort and celebrity chef tourism hotel, cafe and convention centre industry.

That major innovation with global impact should come from agriculture is testimony that ‘knowledge economies’ do not begin and end with computing and software, important though both are as inputs to this particular generative growth cluster.

Regional Innovation & Learning Systems: a New Approach to Regional Foresight

‘Technology Foresight’ has become a widely practised way of attempting to think strategically about future development trajectories. The cases discussed bear witness to the promise of a policy approach based on a switch towards generative rather than redistributive growth. Traditional redistributive policies, it will be recalled, seldom brought sustainable generative growth to regions, which is one of the reasons why they have been abandoned as a general policy theory in most advanced economies. But how to stimulate generative growth, especially in less favoured settings? The answer lies in the formation of Regional Innovation and Learning Systems (RILS). At the core of these are the sources of basic research that may have great potential, presently unrealised, for exploitation and commercialisation as marketed innovations sold through buyer or producer-driven global value chains (Gereffi, 1999).

In *knowledge economies* it is recognised that mere ‘information’ of a generic kind is not enough. This is because experiences are neither repeated perfectly nor experienced in the same way by different actors in separate settings. Learning, like innovation is interactive, and institutional learning involves interaction between knowledge brought to a situation and understanding of what is new about the situation. Hence the transaction costs of learning are greater the less the level of

