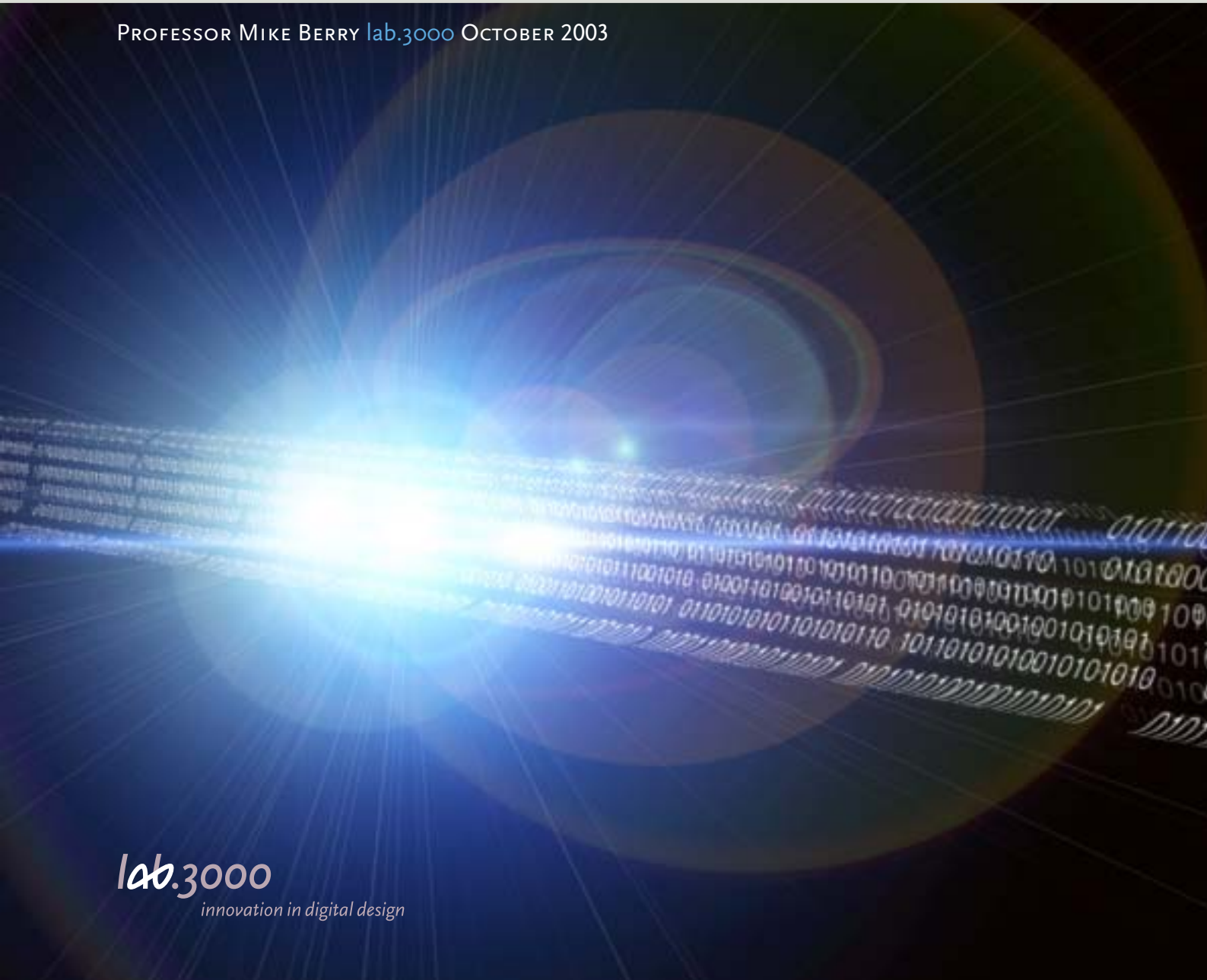
lab.report 01

# **Innovation by Design**: The Economic Drivers of Dynamic Regions

Professor Mike Berry lab.3000 October 2003



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**Innovation by Design:** The Economic Drivers of Dynamic Regions

"The age is running mad after innovation" (*Boswell's Life of Johnson*, vol.IV)

Professor Mike Berry lab.3000 October 2003

ISBN 0-646-42863-2 

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# lab.report 01

I am proud to release ***lab report 01***, the first of 10 publications. The ***lab report*** series will share with you the progress of lab.3000 activities in research, education and exhibitions that underpin our role as Victoria's first centre of excellence in digital design.

I anticipate that the insights presented in ***lab report 01*** – and indeed those of future reports – will be crucial in informing key players in the digital design industry (government, industry practitioners, academics and researchers) who influence policy development, education systems and design innovation in Victoria. Given the scope of lab.3000 activities, communication channels, networks and research, these reports are also targeted to a wider readership both within Australia and internationally.

In ***lab report 01*** Professor Mike Berry, a leading researcher and academic, outlines the findings of the first stage of his cluster economics research – part of a 12-month study that will reveal the dynamics and unveil a portrait of Victoria's digital design industry.

On behalf of lab.3000, I wish to acknowledge the generous funding and ongoing support of the Victorian Government. I also thank Mike Berry for his significant contribution to research into cluster development. Professor Berry's exceptional insight and knowledge have provided a substantive basis for advancing our understanding of digital design.

I commend the ***lab report 01*** to you and believe it will promote greater awareness of Victoria's digital design industry and trends to help shape ideas for the coming years. The findings in this report have important implications for building our digital design future and Victoria's economic prosperity.

Associate Professor Di Fleming
Director, **lab.3000** – innovation in digital design

www.lab.3000.com.au

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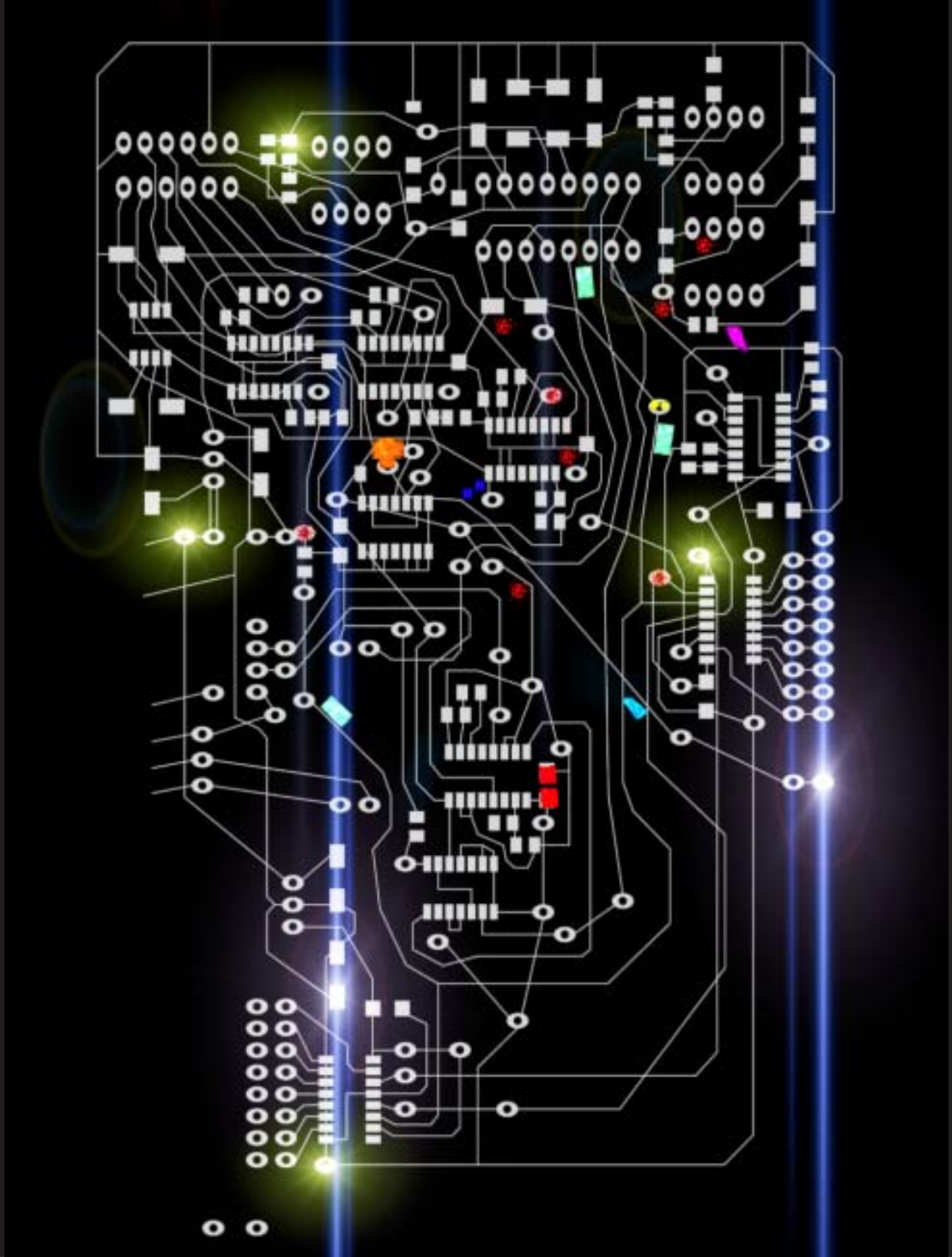

# 01 Introduction

*Innovation* is increasingly seen as the central driver of successful national and regional economies. *Design* across many domains – and digital design in particular – is an essential element of innovation processes leading to continuous productivity improvements responsible for the creation of competitive advantage in the current global environment.

Design plays a critical and central role in the innovation process in many economic sectors. Inter-firm networks and regional economic clusters that have emerged in areas like greater Glasgow, North-central Italy, Silicon Valley and Helsinki are (literally) design-driven. Continuing developments in information and communications technologies are revolutionising design practice and opening up new avenues to both product and process innovations across most sectors of the economy. Tomorrow's successful national and regional economies will be those that recognise and capture the forces creating linkages, networks and clusters across industries and domains, ensuring appropriate regulatory environments, powerful incentive structures and productive cooperation with research and development centres in universities and other agencies.

The key policy-relevant question addressed here is – how and to what extent can the logic and underlying conditions driving innovation and growth in successful regions be translated to the Victorian regional economy centred on Melbourne? More specifically:

- Given Melbourne's national leadership in design across many fields and the strong policy commitment of the Victorian Government to design, innovation and economic performance, can viable design industry clusters be identified and facilitated as probable drivers of future regional development?
- If so, what are the key forces and policy settings likely to encourage such developments and what are the current constraints limiting desirable outcomes?

- In answering these questions, what lessons can be learnt from relevant international developments?

The project of which this report is a part aims to 'prove up' the cluster concept, in the context of Victoria's design and innovation strategy, and provide a basis for future research targeted on growing new (and supporting existing or emergent) design industry clusters in this state.

This report, the first of a series, provides an extensive account of the theoretical basis of the links between innovation, design and regional economic performance, drawing on the research of economic geographers and 'new institutionalist' economists over the past 20 years. This analysis will provide:

- An explication of the literature on innovation and regional economic development.
- A critical evaluation of the key concepts: innovation, national innovation systems, industry clusters, inter-firm networks, milieu, industrial districts, path-dependence, the new economic growth theory, knowledge economy, digital economy, etc.
- An analysis of theories of uneven development: spatial concentration and dispersion, urban polarisation, etc
- A conceptual map of the field: creative industries, design professions, digital design workers, knowledge workers, the creative class, etc.

This study will be carried out through a detailed review of relevant secondary material and some primary sources, drawing extensively on international material published in academic journals and monographs, government reports and the publications of international agencies like the Organisation for Economic Cooperation and Development. An extensive supporting Bibliography of resources is included.

The aim is to provide an accessible (and broadly sympathetic) critique of the relevant literature and related sources that have emerged over the past 20 years or so. This literature has grown explosively, especially over the past five years. It is therefore inevitable that different emphases and sometimes directly opposing positions have been put forward, adding to the confusion and 'fuzziness' surrounding much of the debate. Hopefully, this report will contribute a degree of clarity and rigour to the ongoing debates, both in academic and policy circles.

*Chapter 2* outlines, compares and contrasts the two broad economic approaches to the issue of economic growth: orthodox (or neo classical) economics and evolutionary (or systemic) economics. It will be argued that the former treats innovation as an essentially secondary or exogenous factor in growth and other outcomes, while the latter prioritises innovation as the major growth driver.

The remainder of the report develops and applies the vision inherent in the evolutionary approach, using the emerging domain or field of 'digital design' – the intersection of information and communication technologies and the design disciplines and practice – as an exemplar, where possible.

*Chapter 3* introduces the key concepts, 'industry clusters' and 'inter-firm networks'. Innovation as a learning process encourages the formation of clusters of organisations and changing patterns of cooperation as well as competition.

*Chapter 4* takes up one recent influential analysis – the work of Richard Florida on 'the Creative Class' – that argues that 'creativity' is now the most important factor of production in knowledge-intensive sectors of the economy and that 'creative workers' are a growing proportion of the workforce in the advanced industrial economies.

*Chapter 5* further explicates Florida's analysis of the spatial concentration of creative workers and the factors that attract them to particular regions that, in turn, act as a magnet for capital investment and generate self-reinforcing growth. The empirical research of Florida and Porter are outlined in this chapter.