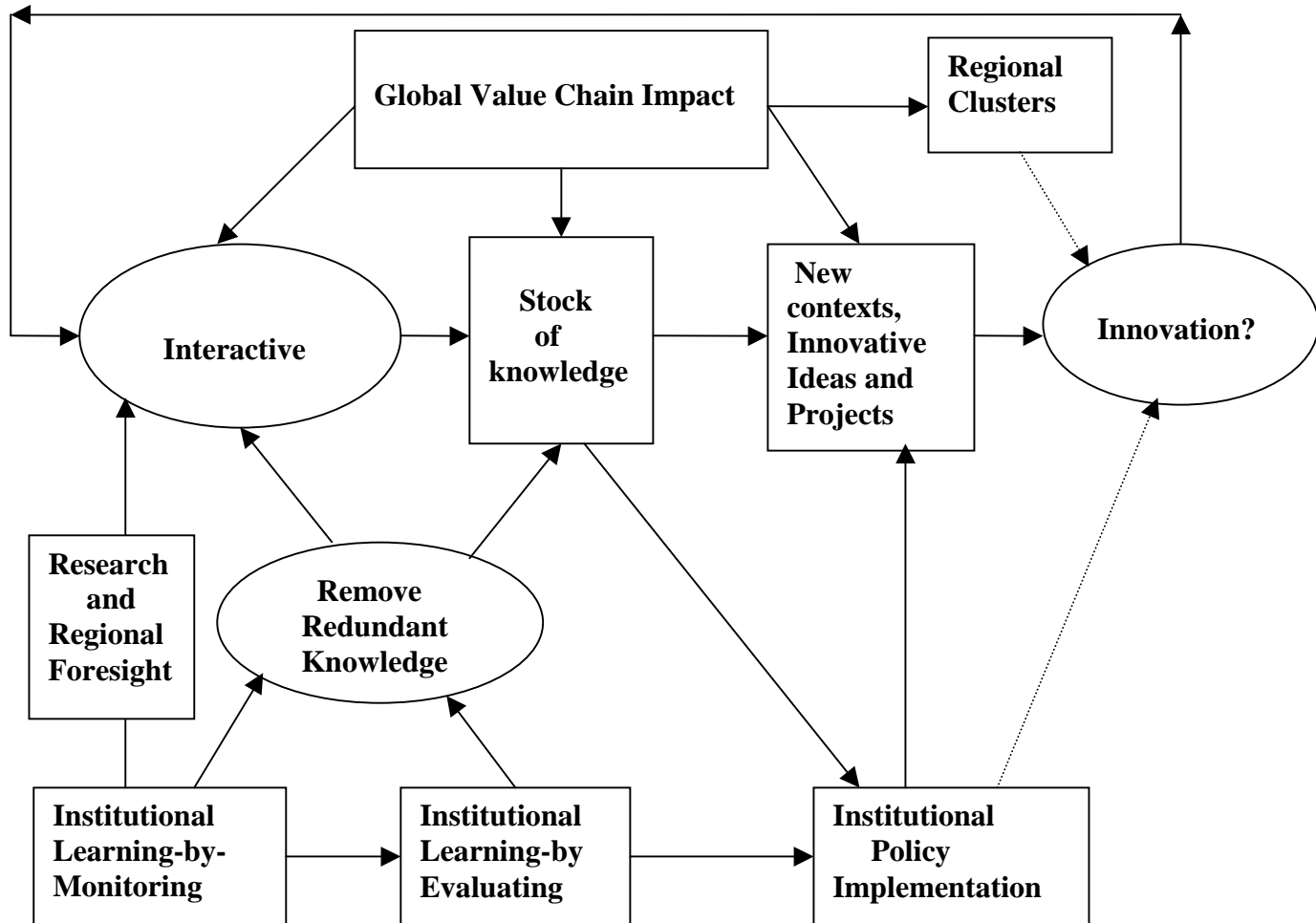


Fig 2: An Interactive Learning System for Regional Sustainable Development

previous learning and vice-versa. So learning, like innovation, has to be a continuous, vision-guided, cumulative monitoring and evaluation process that can be defined as: *improvement in capability to acquire and adapt vision-guided knowledge*, and institutional learning as *improvement in an institution's capabilities to monitor, evaluate and implement vision-guided knowledge*. According to Johnson (1992) these are necessary prerequisites to an ultimate condition where *interactive learning*, by searching, exploring and producing, leads to an institutional capability to stimulate innovative ideas and projects that, through processes of selection, lead to actual innovation. But that is a medium-term aim requiring the embedding of a collective learning capability in the externalised *milieu* of the regional cluster and the global value chain (see Fig.2).

In each region is needed an institutional structure that can promote a sustainable development policy. This involves interactive learning among firms and institutions, global value chains and knowledge centres, including those elsewhere in the world. Central to this is a *sectorally* focused approach. This can be a value chain that is ubiquitous like the food or apparel industry, processing

of raw materials rather than export of feedstocks, or it may be built around a pre-existing enclave of consumer goods, like electronics, ICT, software, engineering components or systems and pharmaceuticals. This focuses the *monitoring* and *evaluating* elements of the interactive learning process because it places emphasis on certain relevant, key industries and completes the application of the Regional Innovation and Learning System (RILS).

The final step in the application of a sectorally focused RILS is to outline the policy process. This can be described as a ‘vision, monitor and manage’ approach much more in accord with Linkage, Leverage, & Learning philosophy. The first step is an *initiation* phase, conducted at the political-policy formulation interface. It involves public and private organizations and actors of consequence to the strategy in question, in this case enhancing learning and innovation capability by linking to global value chains through building knowledge-driven regional clusters