*Chapter 6* turns to the policy question and discusses the concept of 'national systems of innovation', the institutional frameworks peculiar to each country that influence and constrain how innovation actually occurs in each case. The national innovation systems of Britain, the United States, Japan, Germany and Australia are briefly described and compared.

*Chapter 7* provides a tentative conceptual treatment of a 'digital design industry cluster'. This framework will (as noted above) inform later stages of the research. By way of illustration, two recent reviews of the new media sector (an important and rapidly growing component of the digital design cluster) are then discussed. The first study relates to an industry survey carried out in London, the second in New York City, in the late 1990s.

*Chapter 8* concludes by drawing together key findings of the paper.

Future publications from the overall project[1] will provide a 'mapping' of existing, emerging and embryonic clusters in the design and creative industries domains, in the Victorian context, and present a selective collection of international case studies, intended to illustrate comparative outcomes with respect to design-driven cluster dynamics. The emphasis will be on targeting clusters where digital design is a key driver.

[1]Information and future updates on the continuing research program can be found at the lab.3000 – innovation in digital design web site: www.lab.3000.com.au

Future publications will also directly address the 'so what' question. Why is all this important for the future of the Victorian economy and community? What are the implications for government policy? How can existing barriers to cluster formation and dynamics be reduced and the efficacy of cluster-driven growth enhanced?

An important outcome of this research is expected to be the information and guidance provided to key industry and government players in the design field. Useful directions for future research and other support activities should also be forthcoming for lab.3000; how can lab.3000 best contribute to the continuing dynamic growth of design clusters in Victoria – what should the centre's vision and future strategy be, where do productive future collaborative research opportunities lie?

# 02 Understanding Innovation in the Contemporary Economy

The concept of 'innovation' has had a bumpy history in both the study of economics as a discipline and the practice of public policy over the past century in the advanced industrial economies. It has only been in the last decade and a half that innovation has assumed centre stage in debates carried out by economists, economic geographers, urban planners and public policy analysts and policy makers. Government economic policy has partly turned in recent times on the questions – *how important* is innovation to the performance of national and regional economies and what industry policies are most appropriate in stimulating innovation in the domestic economy – i.e. have the most chance of successfully enhancing long term growth outcomes?

Two broad positions can be discerned here. First, is the neo-liberal view that innovation can't be forced but emerges 'naturally' once the correct macroeconomic policy settings and microeconomic reforms are in place. Second, a more hands-on interventionist approach holds that innovation is a collaborative learning process that is most likely to occur and drive growth when the appropriate economic and cultural conditions exist or can be induced to exist by well conceived and targeted policies. Both positions are based in particular visions of how the economy operates, at both domestic and international levels, and how economic and broader social and political processes unfold. This chapter attempts to outline briefly these alternative visions and traditions within economic discourse, before developing the second approach in more detail through the remainder of this report.

### 2.1 The Orthodox Economic Approach

In conventional economic analysis and the public policy approaches informed by it, innovation or technological change just happens. New products, methods of producing and distributing them, new energy sources and so on arise 'naturally' through the smooth operation of markets. The focus of neoclassical economics is market equilibrium, how (and the consequences of the fact that) producers and consumers react to price signals across the economy.

Standard economic theories are, therefore, poorly placed to explain why and how technological change occurs. Indeed, following Solow (1957), neoclassical economics treats technological change as a 'residual' factor in accounting for the growth of capitalist economics in the twentieth century. Somewhat ironically, this 'residual' factor is found to account for the lion's share of observable growth in economies like the United States and Australia. Nevertheless, technological change and other aspects of innovation are specified as exogenous independent variables. This follows from the very strong assumptions economists make in building their standard view of the economy, represented in the crowning achievement of neoclassical economics – general equilibrium theory, initiated in the late nineteenth century by Leon Walras and perfected in the 1950s and subsequently by Kenneth Arrow, Gerard Debreu and Paul Samuelson. These assumptions are that:

- The economy is comprised of 'price takers'. All firms, consumers and other economic agents accept or react to prices, which are set by their interaction in the market. Hence, no agent has any degree of 'monopoly power', no capacity to directly influence prices by its actions. Moreover, markets are 'complete', there are no gaps or areas of 'market failure'.
- All economic agents have perfect knowledge – about current prices, qualities, etc., and, with the full version of the model, about *every* conceivable future state of the world.
- All production consists of decisions about combining factors of production, given existing technologies, rather than as a process by which these technologies change the set of possible factor combinations. Information or knowledge is about prices and known, existing technologies, not a search process for new knowledge and its application. 'Tacit' or informal information within firms, industry groups, professional and policy communities is ignored.
- Consumer preferences (utility functions) are given and independent. In particular, there are no interaction effects in consumption – the tastes and consumption behaviour of some consumers do not influence other consumers.

- All industries are characterised (eventually) by diminishing returns to production. Beyond a certain scale, further increases in output result in rising costs per unit produced. This approach derives from a long tradition in the discipline, initiated by David Ricardo and reinforced by Alfred Marshall; among other things, the over-riding assumption of decreasing returns makes the mathematics of general equilibrium theory tractable.

Arrow has relaxed some of these assumptions in attempting to develop a limited economic analysis of technological change. 'Technology' and 'Science' are usually conflated here (Hofer and Polt, 1998, pp.6-7). Individual market failures are identified. For example, Arrow (1962) argues that scientific research is likely to be under-provided if left entirely to market processes, since some individual investors may not be able to appropriate all the commercial benefits of a research project while they do pay all the costs; this is a case of a positive externality or spillover effect. Similarly, some research projects may be so large and expensive and risky as to preclude any private investor from getting involved. In such cases, it is suggested there is a case for governments to directly fund the research.

Although economists operating within the dominant paradigm do not totally ignore questions of technological change and innovation, these issues are, nevertheless, marginal to the main concerns. Moreover, their treatment is necessarily coloured and limited by the overall cast of the dominant model; relaxing one assumption still leaves the others operative.

Dissatisfaction with this approach has intensified over the past fifteen years, as some economists, technology experts and policy makers have sought new directions.

### 2.2 A New Economic Paradigm

Recent work has focused systematically on how the innovation process in real-world mature economies does not resemble the picture presented in general equilibrium theory. In particular, as Bryant and Wells (1998, p.87) note, in our world:

- Increasing returns to scale and sunk costs associated with current technological installations exist and influence future developments (Arthur, 1988; Quinzii, 1992). Path breaking contributions were made on this theme in the 1920s by Allan Young and Piero Sraffa, ignored at the time but recently recognised as significant.
- Many markets are incomplete (Hahn, 1990).

- Not all agents have full information; conditions of asymmetric information often pertain with respect to future technological possibilities (Laffont, 1992; Stiglitz, 1993).
- Oligopoly – the situation of a small number of relatively large firms – rather than perfect competition characterises many industries (Shapiro, 1989).
- Innovation occurs continuously and is critical to firm survival in many industries, suggesting that technological change is endogenous, not exogenous (Romer, 1990).

In response to such observations and analysis, an alternative model or paradigm is developing; one which privileges innovation as the driving force for economic change. Variously called 'the new growth theory', 'evolutionary economics', 'the new institutionalist economics' or 'systemic economics' this approach has its roots in an alternative economic tradition which stretches from Adam Smith ('division of labour'), through to Karl Marx ('continuous revolutionising of production'), Thorstein Veblen ('conspicuous consumption'), Joseph Schumpeter ('gales of creative destruction') and John Maynard Keynes (chronic uncertainty about the future, 'animal spirits' of investors).

## What is Innovation?

*Joseph Schumpeter* depicted innovation as a process of 'creative destruction' – i.e. as undercutting the current competitive position of rivals, either through delivering the innovator lower costs or a product differentiation premium. He defined innovation as including new products, drawing on new technologies, exploiting new sources of supply and introducing new forms of business organisation.

*In 1999*, the 3 M-NatWest Innovation Trends Survey stated:

'Innovation occurs when a new or changed product is introduced to the market, or when a new or changed process is used in commercial production. The innovation process is the combination of activities (such as design, research, market investigation, process development, organisational restructuring, employee development and so on) which are necessary to develop and support an innovative product or process' (quoted in Simmie, 2001, p.15).

Schumpeter (1911, 1942) distinguished between 'invention' and innovation'. The former referred to new techniques and ways of doing things, the latter to their application by profit-seeking entrepreneurs. Inventions he initially saw as largely determined by exogenous and fortuitous factors. Innovations, on the other hand, were a central and predictable feature of (endemic to) modern capitalist societies, tending to 'swarm' or bunch together near the nadir and in the early recovery phase of the business cycle. However, later in life, Schumpeter came to see the growth of large oligopolistic corporations to market dominance as internalising the invention generation-innovation application process through the systematic exploitation of research and development. R&D lead to inventions that lead to innovations that generate super profits that are ploughed back into R&D, and so on, in a virtuous growth circle. In this later view, entrepreneurial SMEs gave way to the large corporation as the engine of capitalist growth (Schumpeter, 1942).

> Schumpeter's main legacy is that he has inspired serious consideration of four main ideas in economic theory. These are, first, that innovation is the main source of dynamism in capitalist economic development. Second, the importance of the historical perspective in understanding long-term economic change. Third, that it is essential to distinguish conceptually between invention, innovation and diffusion of innovations. Fourth, the importance of the links between organisational, managerial, social and technical innovations... (Simmie, 2001, p.18).

A key concept here is the idea that industrial processes and economic development are 'path dependent'. Time is irreversible and history significant.

> The accumulation of experience is the primary mechanism by which economic knowledge grows and it is this factor which underpins strong elements of irreversibility and path dependence in economic evolution (Saviotti and Metcalfe, 1991, p.21).
>
> Technological change is dependent on its own history (Hofer and Polt, 1998, p.10).

Once technological change occurs and is diffused along a particular path – for whatever reason, including accident – positive feedback effects lock-in relatively permanent advantages for firms continuing on down that path. Pioneers or innovators who lead the charge are likely to gain a disproportionate share of the new profits generated. Laggards or new competitors are likely to be reduced to reaping small returns around the edges of the dominant innovators or somewhat greater returns by 'piggy-backing'

complementary products or services on the new winners, creating local or 'mini-ecologies' of interdependent and mutually reinforcing competitive advantage.

The information technology sector is normally offered as the prime example where these mechanisms are at work, helping to explain the market dominance of Microsoft, the explosion of the software industry and the marginalisation of Apple-Macintosh. But history offers other and earlier cases. For example, Krugman (1994) notes a similar story with respect to the persisting dominance of the traditional QWERTY typewriter keyboard, a nineteenth century innovation.

Once a particular new 'technological paradigm' or direction is established, it tends to persist. The advantage of being first in the door grows, even where the underlying technology is not the most superior available. It has been argued, for example, that Microsoft's DOS operating system is a 'clunker'. Likewise QWERTY is far from being functionally and ergonomically optimal. Yet they have swept, or indeed created the field. The idea that small, accidental critical advantages can turn into qualitatively new phenomena which bend future developments into novel paths draws on the evolutionary analogy – as does the notion of 'mini-ecologies' of products and services. This is reflected in naming the field 'evolutionary economics'.

This approach is, in turn, part of a broader project to introduce biological models into economics, dependent on the application of recent developments in non-linear mathematics or qualitative dynamics (Nelson and Winter, 1982; Omerod, 1998). The new mathematics replaces the low-tech linear algebra and calculus current in conventional economics that was essentially borrowed from nineteenth century physics. It allows economists to effectively model interaction effects in production and consumption, opening up the likelihood of discontinuous, though unpredictable change.

The phenomenon of 'lock-in' is particularly prevalent in industries in which information or knowledge – tacit as well as formal – figures as an important input and output. Arthur (1996) offers three reasons why increasing returns lock-in initial advantages in such industries:

- *Large up-front or 'sunk' costs.* High-tech products usually require the commitment of considerable R&D and organisational resources at the front-end of the process. Such capital may need to be very 'patient' to withstand initial failures in an essentially experimental search. The risks of outright failure are high. If successful, these costs can eventually be recouped and profits ensue. 'The first disk of Microsoft to go out the door cost $50 million, the second and subsequent disks cost $3.' Once Microsoft had triumphed, the risks of failure for new competitors rise significantly – will the new product displace the existing standard? If not, the very

large front-end costs will be lost. In such circumstances, it normally pays newcomers to accept the standard and add new products to complement it.

- *Network effects.* Some new high-tech products depend on compatibility with an appropriate network. This is particularly the case with software. The more computer or Internet applications are run on a particular network system, the more likely that system will be entrenched as the unchallengeable standard. Competing systems face an 'applications barrier to entry', a further source of DOS's market dominance – and the focus for recent anti-trust legal action by the U.S. government against Microsoft.
- *Customer groove in.* The effective use of many high-tech products requires training and practice. These are costs that the user 'sinks' into the established standard. 'Re-tooling the head' is costly in time and money, acting as a disincentive for users to switch to radically new products (even when superior) but to look to amortise their user expertise over an increasing range of new complementary products.

Lock-in ensures that, in these cases, it is a 'winner takes most' outcome (Arthur, 1996, p.104).

Historically, and for many industries today, competition has been essentially static. Firm strategies in this world focus on minimising costs and matching competitors on price and other features of the product or service provided. Factors of production are combined in order to minimise costs *given existing technologies*, allowing prices to fall just low enough to maintain market share. However, in the new economy '(c)ompetition is dynamic and rests on innovation and the search for strategic difference' (Porter, 1998a, p.209). Firm strategy fixes on the need to create new options for factor combinations that *radically* reduce the costs of meeting customer needs throughout the economy. By substantially reducing prices and/or increasing product performance, the new economy radiates competitive advantages to the chain of producers caught up in change. Conversely, this competitive process ruthlessly culls those firms that fall behind or can't compete in the new environment.

What is, in fact, emerging in the world's most advanced economies is a dual economy. In the older, more traditional sectors 'decreasing returns' (increasing costs) eventually set in as the possibilities of existing technologies are exhausted and economies of scale turn into diseconomies. However, in the newer, technologically dynamic industries, 'increasing returns' associated with productivity-enhancing innovation allows costs to be continuously reduced, thereby strengthening the competitive advantage of the pioneering firms. These pioneers get a head-start on existing and potential competitors. But instead of being competed away as the rest mimic the innovators – as conventional economics decree – the initial advantages are typically

locked-in and extended. The innovators establish a market lead and build on it as competitors accept – rather than challenge – the new market conditions and attempt to 'ride on the coat-tails' of the innovators.

The implication of all this for the economy at large has been argued as follows:

> Mechanisms of increasing returns exist alongside those of diminishing returns in all industries. But roughly speaking, diminishing returns hold sway in the traditional part of the economy – the processing industries. Increasing returns reign in the newer part – the knowledge-based industries. Modern economies have therefore bifurcated into two inter-related worlds of business, corresponding to the two types of returns. The two worlds have different economics. They differ in behaviour, style, and culture. They call for different management techniques, strategies, and codes of government regulation. They call for different understandings (Arthur, 1996, p.101).

and, again:

> so we can usefully think of two economic regimes or worlds: a bulk-production world yielding products that are essentially congealed resources with a little knowledge and operating according to Marshall's principles of diminishing returns, and a knowledge-based part of the economy yielding products that essentially are congealed knowledge with a little resources and operating under increasing returns (ibid, p.103).

Individual firms and industries are viewed here as parts of systems or sets of sub-systems, each with an inherited and specific set of rules, laws, norms, values and operating protocols. They also – as the aforementioned quote stresses – comprise a mix of both worlds. Knowledge and new technologies are diffused (or blocked or diverted into particular directions) through this socially created set of inter-locking sub-systems.

> ...the overall innovation performance of an economy depends not so much on how specific formal institutions (firms, research institutes, universities, etc.) perform but on how they interact with each other as elements of a collective system of knowledge creation and use, and on their interplay with social institutions (such as values, norms, legal frameworks and so on) (Smith, 1995, p.72).

This suggests that innovation as a central process is much more than information or knowledge 'bites' in isolation. An innovating industry sector or economy is one in

which a culture of change and improvement is pervasive, where enterprises are 'learning organisations' focused on positioning themselves to both benefit from their current leading edge technologies and market opportunities, and looking to recognise and exploit the next 'new wave' or 'creative gale' of change; at least, this is so for organisations or parts of organisations inhabiting the world of 'congealed knowledge'. In this world, 'soft infrastructure' – the recruitment of skilled and flexible workers, entrepreneurial and strategic managers, the connection of loose alliances and networks of communication and cooperation – looms at least as large as the 'hard infrastructure' of telecommunications, transport and smart buildings. Indiscriminate downsizing, cut-throat competition and an excessively short time horizon for investment payback are unlikely to get firms into the 'winner-takes-most' world of increasing returns, the 'casinos of technology' in Arthur's (1996, p.103) evocative phrase.

In innovation-driven learning organisations, management hierarchies are flat - not for reasons of industrial democracy but in order to encourage all workers in the firm to learn and apply a collective entrepreneurial search for the 'next big thing'. Arthur argues persuasively that corporate strategy must be about 'adaptation in the proactive sense' (a wonderfully self-contradictory but suggestive phrase), by which he means 'watching for the next wave that is coming, figuring out what shape it will take, and positioning the economy to take advantage of it. Adaptation is what drives increasing-returns businesses, not optimisation [as in neoclassical economics]' (ibid, p.105). Innovation for these firms and their industrial sectors is central, endogenous, a matter of survival.

Finally, this new economic paradigm has implications for government industry policy. In the world of diminishing returns, policy is seen by orthodox economists as a clearing away of remnant barriers to freely competitive markets. This can be achieved, it is argued, through microeconomic reform, selective privatisation of government business enterprises and a regulatory regime which encourages competitive market structures and conduct. Where particular cases of market failure arise, as in the under-provision of scientific research, selective government intervention and funding is justified 'upstream', at the source. However, 'downstream effects' at the level of take-up of new technologies which may emerge can be left to the market, to the individual responses of firms responding to changed market opportunities and to price signals.

In contrast, the policy implications for the world of increasing returns involves a much broader and more strategic canvas for government. Far from indicating problems to be solved, some market failures are seen to be part of the institutional platform for successful, continuing innovation. Knowledge asymmetries and spillovers, monopoly power and current market disequilibrium often fuel innovation because they open up the prospect of super-profits for entrepreneurs who seize the opportunities first - i.e. those who proactively adapt fastest.

Consequently, Hofer and Polt (1998, pp.12-13) argue that innovation policy needs to:

- *Create and support the institutional pre-requisites for steady*, continuous change. This necessitates a particular concern to foster investments by small and medium sized firms to reduce what Brain (1999) has called 'the risk management constraint' on investment. Many innovations and 'new waves' are unleashed by small businesses or individual entrepreneurs. Microsoft and Apple started in basements or garages.
- *Be process oriented*, concerned with system design. Policy must focus on setting the rules, encouraging the flow of ideas, shaping relationships between industry participants, getting the incentive structures right and generally inculcating an entrepreneurial culture.
- *Stimulate more than research* – i.e. to be more concerned with the D end of R&D. This points to a concern for improving general qualifications and skill levels in the workplace, establishing appropriate management styles and employee relations, and encouraging the faster dissemination and 'take-up' of publicly available knowledge throughout industry. 'The procurement of information and knowledge, their dissemination and processing, of no consequence in the neoclassical view are (from an evolutionary perspective) central policy recommendations' (Hofer and Polt, 1998, p.13).
- *Systematically influence general community long term expectations* in order to develop a lasting social consensus regarding continuous technological change and adaptation.
- *Explicitly support and legitimate experimentation* and experimental behaviours in industry. A learning organisation in part learns from its mistakes.
- *Be experimental and adaptive itself.*

# 03 Linkages and Networks

A central concept in the new evolutionary or systemic paradigm is the concept of inter-agency linkage. This chapter outlines the rapidly expanding literature on industry clusters and looks in more detail at the nature and usefulness of the notion of 'inter-firm network' for an understanding of innovation processes, drivers and outcomes.

## 3.1 Industry Clusters

The new economy just described is evolving within a definite spatial framework, centred on major metropolitan regions linked by global flows of information, capital and skilled labour. Globalisation has undercut many of the traditional reasons for the location of economic activity in large cities, since firms can source inputs and locate their operations almost anywhere in the world in search of the lowest costs. These forces for decentralisation are driven by the huge advances in information technology and transport and the swing towards economic liberalisation unleashed in the post-Cold War period. This means that many of the 'agglomeration economies' or mutual cost savings that caused firms within particular industries to co-locate in big cities – such as proximity to large local markets and labour supplies – have disappeared.

However, there is a new logic of metropolitan concentration emerging, driven by the very forces of globalisation that are destroying the traditional advantages of urban location; 'and therein lies a paradox: the enduring competitive advantages in a global economy lie increasingly in local things – knowledge, relationships, motivation – that distant rivals cannot match' (Porter, 1998b, p.78). But it is not a logic that operates at either the level of individual industries – like automobiles or textiles – or for all industries in a metropolitan region, as in the case of the mutual advantages of access to a large local labour market. Increasingly the advantages of urban location relate to collections or 'clusters' of industries strategically related in ways that enhance the competitive advantage of all in the global market.

... Michael Porter [1998a]:

Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also cooperate. Critical masses of unusual competitive success in particular business areas, clusters are a striking feature of virtually every national, regional, state and even metropolitan economy, especially those of more economically advanced countries (p.197).

A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (p.199).

A cluster may thus be defined as a system of interconnected firms and institutions whose value as a whole is greater than the sum of its parts (p.213).

Examples of industry clusters are provided by:

- *Tourism* – the collection of firms, organisations and institutions that deliver the 'total experience' to tourists. This cluster in a city like Melbourne or Sydney would therefore include: airlines, hotels of various qualities, tour operators, travel agents, tourist industry peak associations, land transport operators, trade unions, specialist tourist facilities like theme parks, restaurants, specialty shops, relevant government agencies, local councils, and so on.
- *Information and communications technology* – computer hardware and software companies, specialist consultants, telecommunications carriers, sales outlets, systems engineers, relevant professional associations, specialist R&D organisations (including university departments or centres), technical repair and recycling firms, government regulators, training organisations, etc.
- *Wine* – growers, producers, transport operators, merchants, equipment suppliers, training colleges, R&D agencies, government regulators.

The boundaries of industry clusters are highly permeable and changeable over time, the changes driven by continuing innovation and the ceaseless search for competitive advantage. Some clusters cross-cut each other. Thus, information technology interpenetrates with the multimedia cluster, linking with electronic publishing and the production of information in all its forms. In many places, the wine cluster has links

with the tourism and food clusters. *In short*, dynamic, growing regional or metropolitan economies are made up of an overlapping mosaic of distinct but evolving and partly interrelated industry clusters.

Porter goes on to argue that industry clusters build competitive advantage in three main ways.

*First*, clusters directly increase productivity for each cluster member by:

- *Improving access to specialised inputs and employees*. Suppliers of these inputs are drawn to the region by the existence and growth of this complex of knowledgeable customers. Local sourcing of those inputs reduces some of the risks of purchasing them from distant suppliers, and also reduces the costs of holding inventories. Face-to-face contact enables more flexible and timely responses by suppliers to customer needs.
- *Greater (and faster) access to vital information*. Proximity facilitates the flow of market-relevant information within the cluster, more effectively diffusing innovations and market opportunities and building relations of trust among cluster members. Greater trust, in turn, reduces the costs of and delays in doing business with each other.
- *Facilitating the development of complementarities in operation*. Economic performance of one part of the cluster depends on the performance of other parts. The total tourist experience, for example, turns on the quality of local restaurants and hotels, as much as the nature of particular tourist attractions. Developments in one part of the cluster typically open up new market opportunities for other parts. Information about the new opportunities travels quickly within local clusters.
- *Enabling joint access to public benefits*. The existence of a thriving industry cluster supports and draws on a range of activities that benefit all members of the group. For example, firms can readily employ locally trained skilled staff who bring with them a deep knowledge of the local scene and established personal contacts, which they can draw on in carrying out their jobs. They can also access specialist advice and information from local experts and government agencies at low or no cost to their employers.
- *Strengthening incentives and performance*. Co-location, exchange of information and mutual dependence strengthens the incentives to deliver quality and timely outputs. In other words, proximate location of complementary activities, under the gaze of competitors and government regulators, provides strong incentives and sanctions for all parts of the cluster to perform. Non-performance is quickly and accurately traced to source and efficiently punished by the market. Since the entire cluster's reputation can be tarnished – in the local business environment and more broadly

– by the poor performance of one member, all members have a common interest in policing performance across the group.

The *second* basis of superior competitive advantage created through clustering concerns the link between innovation and productivity growth. Clusters can be hot-beds for innovation leading to radical productivity improvements that are quickly recognised and diffused among cluster members. Informal face-to-face communication increases the likelihood that new buyer needs or technological possibilities will be *both* perceived *and* taken up. The necessary specialist knowledge, component parts, machinery and other pre-requisites for innovation are close at hand.

Reinforcing the drive to stay ahead is the strong and observable competitive pressure provided by nearby existing and would-be rivals. A firm's competitive position is never guaranteed; it can always be undercut by competitors. Responsiveness to new market needs, technologies and forms of organisation becomes a critical defence strategy. Productivity-enhancing innovation creates defensible competitive advantage for firms and the conditions that encourage innovation are most readily developed where industry clusters locate. The key characteristic of a cluster is that it facilitates *real and recurrent communication and cooperation* between firms and with other organisations, distinguishing it from accidental or functional agglomerations, as when individual firms co-locate to be close to common raw material sources or labour pools. 'For us, innovative clusters are not a simple concentration of independent economic agents, but display at an inter-industrial level, underlying networks of interrelated cooperating businesses' (Debresson, 1996, p.161).

The *third* basis of cluster formation turns on the attractions of such environments for *new* businesses. Emerging market needs and niches are most readily apparent to existing businesses and investors already located in regions with strong industry clusters. New business opportunities are often taken up by managers and skilled workers who leave established firms to start their own. These are the people most likely to be aware of the current gaps and weaknesses in the regional economy, and best placed to do something about them. The early development of California's Silicon Valley saw a number of university staff 'spinning themselves off' to form new IT and bio-tech companies in the 1980s.

The barriers to entry at cluster locations tend to be low, since there already exist pools of specialised skilled labour, networks of complementary activities, supporting infrastructure and knowledgeable local regulators. Local investors and financial institutions are also knowledgeable about and experienced in dealing with the clusters already operating in the region. Risks can be accurately assessed and, thus, the cost of financing new business ventures that tap into existing clusters more finely priced. 'All of these factors - lower entry barriers, multiple potential local customers, established

relationships, and the presence of other local firms that have "made it" – reduce the perceived risks of entry' (Porter, 1998a, p.224).