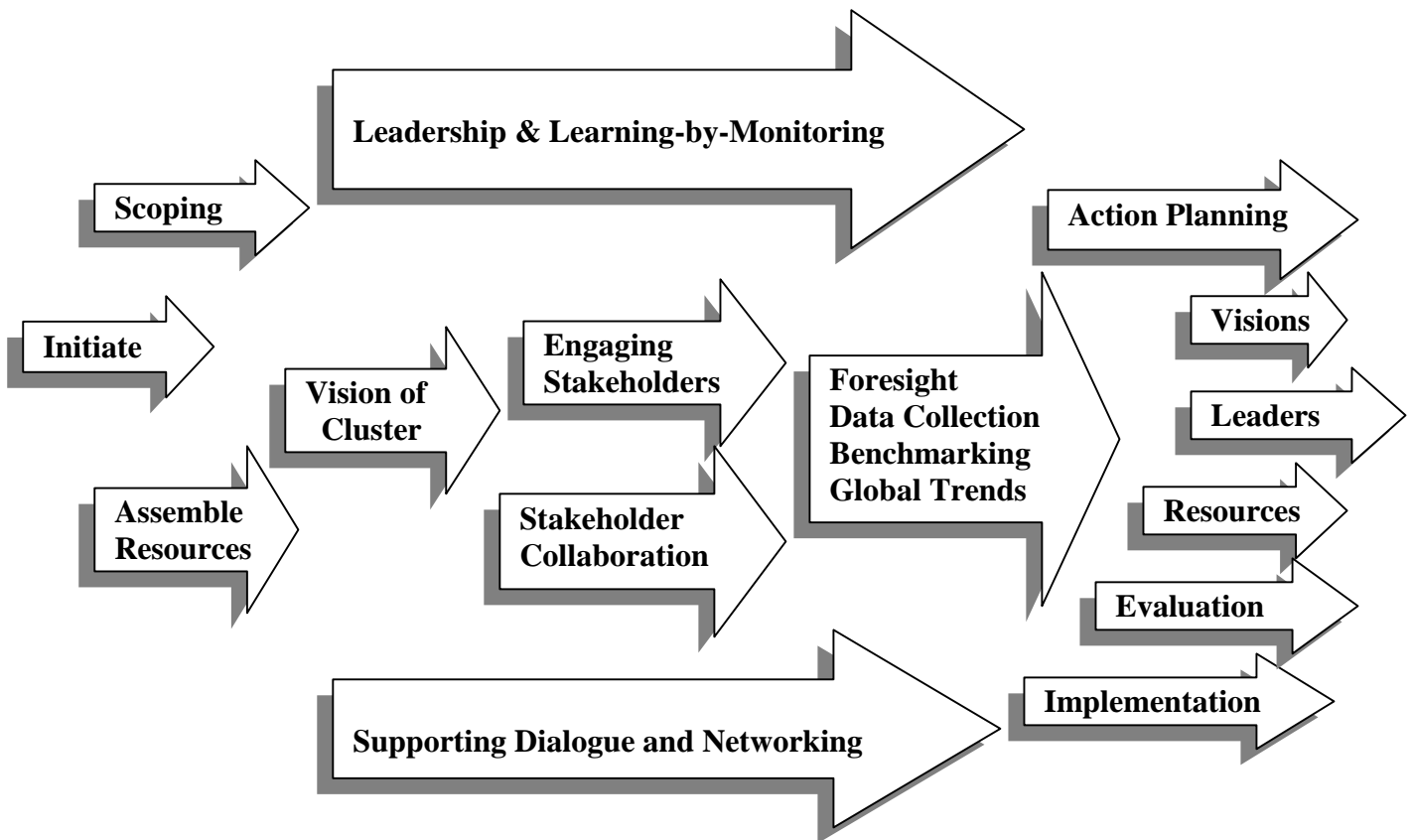


Fig. 3: Sectoral Policy for Regional Clustering in Global Value Chains
(After Scottish Enterprise, see Cooke 2001b)

Next come two parallel steps, one of which is a *scoping* exercise, in which the range of serious candidate sectors for sustainable development of a regional clustering and global value chain policy is determined, and the other requires the assembly of necessary *resources* to achieve objectives.

This latter activity involves pooling of funds and personnel from a variety of public and non-public sources of consequence to the strategy in question. This leads to a *visioning* process built on regional foresight, where the desired state is clearly envisioned in relation to existing assets, linkage possibilities and learning requirements. At this point, stakeholders from business, trade associations, knowledge centres, intermediaries like ‘agents’, consultants, investors and lawyers, as well as specialist government agencies are assembled, encouraged to engage with the process and collaborate with each other. From this process of networking, *leadership* must emerge and a monitoring process be set in motion relating the vision to internal and external realities supported by the governance and learning support system. At this point, not before, statistical exercises, benchmarking, and scenario building in relation to global trends are conducted.

Following this, actions are planned and implemented, drawing down appropriate and justified resources. Thereafter, implementation is *evaluated*, foresight visions are updated, further resources are mobilised and new leaders identified to take the process forward.

Finally, why might the widespread adoption of a regional innovation systems approach integrated with a learning economy perspective help moderate the discontents of marketised ‘hire-and-fire’, overwork, and other diseconomies of agglomeration associated with high growth but low social inclusion often found in leading new economy clusters? There are three reasons for this: regionalisation, public equity governance, and social capital. It is highly evident, though implicit in this paper (but see Cooke, 2002), that the new economy generates clusters that exist in a high degree of spatial disequilibrium. This is caused by the principle of comparative advantage whereby under liberal trading conditions the most competitive producers specialise sectorally and spatially. They do so sectorally as comparative and competitive advantage generate internal scale economies; they do so spatially as spillover effects generate external scale economies. Over-development turns these into diseconomies of agglomeration because of insufficient competition from elsewhere. Implementing RILSs assists the reduction of scale diseconomies and improves net welfare by *regionalising* generative growth.

Governance enables firms and other actors of consequence to evolve microconstitutions of industrial order, moderating cutthroat competition, anticipating possible downturns and how to deal with them, and enables localised agreements to be reached on effective and efficient ways of working. Instead of only private venture capital, public equity financing can exert sustainability leverage. Just as governance may involve third parties organising the provision of collective goods

such as common purchasing and common training facilities, so the offer of public investment should carry some strings. In Cooke (2002) evidence is given of the power of public venture capital in advancing, for example, biotechnology applications in environmental upgrading.