For Porter, the advantages of clusters lie in their capacity to encourage individual member firms to 'unbundle their value chains'. Firms create economic value for their customers by transforming inputs into outputs through the various activities that make up the production and distribution process:

> 'Competitive advantage grows out of the way firms organise and perform discrete activities' (Porter, 1990, p.40).

> 'A firm's value chain is an independent system or network of activities, connected by *linkages*' (ibid, p.41; italics in original).

> 'Gaining competitive advantage requires that a firm's value chain is managed as a system rather than a collection of separate parts' (ibid, p.42).

The discrete activities that make up the firm's value chain are: inbound logistics, operations (i.e. production), outbound logistics, marketing and after-sales service, all activities supported by the firm's 'infrastructure' – the overhead commitment through internal activities of planning, financing, R&D, human resource management, etc. Efficiently operating firms squeeze maximum value from the way they arrange and link these critical activities. The value chains of individual firms are in turn linked through networks or clusters, forming a 'value system', linking supplier to customer through the vertical stages of production, from raw material inputs to sale to the final consumer. Various 'horizontal' linkages – such as those linking government agencies and universities to the corporate cluster – might also be said to characterise the fully developed value system. 'Competitive advantage is increasingly a function of how well a company can manage this entire system' (ibid, p.42). Industry clusters therefore provide the institutional or organisational means of building an integrated value system that enhances the individual competitive advantage of their members.

### 3.2 Industrial Districts and Inter-firm Networks

Many of Porter's ideas and conclusions were first advanced more than a century ago by one of the founders of neo-classical economics – Alfred Marshall. In his two major books – *Principles of Economics* (1930, originally published in 1890) and *Industry and Trade* (1921) – Marshall introduced the concept of 'industrial district', subsequently defined as 'a territorial system of small and medium sized firms' (Goodman, 1989, p.21).

Marshall argued that individual firms could benefit from economies of scale both internal and external. *Internal economies* arose as the firm's increased scale of production enabled it to develop a more intense internal division of labour facilitating the introduction of new, efficient production methods, while spreading the fixed costs of operation over growing production runs. The capture of internal scale economies has traditionally been seen as the critical mechanism of industry development in the age of mass production or 'Fordism'. *External economies*, on the other hand, are benefits or cost savings that accrue to a group of firms co-located in a region or district. Such economies are external to the individual firm but internal to the group concentrated in the region.[2]

External economies arise as a result of a social division of labour between the firms co-located in the region. Patterns of vertical and horizontal specialisation emerge, with individual firms taking up particular niches within the localised production complex. Relatively permanent networks emerge, involving supply chains of firms operating at different stages in the production process, from raw materials supply to final market. Lateral connections also occur at a given stage of production as do 'diagonal' connections between manufacturing and producer service firms[3]. Obvious examples of external economies include:

- the reduction in transport costs when firms cluster in space
- more effective dissemination of innovations and market intelligence within the group of firms
- the growth of a large, skill differentiated (i.e. 'thick') local labour market

However, Marshall also recognised that there were other advantages or *agglomeration economies* that flowed from geographical clustering.

> In contrast to traditional regional economics, Marshall attaches a more independent role to agglomeration economies as the specific *territorial* aspects of a geographical agglomeration of industrial production. Marshall focuses on traditional socio-cultural factors, which concern the quality of the social milieu of industrial districts, and which only indirectly affect the profits of firms (Asheim, 2000, p.415).

[2] Strictly speaking, external economies come in two forms: technical and pecuniary (Scitowsky, 1954). Technical externalities change the production function of firms. Pecuniary externalities leave the production function alone and act on relative factor costs.

[3] These advantages of co-location or geographic clustering are economies of scale in the sense that they tend to grow as the size and complexity of the group of firms grows. They can also be seen as 'economies of scope' – the benefits to firms that arise from the concentration of complementary activities in space.

The social, cultural, historical and political nature of local regions – in this view – can materially affect the productivity and profitability of firms located there and, therefore, the overall economic performance of the region. For example, where local traditions of trust and reciprocity ('social capital') are strong and all parties know each other well, often meeting face-to-face:

- transaction costs among firms may be lower, since informal arrangements rather than legal contracts will often suffice to ensure the mutual discharge of commercial obligations
- relevant technical knowledge is rapidly transferred, within and between generations (often facilitated by kinship ties that characterise local firms)
- information travels quickly through and innovations are readily diffused within the cluster

Informal or tacit knowledge about markets, technologies and new opportunities is difficult to codify but critical to successful innovation and the creation of competitive advantage in a rapidly changing economic environment. The local 'milieu' of social norms, traditions, shared understandings and commitments – what Marshall termed 'the industrial atmosphere' – can facilitate the effective exchange and application of such knowledge, leading to patterns of cooperation among, as well as competition between, members of the industrial district that drive innovation and regional growth. In this view, local economy and local community are interdependent. 'In the [industrial] district, unlike in other environments, such as manufacturing towns, community and firms tend to merge' (Becattini, 1990, p.38). Put another way, local economic activity and outcomes are 'embedded' in a particular set of historically specific social and cultural conditions. The concept of 'embeddedness' holds that economic activities have social and cultural characteristics and determinants (Granovetter, 1985). Proximity breeds mutual knowledge and trust between local economic actors that underpin economic behaviour and performance, reducing the costs of doing business and facilitating knowledge spillovers and collective local learning (Feldman and Florida, 1994).

Following Garofoli (1991), Asheim (2000, p.418) summarises the structural characteristics of industrial districts as follows:

- an extensive division of labour between the small and medium sized firms (SMEs) in the local production system or complex, entailing a dense network of inter-firm linkages
- strong product specialisation at the level of the firm, leading to the acquisition of specialised knowledge and production technologies in each firm and a high level

of technological interdependence between firms, which, in turn, facilitates the diffusion of innovation across firms

- an effective information network at the district level, ensuring rapid diffusion of information about market trends, production technologies, raw material sources, etc., facilitated by frequent face-to-face contacts
- high competencies in the local workforce, fed by intergenerational transfers of knowledge, including tacit knowledge, concerning labour processes and technologies

**The New Industrial District**

Marshall's basic idea, viz. that regional economic growth is partly dependent on the socio-cultural base or milieu, was taken up in the late 1970s and 1980s in order to explain the otherwise surprising economic success of regions in 'the Third Italy' – the Central and North-Eastern regions of Tuscany, Emilia-Romagna and Veneto – as opposed to the established industrialised North-West and the underdeveloped South of the country (Asheim, 2000). Dynamic regions attract dynamic firms in a self-reinforcing process, resulting in 'an innovative milieu' (Maillat, 1995). Such localities and regions reduce the uncertainties associated with (and therefore, facilitate) innovation for the individual firm by encouraging (Lawson, 1997):

- collective information gathering, selection and exchange between firms
- collective learning processes through the mobility of key and routine workers between firms in the region
- improved managerial decision making resulting from the mobility of managerial staff and cooperative decision making through local business associations
- informal exchanges in clubs, family networks, business associations, etc.

Piore and Sabel (1984) argued that the Third Italy heralded a major structural transformation in the nature of advanced capitalist societies – a second industrial revolution in which the existing paradigm of mass production (Fordism) would increasingly give way to one based on 'flexible specialisation'. This 'Post-Fordist' world (Berry and Huxley, 1994; Amin and Thrift, 1994) is characterised by:

- increasingly differentiated product markets, with knowledgeable and demanding consumers (an emphasis on 'quality')
- production technologies, logistical support and labour organisation that facilitate

small-run, niche-targeted output (rather than standardised mass produced commodities)

- the delivery of design-intensive goods and services
- continuous innovation, both product and process focused
- government policy settings that facilitate or remove barriers to the new 'flexible paradigm' (competition policy, R&D, welfare reform, etc.)

Piore and Sabel argue that industries in a world of flexible specialisation are increasingly driven by competitive pressures to 'de-verticalise' – or express a process of vertical *dis*-integration – creating interacting complexes of smaller firms specialising in different but linked parts of the overall production process. Such clusters of producers tend to concentrate together in space in order to manage the uncertainties and instabilities of their niche-dependent demands, '...locating in close proximity to reduce the cost of their unstandardised and unstable exchanges' (Simmie, 2001, p.22). However, as Simmie and others have pointed out, *vertical dis-integration* appears to characterise few advanced industrial economies and industrial sectors; vertical integration through mergers and acquisitions on a national and global scale still characterise many, if not most, industries. The cases proposed by Piore and Sabel, Becattini and others tend to focus on special cases, notably some established craft-based, design-intensive industries like fashion and high-end consumer goods.

The idea that industrial 'dis-integration' characterises new production systems has lead to claims that clustering will arise naturally in space as a result of pressures to carve out and maintain competitive advantage. As the number of specialised firms grows (as the value chain is fragmented), so too do the links between them. Spatial concentration allows the transaction costs of managing the exploding number of linkages between them, in a world characterised by just-in-time inventory systems and the like, to be minimised (Scott, 1988).

The key question raised by the literature on industrial districts is – how central is innovation as a driver of continuing regional economic growth? Will the industrial district 'run out of steam', become locked into existing technological paradigms within an established socio-cultural milieu?

Asheim (2000, pp.420-2) refers to researchers who argue that such regions will tend to support incremental rather than radical or 'leap-frogging' innovation. This follows from the high levels of trust and surveillance present among firms in the region. Improvements on current ways of doing things, information about new markets, etc. flow easily between firms, encouraged by a tradition of common knowledge and reciprocity. However, radical ruptures in current markets, forms of organisation and technologies threaten the very socio-cultural basis on which 'business as normal' is

carried out and, in particular, the bonds of mutual trust that lock the members of a region into a benign competitive complex. The very stability and homogenous nature of an industrial district's socio-cultural milieu undercuts its long term economic success. This analysis suggests that eventually the industrial district as a socio-spatial system loses its dynamism and falls behind other regions, which have managed to harness 'break-through' innovations – the apparent fate of the Third Italy (Bianchi, 1998) and the established watch-making regions of Switzerland (Glasmeier, 1994). Cooke and Morgan (1994) argue that the SMEs in Emilia-Romagna have come under increasing market pressure from two sources. First, the region's traditional craft-based industries in textiles, clothing and footwear must face increasingly well resourced competition from developing third world countries. Secondly, the region's high value adding, technologically sophisticated producers of food-producing and earth-moving equipment and machine tools face increasingly intense competition from other producers within the European Union. It also suggests that, perhaps, one of the critical pre-conditions for sustainable economic development is *diversity* – a complex and changing mix of people, traditions and ideas. This insight, as will be argued in the next chapter, figures prominently in the recent work of Richard Florida on creative regions.

In both the Swiss and Italian cases briefly mentioned above, local stagnation has been embedded in the incapacity of local institutional complexes to respond to the growing competitive pressures posed by globalisation. Referring to the late twentieth century experience of the Swiss watch industry, Glasmeier (1994, pp.118-19) comments:

> ...localised network systems are particularly vulnerable to external shocks in the form of paradigm shifts. Individual self-interest and limited information flows can inhibit a local complex's ability to transform institutions that otherwise regulate industrial networks. These institutions often have only a limited ability to effect change and are more often a reflection of the complex rather than a window on to the outside world... In a span of less than thirty years, the world's dominant watch region yielded technological leadership (in watchmaking and micromechanics) to its Far Eastern rivals.

The tendency for once successful regions to blossom and fade also raises issues of appropriate public policy interventions. Brusco (1990), among many researchers, argues that governments at all levels need to support large scale innovation at the regional level, though the nature of these interventions is contentious (Cossentino et al., 1996). Cooke and Morgan (1994, 2000) suggest that the traditional, government supported 'business support centres' are too small and increasingly less likely to meet the needs of SMEs in the Emilia-Romagna region in the global economy. Government policy settings and institutional presence are critical components of the industry cluster/industrial district concepts, part of the overall institutional complex within

which innovation drives economic performance. This important issue (raised in chapter 2.2) will be returned to below in the context of the discussion of 'national innovation systems' (chapter 6).

**The Idea of Network**

Central to the twin concepts of industry clusters and industrial district is the idea of 'inter-firm networks'.

> Networks are seen as an important defining characteristic of industrial districts, binding firms together into a coherent and innovative system of relational contracting, collaborative product development and multiplex interorganizational alliances. All economic action in industrial districts is said to be embedded in a dense web of network ties among individuals, firms and service organizations (Staber, 2001, p.537).

Staber goes on to argue, however, that although the concept of network is central to the literature on industrial districts and related constructs, there is very little concrete research on the structure and functioning of different sorts of networks as they impact on the stimulation of innovation and regional development. In his analysis of 64 empirical studies dealing with industrial districts, he found that the overwhelming majority (84%) were concerned with simple dyadic, first-order linkages between firms, mainly to do with purchaser-supplier relationships. A minority of studies also focused on characteristics like the number of firms, the stability or duration of linkages, the formality of relations and the degree of hierarchy displayed. Staber (2001, p.542) argues that his '... survey indicates no consensus on what properties of network structure should be studied, nor is there much of a debate on what difference that consensus would make for understanding the innovative capacity of networks'. Networks cut both ways – i.e. they can encourage or constrain innovation. Active inter-firm linkages can, on the one hand, facilitate the swift diffusion of new knowledge and productive possibilities. However, as noted above, established linkages between firms and with other actors in a region may reinforce traditional ways of doing things, throwing up effective barriers to anything other than incremental change and innovation. Can anything be said about what sorts (structures) of networks are more conducive to significant, even leap-frogging innovation?

Staber attempts to begin to answer this question by distinguishing between first-order and second-order network structures. Figure 1 presents a simple first-order network where a firm establishes a number of separate linkages with other actors.

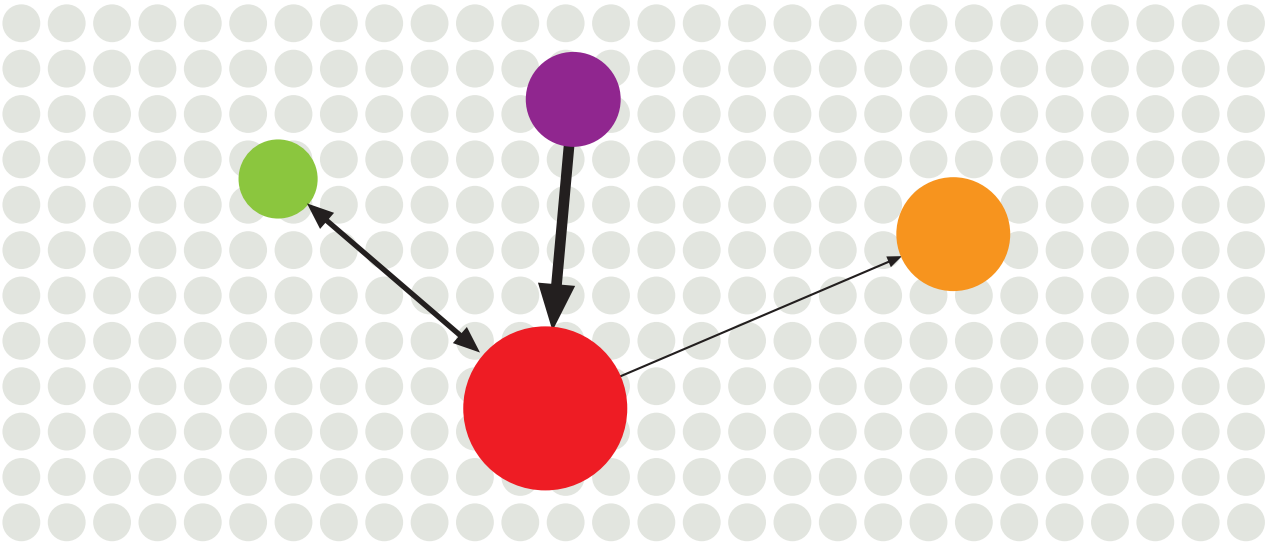

Figure 1: A First-order Network

In Figure 1, the red actor (say, a large firm) is the central component of the network. Linkages exist with other players. Thus, the double-headed arrow linking red with green might represent interactions between the firm (red) and a smaller firm (green) involving partnership arrangements of one sort or another. The one-way link between red and purple could represent the regular supply of products from the supplier (purple) to the customer (red). The orange actor could be a professional or industry association and the one-way link signifies the reliance of red on orange for key industry intelligence or political lobbying. In this simple representation, the relative size of the circles can symbolise the relative size of the actors making up the network. The width of the arrows can represent the relative strength of the ties between actors, while arrow length can stand for the distance between actors – that is, how spatially concentrated or clustered the network is. There are, of course, other structural characteristics that might be relevant to the way actual networks are formed and work to either encourage or constrain innovation, for example:

- the forms and frequency with which network members communicate with each other
- the degree of formality of linkages
- the stability and duration of linkages
- the number of members
- the hierarchy of linkages within the network

This suggests that the range of potential situations is large, even in the case of simple first-order networks involving dyadic relations between a primary member and other members. The situation rapidly becomes more complex when second-order network structures are envisaged, as represented in Figure 2.

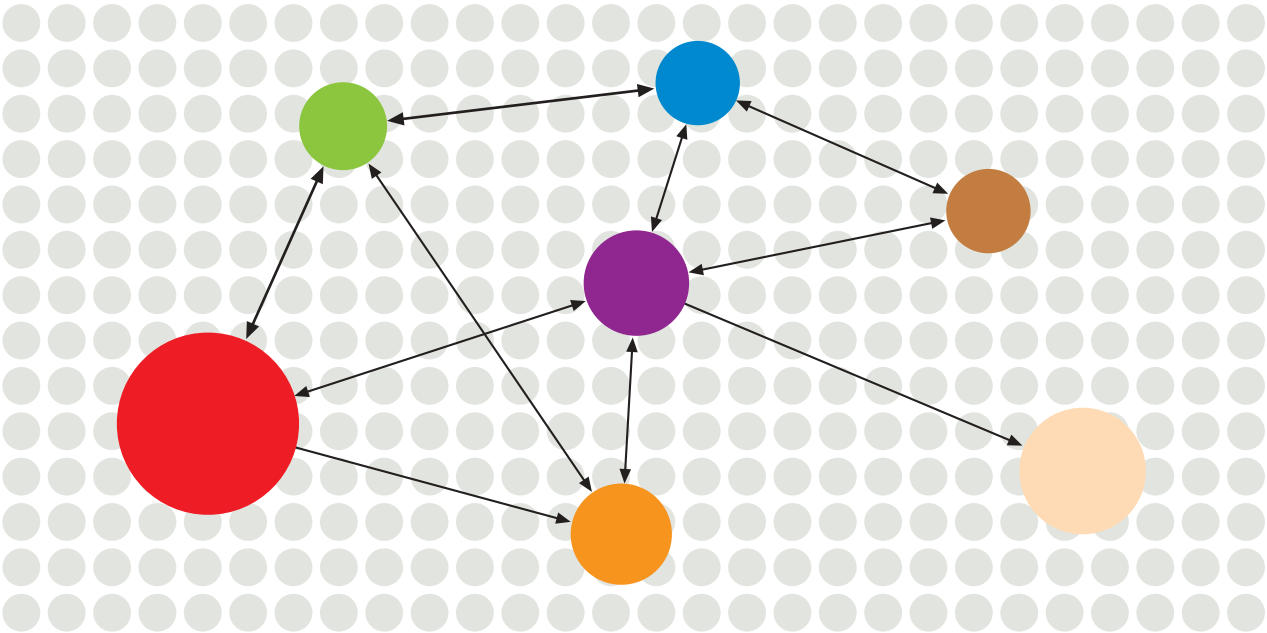

Figure 2: A Second-order Network

In the network depicted in Figure 2, the red actor is embedded in a much more complex set of relationships than in the situation presented in Figure 1. Abstracting from the issue of strength of ties (i.e. thickness of the arrows) a number of novel features can be noted:

- red is less central to the network than purple, indicated by the relative numbers of linkages each maintains
- if purple leaves the network then many of the linkages disappear
- scope exists for segmentation within the network. For example, red-purple-green and orange form a network within a network – as do purple-blue-brown
- pink is only peripherally connected to the network

- blue and red occupy structurally similar positions in the network but do not have direct linkages between each other – they may be firms specialising in the same product range and market niches and are therefore strong competitors

The position and role of purple is particularly strategic in the Figure 2 network. This actor may be a leading-edge university research and development laboratory or a government 'business service centre' (such as those that have been apparently successful in the economic success of the Emilia-Romagna region of Italy; see Bianchi, 1996) or a powerful industry association. Purple's strategic location allows it to disseminate new information, technical solutions and commercial opportunities throughout the network – or, alternatively, to block these flows. If purple is a local branch of a transnational corporation, for example, it may have little incentive or authority to stimulate innovation across the network, since its actions will be primarily determined by the interests of its parent group head-quartered elsewhere. On the other hand, if purple is a rapidly expanding firm at the forefront of new technologies and markets – 'a first-mover' – like Nokia in the Helsinki region, innovations and their dissemination across the network may occur at a fast and continuous rate.

It is possible to envisage more close-knit or 'dense' networks than that depicted in Figure 2 and also third or higher order networks. Out of the possible 42 one-way arrows linking the seven actors in Figure 2, there are 19 links articulated; this represents 45% of the maximum number of linkages. A figure of 100% would mean that all members of the network were related to every other member. Given the cost involved in establishing and maintaining links and the fact that, for any member, some links will be more important than others (and that the relative importance is likely to change over time), it is unlikely that workable networks would ever approach a density of 100%. Similar constraints – especially the management time involved in maintaining useful links – are likely to limit the emergence of sustainable higher order networks.

At the periphery of the network, actors like pink may also be critical to the long run dynamism of the network, since pink is much less 'locked into' the existing network and more likely to be connected with other networks and economic environments from which new ideas and opportunities may unexpectedly emerge. Put another way, the other actors may be concentrating on their intra-network relationships, looking inward rather than outward, missing the new opportunities. Over time, pink may become more central to the network; the obverse is that some other actors may become less central over time. The ability to recruit new members and expel old members may be a necessary part of retaining the competitive edge in a changeable global economic environment.

The critical question raised above is - what aspects of network structure enable rather than constrain innovation? Staber (2001, p.539) argues that:

> Successful networks balance two opposing forces. On the one hand, a network can only lead to innovation if its boundaries are relatively permeable, its structure is flexible, and information can flow freely. If boundaries are fixed and the network is highly centralised, new entrants may be prevented from importing new competencies with potentially greater adaptive value. On the other hand, for innovation to be possible network structures need to be sufficiently stable to permit the development of new competencies and the exchange of ideas about a broad range of technical and commercial problems. Enduring interfirm ties sustain the structure necessary for the network to be a resource for action.

It is not clear where the optimal line between stability and change in networks should be drawn, both for different networks and a single network over its life-cycles. Ideally, a body of relevant empirical research should cast light on the range of network structures supporting rapid innovation and sustainable regional economic development. However, as Staber's review demonstrates, there is no such body of work. In its absence he offers a tentative theoretical hypothesis as to the key characteristics of inter-firm networks leading to innovation and growth, drawing on the evolutionary approach to economics (Nelson and Winter, 1982; Hodgson, 1993; Andersen, 1996; Aldrich, 1999).

This paradigm conceptualises the path-dependent emergence of economic actions and interactions as a competitive struggle between firms out of which some actions and interactions survive (i.e. are 'selected') and others disappear ('go extinct'). Industry clusters or industrial districts are, in this view, collective survivals of intense selection pressures – i.e. 'an organisational response on the part of a business organization, or group of populations, to the problem of adaptation to changes in the economic environment' (ibid, p.544).

The key concepts characterising this approach are:

- *variation* – differences in the types and structures of inter-firm networks
- *selection* – the external pressures exerted on firms and other organisations that favour some network forms over others in the actual economic environment encountered
- *retention* – the mechanisms and processes that tend to the persistence of those networks and network structures that are selected
- *competitive struggle* – over the resources and levers of influence driving the selection process

This approach suggests that today's successful networks and clusters will not necessarily be tomorrow's survivors. Unexpected and uncontrollable changes in the external economic climate may undercut and supplant established networks, markets and regions. The succeeding networks may not necessarily represent the most efficient possible outcomes – just those that happen to survive in the now prevailing conditions, either by design or accident (or a combination of both). However, it is likely that those networks and actors that are able to respond quickly and flexibly to the changing conditions, threats and opportunities – i.e. who are able to innovate – are more likely to survive than others wedded to traditional patterns of activity. Innovation – or, more accurately, the capacity to innovate – is likely to have strong adaptive advantages and, therefore (in this view), be selected for over time. Hence, the evolutionary nature of economic development in real time and space ensures that innovation remains as a central driver of economic outcomes. Successful networks and the regions supporting them are 'collective learning systems' (see also: Asheim, 1997, 2000, pp.423-428; Lundvall and Johnson, 1994).

The hypothesis, as yet untested, that Staber advances in this context is that *the network structure most conducive to innovation by enhancing the network's adaptability, flexibility and learning capacity is likely to be defined by three structural characteristics:*

- *Loose coupling* – a loosely joined network in which the probability of any one member directly influencing another is low. In a loosely coupled network one member affects another:

  - suddenly – rather than continuously
  - occasionally – rather than constantly
  - negligibly – rather than significantly
  - indirectly – rather than directly
  - eventually – rather than immediately

  Loose coupling has evolutionary value in uncertain and changeable environments. Firms need to be flexible and not locked into particular relationships and information channels. They must be open to new ways of doing things and to back their judgment over others. 'Conditions of uncertainty, which are the environment in which networks are most likely to thrive ...place a premium on constant learning and innovation' (Staber, 2001, p.545). There needs to be enough slack or 'grit' in the network to enable frequent variation for selective forces to work on. Successful innovations must be retained long enough to make a difference. Tightly coupled networks may disseminate new changes too quickly and universally, with each new event disrupting the whole network, undercutting preceding changes that are yet to establish their adaptive value. Individual network members may then start to

erect barriers to protect themselves from the incessant barrage of new ideas and pressures – what the economist Joseph Schumpeter called 'the perennial gale of creative destruction' – so undermining their capacity to respond to the really creative options that arise. Tight coupling may also entail raising barriers to the entry of new members to the club, losing the opportunity of stimulation from outside. Staber points to studies of inter-firm networks in the established industrial district of the Ruhr in Germany that found evidence of such 'lock-out' behaviour and suggests that this may be one reason for that region's long economic decline.