Finally, *social capital*, meaning trustful, reciprocal networking through professional, civic and cultural associations is a means of securing full civic engagement and sharing of common problems and issues. Outcomes possibly requiring solidaristic action to lower exploitative conditions in industries and localities where individualised employment contracts may ensue. Social capital development will open up the lack of transparency that lies at the heart of many workplace discontents. These derive from the social and regional disequilibria that are a common feature of 'breakthrough economies' based on knowledge-driven clusters.

Conclusions

The aim of the paper has been to show how a new development model resting on public funding of knowledge generation and private funding of knowledge exploitation creates *generative growth*. The value of this to policy makers is clearly immense. But the paper has the parallel role of acting as an example of *regional foresight*. This task was performed by, first, the application of *research* capabilities of search, analysis and discovery, followed by *testing* to see whether the model operated in a variety of contexts, and finally, *synthesis*, where the model is subjected to critique, and a superior policy model is elicited. Without performing these concrete tasks, regional foresight becomes merely a species of idealism based on a rather cerebral 'futurology', or worse, mere extrapolation. So, regional foresight of the kind displayed, is one in which medium-term expectations are based on the actual practices of leading firms, organisations and regions. This is because they will be the ones whose decisions will mould the near-future. Research is fundamental to regional foresight. But, as can be seen, armed with it, better understanding of complex socio-economic processes like *globalisation*, the *knowledge economy*, and issues of responsibility and accountability for *sustainability* become much clearer. On this basis, responsible agencies can improve organisational learning and capacity building inputs and, more importantly, innovative and credible policy outputs.

As the paper sought to show, globalisation poses major problems for sustainable regional development, and a new policy theory embodying a regionalised foresight and *envisioning* procedure needs to be put in place. This is superior to established 'technology' foresight methods.

Central to this is the regionalisation of the ‘breakthrough’ that occurred first in Silicon Valley but which remained hidden because observers were dazzled by the technology rather than the more mundane organisational model that underpinned the recurring *generative* growth of that cluster. Globalisation heightens the demand for innovation from ‘knowledge economies’ that take the form of clusters. In this way global value chains are linked to local value chains as the key mechanism by which globalisation works. Clusters are poles of spillover and marketised knowledge that is transformed from its raw state on the laboratory bench by the risk-seeking activities of entrepreneurs, equity investors and ‘knowledgeable attorneys’, consultants and various other intermediaries, including some from the public sector. Governance moderates its rapaciousness.

The key to regional development based on generative growth from innovation is to replicate the fundamentals of the organisational model of the cluster, not to seek to copy the technology as the old, mistaken policy theory led policy makers to try and usually fail to do. In Sweden, for instance, a different and more socially benign model of technology-led growth in concentrated local areas has been pursued with some success. Technology-based activities have been induced in proximity to corporate and university research, and entrepreneurship has ensued. Success for the inclusive and foresight-driven approach taken, moving completely away from unsustainable ‘old economy’ path dependence has been achieved at Karlskrona’s Telecom City. As we saw, telecom interests are highly attuned to sustainability foresight although at a formative stage in ‘Digital Europe’,

In Galicia, we saw a lagging rural region becoming a world leader in a design-intensive clustering process led by the vision of ‘a democratisation of fashion’, something that resonates somewhat with the evolution of Barossa into a globally competitive local wine-based value chain now diversifying into gourmet cuisine tourism. Regions must build regional innovation and learning systems by embedding important regional foresight, institutional monitoring, evaluating and learning capabilities, and sectoral resource targeting upon specific knowledge economies. Israel is operating a ‘Silicon Valley offshore’ model but with insufficient concern for social conflicts that may be exacerbated by the successful import of ‘Americanism’ in its cluster-building strategy. Sweden has an honourable record of social inclusion and the rapid development of an equity investment model that, sadly, as in many European countries, does not spread far from the centres of financial power. Both Galicia and Barossa have implanted generative growth in rural areas. Now is the time to grasp the opportunity to implant Regional Innovation and Learning Systems with sectoral focus, regional foresight and research-led entrepreneurship to show that generative growth does not have to mean social and regional disequilibrium and polarisation. The prize is competitive success combined with

social harmony in an increasingly opportunistic, unsustainable and heartless, 'High Tech with Homelessness' economic world governed by globalisation.

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