- *Diversity* – a mix of different types of network members, distinguished by their size, histories, organisational structures, missions, financial sources, competencies, etc. In a stable environment networks tend to form on the basis of unchanging relationships between similar parties – like attracts like. But in uncertain and changing environments sameness can spell death since the range of resources across the network is narrow and if the environment changes radically may not be sufficient for any of the network members to respond adequately to the new circumstances. But heterogeneous networks can draw on the resources of whichever members happen to have the capacity to thrive in the new circumstances, especially where entry to the network is relatively open. 'Variation of organizational forms is the raw material for evolutionary selection processes to have an effect... Variation thus raises the likelihood that the business population survives significant and unpredictable changes in the environment' (ibid, p.546). Differentiation leads to the exchange of knowledge (formal and tacit) from which new synergies can arise.

- *Redundancy* – the formation of multiple linkages in the network that reproduce information exchange. Duplication of relationships confers survival and hence competitive advantage on the group since it means that if the network loses a strategic source of knowledge or resources, the same information still gets through by other routes. Highly specialised networks are vulnerable to the loss of strategically located members – such as purple in Figure 2, above. 'The evolutionary advantage of redundant relationships is that they minimise the negative impact of the loss of a particular relationship on the maintenance of the network as a whole.... Structural redundancy makes the network more "error friendly"' (ibid, p.547).

Although Staber notes a series of studies that offer some support for his hypothesis, these conclusions must be regarded as highly speculative and therefore treated with some caution. Evolutionary theory as applied to organisational analysis is still in its infancy.

In reviewing the application of the network concept to innovation processes, Simmie casts doubt on the generalised importance of locality or proximity as a critical factor. He concluded:

> As with the new industrial district thesis it would appear that the local network paradigm should be regarded as a relatively exceptional, minority case rather than a generally emerging or new form of production relationships. The minority of empirically verified cases where local networks have been shown to have made significant contributions to innovation and therefore related innovation to space are atypical. They only include a sub-sample of areas that have been identified as new industrial districts. With the possible exception of California, they do not include the major metropolitan centres of innovation (Simmie, 2001, pp.27-28).

Simmie argues that vertical 'dis-integration' has been the exception rather than the rule and that vertically integrated multinational corporations, head-quartered in 'world cities', still dominate many sectors and regional economies. Networks and clustering effects are thus likely to have extensive spatial referents within global production complexes.

It may, of course, be possible to visualise complex networks that combine *both* the local and the global. Figure 3 presents a spatially extensive and segmented view of a network that incorporates both localised second order sub-networks and global linkages expressing first order connections.

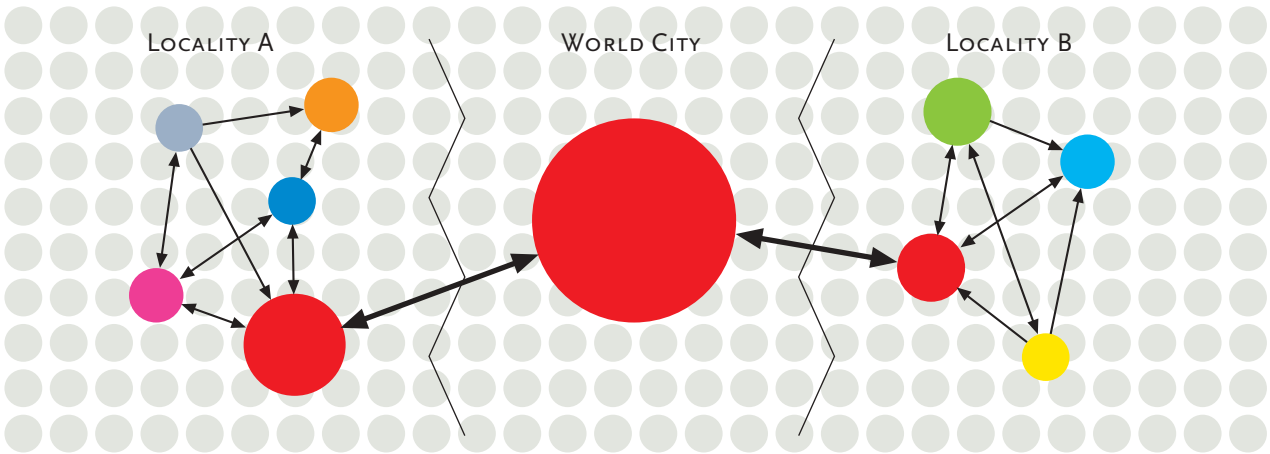


Figure 3: A Global Network System

The large red circle represents the multinational firm head-quartered in a world city like Los Angeles or London linked to two subsidiary or branch firms in particular regions, locations A and B. Each of the latter is embedded in a localised network with other SMEs. In fact, Coe (2001) describes such a network structure with respect to Vancouver's film industry; what he calls a 'satellite-Marshallian industrial district' can be represented by the networked cluster in Locality A in Figure 3, while the parent studio and production supports are located in Los Angeles, the world centre. Locality B could then represent another localised film production district - for example the Fox studio and supports in Sydney.

A recent study (Freel, 2003) of 597 SMEs in the manufacturing sector, located in Scotland and Northern England, found a complex and far from unambiguous link between inter-firm and other networks and innovation propensity. This is an unsurprising result, in view of the discussion above. On the one hand, linkages with suppliers, customers and others spread risks, open up channels for new ideas and collaboration, extend the individual firm's knowledge base and help cover knowledge gaps. On the other hand, collaboration is costly to initiate and maintain, raises the risk of losing control over intellectual property, may stifle radical ideas and take the emphasis (of firm management and policy makers) away from the factors internal to firms that drive innovation. Freel conducted a simple regression analysis of several factors (independent variables) that were hypothesised to impact on whether individual firms in the sample had carried out at least one process or product innovation (the dependent variable) over the preceding three years. Independent variables that were selected included: age and size of firm; proportional R&D expenditure; proportion of the workforce in technical and scientific jobs; and the presence or absence (over the preceding three years) of collaboration with customers, suppliers, universities and government agencies.

Taking the sample in aggregate, Freel found, for *product innovation*:

- A positive (statistically significant) link between collaborating both with customers and with public agencies, on the one hand, and with the probability of innovative performance, on the other hand
- No positive or significant link between universities or suppliers and innovation performance
- Statistically significant positive associations between innovation and factors internal to the firm – R&D expenditure, proportion of technical workers and firm size

The situation was similar for *process innovations*, in relation to the influence of internal factors – R&D expenditure, proportion of technical workers and firm size. However, the external factors that were positively associated with innovation performance were,

in this case, links with suppliers and with universities. In contrast to product innovation outcomes, there was no significant association between process innovation and links with either customers or the public sector.

These results suggest that, for this British sample of manufacturing firms at least, internal factors are in all cases significant influences on innovation outcomes or performance but the importance of particular external linkages and collaborations (the scope and content of networks) depends on the *type* of innovation considered. Linkages with universities, for example, are more likely to positively impact on process, not product innovations. Freel found that 50 per cent of the firms in his sample did not collaborate and of those, almost a third nevertheless carried out at least one innovation activity in the three-year period. This compares to slightly more than 50 per cent of the firms with at least one external innovation-related linkage carrying out innovation during the period in question. 'The corollary, which may be drawn from this, is that "networks" (in the sense intended here) are not homogenous or homogenously good.... It seems external collaboration is, unequivocally, neither a necessary nor less a sufficient condition for successful innovation' (Freel, 2003, pp. 766-7). Put simply, networks work in some circumstances and not others.

Freel also looks at the degree of *spatial clustering* of external (inter-firm) linkages. He found that:

- Large firms are more likely to have innovation-related linkages on an international scale, while small firms tend to have linkages at the local level – i.e. to be part of networks focused in space
- Firms with a high proportion of technical staff are more likely to have extensive, international networks
- Firms introducing novel or radically new products and processes are also likely to be internationally connected; firms introducing incremental product change tend to be locally embedded

Freel's study is only one case, focused on particular manufacturing industries in Northern Britain. However, its complex set of findings should warn researchers and policy makers that easy generalisations promoting networks and clusters as policy panaceas for regional economic development can be misleading.

Nevertheless, in general terms, Eurostat (the central statistical office of the European Union) has found a clear link between innovation activity and inter-firm cooperation, documented in its 'Community Innovation Survey, 1997/98' (Eurostat, 2000). For the year 1996, around 25 per cent of all innovating firms in the EU had developed

cooperative or partnership arrangements with other firms in developing new products or processes. Key conclusions of this study are:

- Manufacturing firms are slightly more likely to cooperate than firms delivering services (26% to 24%)
- Cooperation is greatest in the Nordic countries, Norway, Finland, Sweden and Denmark and lowest in the southern countries, Italy, Spain and Portugal; e.g. 71% of manufacturing firms cooperate in Finland, compared to 11% in Italy
- Cooperation is most prevalent within corporate groups, understandable in view of the reach of multinational corporations (MNCs)
- Cooperation is also most prevalent between firms and their suppliers, clients and (in the case of services) competitors – and less so with universities, consultants and government agencies
- The location of partners is concentrated within the same country, followed by location elsewhere in the EU, followed by location in the United States
- 'Novel innovations' (entailing introduction of a new product to market) were more likely to be made by collaborating innovators than lone innovators

Overall, the Community Innovation study found that just over 20% of all manufacturing firms in Europe had been commercialising a new product or introducing a new technological process in the 1994-1996 period. This figure exceeded 50% for manufacturers with more than 20 employees. In a subsequent review Eurostat (2001) found that the percentage of novel innovations rose with firm size – 16% for small firms, 23% for medium firms and 41% for large firms – and the propensity to innovate was highest in the high-tech sector; e.g. more than 50% of large high-tech firms were novel innovators. A later study (Eurostat, 2002) reinforced this finding, though the gap is fairly small; 36% of large firms (employing more than 250) received more than 10% of their revenue from new products in the two years to May 2001, compared to 33% of medium sized firms (employing between 50 and 250) and 32% of small firms (employing less than 50). The same study found that large firms were still more likely to use information and communications technologies, though the gap was slowly closing.

Porter has argued that industry clustering is a pervasive feature of the modern economy in the current era of globalism. Clusters are not confined to high-tech industries. But it's equally true that not all industries display the most prominent features of clustering identified in paradigmatic cases like ICT. What, then, determines whether and to what degree industry clusters will emerge in particular sectors and regional economies?

Steinle and Schiele (2002) have addressed the first question implied above – viz. *which* industries are most likely to cluster and why – while leaving open the 'where' question. 'The conditions for clustering are not elaborated in order to predict where a cluster will develop, but to indicate which types of industries are more likely to cluster – somewhere' (ibid, p.851). They identify *six conditions*, each conducive to the formation of industry clusters. The first two are 'necessary conditions', in the sense that for clustering to occur they must hold. The last four are 'sufficient (but not necessary) conditions', in the sense that if they hold then clustering is likely to develop.

1. *Divisibility of the production process*. The overall value system in an industry sector must be divisible into specialised parts, linked by multiple supply chains, in order for inter-firm networks of firms to develop as the core of new industry clusters. Vertical and horizontal *dis-integration* is therefore a defining component of clusters, as the literature on new industrial districts emphasises. Critical mass in terms of numbers of economic agents and volume of production is a necessary corollary of technical and organisational specialisation underlying network density. 'This aspect is further stressed by the observation that there should be several actors at each step of the value-chain [system] to allow for healthy competition, as well as mutual learning' (ibid, p. 852).
2. *Transportability of the final product*. Clustering of production requires the capacity to distribute the product to diverse and spatially extensive markets – unless the industries serve only local markets. The more transportable the final product – both goods and services – relative to its various inputs, the more likely firms and other supporting agencies will cluster together and export to the wider world. Transportability of the final product increases the size of the market and – as Adam Smith first cogently argued – the extent of the market limits the scope for division of labour (specialisation).
3. *Long value chains and high coordination costs*. The more developed the pattern of industrial specialisation – i.e. the longer and more fragmented the overall value system linking firms in a sector – the greater the number of linkages between agents and the higher the transaction and coordination costs of doing business. These costs can be minimised, in many cases, by co-location – that is, by clustering in space. Proximity (as argued earlier) facilitates face-to-face contacts, the fast dissemination of market-relevant information and quick responses to new threats and opportunities without costly information search behaviour.

4. *Diversity of complementary competencies*. The larger the number of distinctive but complementary skills and tasks making up the value system, the more difficult and costly it is for single firms to internalise all of them and the greater the scope for specialisation among interacting agents. Specialisation comes, as noted in the preceding point, at the cost of increasing coordination challenges.

5. *Innovation as a driver*. In industries where innovation is pervasive and a critical determinant of competitive advantage, clusters that facilitate innovation are likely to form. Radical innovations often require the creation of new and unexpected linkages between agents that previously acted independently. Clusters throw up unplanned and fortuitous connections out of which new opportunities for innovation may emerge. Conversely, piecemeal, ad hoc innovations may also emerge more readily where established clusters support routine information and informal linkages across the value system. The innovative milieu formed by overlapping industry clusters may – as Porter and others have argued – reinforce the clustering process in a continuing virtuous circle.

6. *Market volatility*. Where the markets for final products are highly volatile, subject to sharp shifts in demand and technology, clustering can aid the quick responses of economic agents that are necessary for individual commercial survival. Clusters facilitate the fast dissemination of information and the creation of new collaborative responses as firms, support organisations and regulatory authorities strive to respond effectively to changing market conditions.

For industry clusters to develop, Steinle and Schiele argue, the two necessary conditions must hold. However, these conditions are not sufficient to guarantee viable clusters. The satisfaction of one or more of the sufficient conditions makes clustering increasingly likely, as long as the necessary conditions also hold.

This analysis underpins the salience of the 'digital design' and ICT clusters examined in chapter 7.1. Both industry sectors display to varying degrees all six of the conditions noted above. They involve a detailed technical division of labour, long value chains, the flexible coordination of complementary competencies by distinct agents and are intensely innovation-dependent. The products and services created are information-intense and readily transportable, physically and electronically, to markets that are highly volatile, driven by rapid technological change and demanding consumer requirements.

**Schumpeter Redux**

Simmie (2001, pp.30-44) outlines what he calls the 'Schumpeter II model' of innovation and growth, corresponding to Schumpeter's later work in which he stressed the increasing tendency for R&D, invention and innovation outcomes to be initiated and managed within the large oligopolistic firms that came to dominate core industries in the major industrial economies during the twentieth century. Simmie contrasts this approach with 'Schumpeter I', Schumpeter's earlier work where he tied innovation to the essentially unpredictable activities of the small, self-employed entrepreneur. In the Schumpeter II view, buttressed by the concepts of evolutionary economics, large multinational corporations (MNCs) internalise the innovation process. Investment in R&D drives new product design and delivery, which results in enhanced market share, new markets and greater profits, which are ploughed back into R&D, creating a self-sustaining virtuous circle. The strong force of path dependence ensures that pioneers entrench their absolute advantages, both in cost minimisation and premium-adding product differentiation terms. Increasingly, the growing global reach of MNCs creates integrated clusters articulated across space, as represented in Figure 3, above. It is the 'Schumpeter II' model of innovation, best captured through an explicitly evolutionary paradigm, that underpins the new economic paradigm outlined in chapter 2.2.

The control of innovation as an institutionalised process therefore tends to be increasingly concentrated in a limited number of large metropolitan regions that host the headquarters of large MNCs. Knowledge is transmitted both within the geographically distributed corporate structure and across organisations forming larger industry clusters that, again, straddle the spatial divide. The 'learning organisation', as well as the 'learning region', comes to the fore as a critical component of an innovative milieu (Lundvall and Maskell, 2000; Feldman, 2000). Innovative city regions are those that attract, in a chicken-chase-egg way, highly skilled and motivated workers. Such cities are also normally well locked into (are important hubs in) efficient rapid inter-regional and international transport systems.

Alongside this spatial pattern of metropolitan concentration, some researchers point to a partly countervailing trend – the emergence of 'urban networks', '...meaning enhanced communications and facilities linkage between neighbouring towns and cities in furthering economic growth without excessive negative externalities and sustainability implications' (Cooke et al, 2002). Large scale metropolitan growth in cities like London and Los Angeles drives land prices up and results in rising congestion and other negative externalities. Nearby smaller cities and towns may therefore attract a growing stream of investment and skilled workers looking for a functionally and aesthetically more attractive location to operate. Increasing communication flows and cooperation between industry and government leaders in these towns can enhance

the environment of each as a magnet for new industry, investment and jobs. Cooke et al. (2002) describe three such 'clusters' of smaller centres, including one in the Thames Valley in south-western England, defined by Swindon, Oxford, Reading and Newbury. Such clusters have seen rapid growth in knowledge-intensive industries, in part encouraged by the presence of university and other knowledge institutions and in part due to the collective support or provision of higher order urban facilities like museums and other cultural assets normally only found in the large metropolitan centres. Collaboration between key actors in the smaller centres is vital to this process of collective growth, according to Cooke et al. (2002, p.235), often running against a long history of inter-town rivalry and competition.

Urban networks, in this sense, can be identified by tracking the daily volume of flows between actors in each centre. These flows include telecommunications traffic, physical commuting, freight movements, travel-to-work patterns and trips to cultural events or facilities. European research has identified the appearance of 'an innovative class of polycentric urban configurations or network cities' (Batten, 1995; Batten et al., 1998). Examples include: the Randstad in the Netherlands, Heidelberg-Karlsruhe-Stuttgart in Germany and Brussels-Ghent-Leuven-Antwerp in Belgium. Cook et al. (2002, p.237) argue that this focus on identifying and encouraging the growth of 'middle-sized' urban networks is now part of official European Union spatial planning policy, though this seems to be driven more by concerns over the environmental costs of continued metropolitan centralisation and the need to reverse economic decline in disadvantaged regions, than by an appreciation of what drives innovation.

However, in this new world, face-to-face contacts are still critically important, a factor that *both* reinforces the clustering of activities *within* successful regions and shapes how those activities are distributed *over* space, on an international scale. Proximity underpinning competitive advantage now has *two* dimensions. First, *distance proximity* – the need for face-to-face contacts, planned and accidental – requires some activities and firms to be co-located in a particular place, say within a particular quarter of a large city. Second, the revolution in land and air transport raises the prospect of regular face-to-face contacts occurring for those people who are located far apart but able to easily access these services. They benefit from *time proximity*. Meetings can now be organised in one location to which people travel from a number of other locations. Clearly, those cities that have high-order international airports and high-speed train connections can draw people from further afield than centres lacking these infrastructure facilities. In terms of the time taken to travel, Paris and New York are 'closer' than Los Angeles and New York. In Karl Marx's prophetic phrase, modern communications has allowed 'the annihilation of space by time'. The other half of this story, of course, is the extent to which *telecommunications* (telephone, fax, email, teleconferencing, broadband, etc.) has complemented face-to-face contacts in the

international economy. Here too, the large metropolitan region is advantaged, since it is there that telecommunications investments are concentrated.

The consideration of time proximity also gives a clue to the seeming success of some networks of small cities and towns in parts of Europe. Linkages seem to develop where physical commuting – the capacity to achieve face-to-face contact – can take place within a one-to-two hour window and where that commuting shadow includes a major metropolitan centre; London in the Thames Valley case, Amsterdam in the case of the Randstad.

What this suggests, Simmie (2001) argues, is that innovation is increasingly a process that feeds off and reinforces the economic dominance and success of well-placed metropolitan regions – and, we might add, proximate networks of smaller centres. The key economic and policy challenge in Victoria's case is: to what extent can the regional economy based on greater Melbourne (including potential urban networks like the 'Western Crescent' of Geelong-Ballarat-Bendigo) develop through innovation-driven virtuous circles within a global environment marked by established large successful regions? How does one get to be a winning region? Recent research carried out in the United States by Richard Florida addresses this general question – which regions win and why? – to which we now turn.

# 04 The Creative Class

The basic economic resources...is (sic) no longer capital, nor natural resources ... nor 'labour'. It is and will be knowledge (Drucker, 1993, p.8).

Today's economy is fundamentally a Creative Economy (Florida, 2002c).

Over the past 30 years, starting with Daniel Bell's (1973) seminal book – *The Coming of Post Industrial Society* – a succession of researchers, commentators and critics have pointed to seismic changes in the nature of advanced industrial capitalist societies. Many of the earlier commentaries focused on the role and reach of the large corporation – e.g. C. Wright Mills (1951); Whyte, Jr. (1956); Galbraith (1967); Chandler (1977) – while later work focused on the impact of information technology and the changing nature of work – e.g. Reich (1991); Mitchell (1995); Rifkin (1995); Sennett (1998).

Whereas this tradition of research focused on the institutional form of the dominant production unit – the corporation – and/or the nature of work within that institutional frame, Richard Florida's (2000) recent influential book deals specifically and centrally with the forces that underpin the value chain of the individual firm and the value system linking firms. These forces are both economic and cultural, since they depend on and operate through the values, skills and behaviours of a diverse and growing group of people forming what he terms 'the creative class'.

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Many say that we now live in an "information" economy or a "knowledge" economy. But what's more fundamentally true is that we now have an economy powered by human creativity. Creativity – "the ability to create meaningful new forms", as the Webster's Dictionary puts it – is now the decisive source of competitive advantage. In virtually every industry, from automobiles to fashion, food products, and information technology itself, the winners in the long run are those who can create and keep creating. This has always been true, from the days of the Agricultural Revolution to the

> Industrial Revolution. But in the past few decades we've come to recognise it clearly and act upon it systematically (Florida, 2000, pp.4-5).

In the current global environment, Florida argues, competitive advantage and economic success depends increasingly on a perpetual race to create new products and markets and service old ones in more productive ways. This endless race delivers huge rewards to the winners and marginalises or destroys the laggards. Winning, in turn, depends on attracting, training and keeping the most creative people. Creative workers '...engage in complex problem solving that involves a great deal of independence and requires high levels of education or human capital' (ibid, p.9).

Florida goes much further than the traditional economic arguments about human capital and argues that '(t)he economic need for creativity has registered itself in the rise of a new class, which I call the Creative Class' (ibid, p.8). The critical defining element of a social class is that its members share more than levels of education, income, interests and objective life-chances – a class *in* itself. They also share common values, perspectives, priorities and a creative ethos that '...values creativity, individuality, difference and merit' (ibid, p.8) and are aware that they share all this – a class *for* itself!

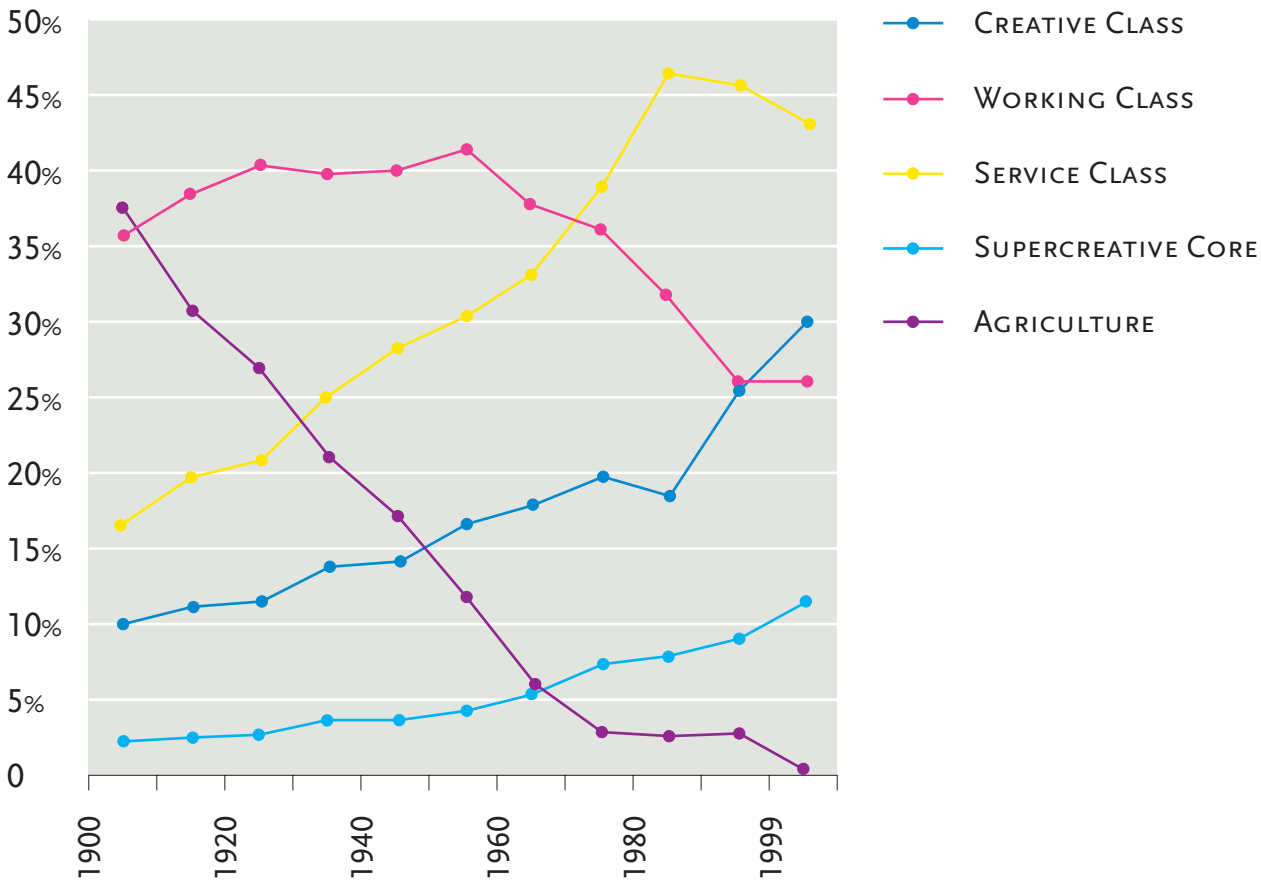
Florida proposes a three-class model of advanced capitalist society. The employed workforce, he claims, increasingly falls into the 'creative class', the 'service class' and the 'working class'. He defines:

> ...the core of the Creative Class to include people in science and engineering, architecture and design, education, arts, music and entertainment, whose economic function is to create new ideas, new technology and/or new creative content. Around the core the Creative Class also includes a broader group of *creative professionals* in business and finance, law, health care and related fields (ibid, p.8; italics in the original).

The 'Service Class', in Florida's typology, consists of the diverse range of people employed in low-wage, low-autonomy, low-skilled, routine service sector jobs in areas like food preparation and hospitality, health care, building services, retail, clerical work and welfare support. The 'Working Class' refers to the traditional industrial workforce, located mainly in the manufacturing sector, including production workers in the chemical, automobile, steel and textile industries, as well as operatives in the construction and transport sectors.

Figure 4 reproduces Florida's attempt to chart the relative sizes and trajectories of the three classes in the United States over the twentieth century. The Creative Class is presented both as a whole and in the form of its 'super core'. Agricultural workers, a remnant class from an earlier era, is also superimposed to underscore the scale of change in occupational structure during the past century.

Figure 4: 'Class Structure', 1900-1999, United States
[percentage of total workforce]




Source: Florida [2000, p.73, p.332]

Florida draws the obvious conclusions:

- the traditional Working Class rose slowly during the first half of the century (in share of total workforce) and then declined sharply after 1950, levelling off at around 20% in 1990
- the Agricultural workforce declined at the same sharp rate, but from much earlier, and continued to decline throughout the century
- the Service Class rose strongly right through the century, peaking in 1980, whereafter it declined slightly to just under 45% by the *fin-de-siecle*
- the Creative Class rose moderately throughout and sharply after 1980, to now number 30% of the workforce (more than the Working Class)
- the Super-Creative Core of the Creative Class rose less quickly but consistently throughout, kicking up from 1970

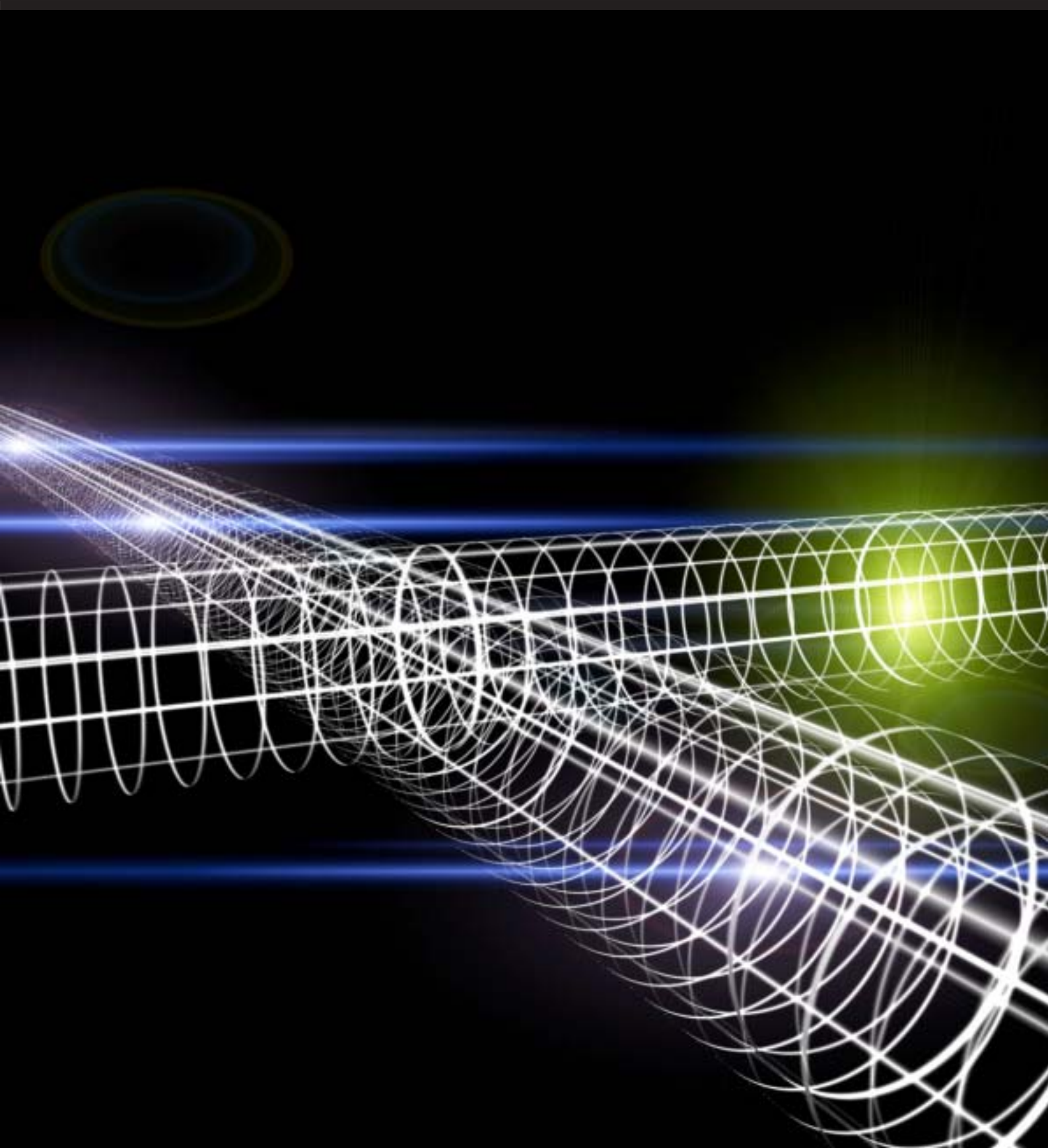
Perhaps the most dramatic development identified in Figure 4 – after the 'euthanasia' of the agricultural worker – is the fact that (based on Florida's occupational classification and official data) the last 20 years has seen the Creative Class and Core continue to absorb growing proportions of workers while the other classes and sectors have lost share or just maintained it. At least, this appears to be the case in the United States.

Florida's three-class model is broadly similar to an earlier model proposed by Robert Reich (1991). Both stress the divide between traditional manufacturing and service sector jobs, following in Daniel Bell's footsteps. More importantly, both authors focus on the emergence over the past 30 years of a growing group of 'knowledge workers'. Where they differ is that Florida insists on locating the critical defining feature of this group in the nature of the creative act, rather than simply the practice of problem solving. Reich's 'symbolic analysts' form an undifferentiated grouping, spread across all sectors of the economy, directing, calculating, resolving. Florida's Creative Class members gravitate to particular locations in the overall economy and internally divide into 'creative core' and a periphery of supporting 'creative professionals'.

However, the analyses of Reich and Florida are similar at another analytical level. Both present an essentially *Weberian* class analysis focused on labour market position, rather than a *Marxist* analysis based on ownership and control of the means of production. In the former view, individual life-chances, social status and power flow from occupational role and position, while in the latter, they depend on whether or not one controls the labour process – i.e. whether one is boss or worker. In fact, Florida is forced to deal with and, to a degree integrate, a more (Marxist) traditional class analysis by explicitly

recognising that many creative workers work under normal labour contract conditions in large capitalist companies (e.g. Microsoft), albeit often with non-traditional remuneration arrangements involving some profit-sharing. It is simply not the case, as Florida recognises, that all creative workers are freewheeling, independent, self-employed entrepreneurs in the Schumpeter I mould. Many creative workers share the loss of control over their daily work lives and the insecurity of employment and income facing workers in the Service Class, without the protection of industrial conditions afforded Working Class members of trade unions. Sweatshops may be reappearing in parts of the knowledge economy, like the animation and software development industries, particularly where some of the processes can be relocated to third world countries.

Florida's model explicitly raises the spatial dimension – where do the Creative Class locate and why? What implications do the answers carry for the relative economic prosperity of different regions? These important questions form the core of the following chapter.



# 05 The Spatial Dimension: Urban Form/ Creative Regions

It was naïve to imagine that the global reach of the internet would make geography irrelevant. Wireline and wireless technologies have bound the virtual and physical worlds closer than ever... Actually, geography is far from dead
(The Economist, 15 March 2003, p.13)

News of the death of geography is indeed much exaggerated. Space (location) matters. This is a major conclusion of the new economic geography and of the recent work of researchers like Florida. Cities that support thriving industry clusters are prospering in the new global economy. The economic benefits generated are diffused throughout the urban economy in a highly uneven fashion. A new space economy is emerging in globally connected cities like Sydney and Melbourne, driven by cluster formation and operation.

Particular areas within the metropolitan region are developing to support the sets of linked and complementary activities that define active industry clusters. Public and private investments in infrastructure reinforce the attractions of such areas for new cluster members. These investments are both general, in the sense that they benefit all businesses and residents, and focused on the specialised needs of key actors. Examples of the former include improvements to telecommunications networks and a new rail line; an example of specialised infrastructure support would be the creation of a research facility, such as a Cooperative Research Centre, linked to a particular industry sector and/or market cluster.

Cluster formation and growth is expressed 'on the ground' through the operation of urban property markets. Existing buildings and derelict industrial sites are recycled into new productive platforms and commercial uses. New commercial developments may encroach on existing residential areas, while vacant sites attract new construction and activity. Once begun, the spatial process of concentration becomes self-reinforcing as the advantages of co-location by existing and new cluster members strengthen.

This process is visible in inner-Melbourne, for example, in the case of food clusters that have transformed a number of dead and dying strip shopping centres and their immediate surrounds. Brunswick Street, Fitzroy and Victoria Street, Abbotsford are two cases in point, the latter catering strongly to Melbourne's Vietnamese community.

A broader and more complex process of urban redevelopment, dependent on the growth and co-location of several interlinked industry clusters, can be discerned in Sydney and Melbourne. What might be called a 'logistics corridor' is emerging in these two cities. In Melbourne's case it focuses on the port and around the new western ring road to the airport, containing manufacturing, warehousing, transportation and a host of support services. In Sydney a similar corridor runs from Mascot airport and Port Botany to the CBD. In both cases the long distance movement of goods is facilitated, linking the metropolitan region with national and international markets. Thus, the opening of Sydney's Eastern Distributor has halved travel times to the CBD, allowing traffic to avoid 17 traffic lights. Parallel heavy rail developments have further reduced congestion problems in Sydney's inner-south.

A second strategic cluster has strengthened its grip on the central areas of all the capital cities – viz. producer services, a major component of the advanced business services sector of the economy. 'It is the interconnection of finance, accounting, legal services, management consulting, and a range of linked activities that produce the critical mass elevating [for example] Sydney's regional position' (Daly, 1999, p.51). This cluster spreads across the Harbour through North Sydney to Chatswood and has established Sydney (along with Singapore and Hong Kong) as a second order (to Tokyo, New York and London) world city in the Asia-Pacific region. This producer services cluster also links closely to an emerging cluster of high-tech manufacturing firms located in the corridor running from the CBD to Chatswood and then bending westward through Ryde (Daly, Taylor and Clark, 1997). Is there an equivalent corridor emerging in Melbourne? If not, what infrastructure investments would encourage such growth? Completion of the inner ring road?

*In short*, what is happening is a process of internal (re)segmentation, with some areas of major metropolitan regions attracting the new growth industries, jobs, construction and linkages, while other areas stagnate or grow slowly along traditional lines. The inner cities have, during the 1990s, experienced particularly intense redevelopment pressures. In Sydney's case, between 1996 and 1998 (Daly, 1999, pp.51-2), more than three-quarters of new office construction in the metropolitan region was concentrated in the inner area, along with:

- a sixth of new dwelling commencements
- almost a third of all business activity

- more than 90 per cent of hotel construction
- 38 per cent of investment in education
- a third of total public investment

What these development patterns reflect and reinforce is a new emphasis on the importance of centrality for doing business in an era of globalisation and world cities. Location within the metropolitan region has become an important business asset because of the multiple sources of competitive advantage conferred by participation in appropriate industry clusters. This economic super-premium on location is also being reflected in and coming to drive housing markets. Workers and managers favoured by the new knowledge economy are choosing to locate closer to the centre as now conceived.

These inner urban newcomers are not the traditional 'gentrifiers' who upgraded the old Victorian housing stock in the 1970s. They are primarily interested in conserving time not nostalgic memories of nineteenth century streetscapes. The existing urban fabric, the buildings, scale, features and streetscape, are irrelevant. Far from being preserved, they are being pushed aside as disused factories, small commercial businesses and old homes are bulldozed to make way for new medium and high density residences and the large scale integrated shopping complexes and other facilities required to service the wealthy, image conscious newcomers. The childless single person and couple households who, in Sydney, line up to pay $800,000 for a moderately sized but well serviced apartment (according to *The Economist* magazine[4]) are winners in the knowledge economy. Similar outcomes are just as apparent in Melbourne, although at lesser scale.

Globalisation, then, is redrawing and intensifying the internal segmentation of our large cities, especially Sydney but also Melbourne. Previously unfashionable areas like South Sydney and Port Melbourne are attracting professionals, business executives, senior bureaucrats, and a range of well paid workers in financial services, advertising, human services and the media. For these groups, access to the city and key facilities like airports ('time proximity') is vital in maintaining their position in the dynamic and highly insecure economic environment. It also opens up opportunities for informal contacts and communication with like-minded people, as well as access to valued cultural and recreational resources.

Central location and apartment-style living reduces time lost in the traditional suburban pursuits of house maintenance and commuting; time which can be turned to the endless pursuit of gaining and maintaining position in the new economy. Strict

[4] Reported in a special survey of property markets in the OECD countries in the 31 May-6 June 2003 issue of The Economist.

divisions between work and leisure, workplace and home are blurring. Further time can be saved by carrying the office around and home, thanks to devices like portable computers and mobile phones, and by exercising in basement gyms and on tennis courts all thoughtfully provided within the confines of the new residential complexes.

At the other end of the income and employment scale, shop and restaurant workers, bus drivers, police and a long line of low paid service workers whose labour maintains the amenity of the redeveloped areas must move elsewhere, often commuting long distances back to work. Older, long term residents – denizens of an earlier economic regime - are also forced out, driven as much by the disappearance of familiar landmarks and memories as by rising rents.

In the case of Melbourne, since the mid-1980s, the inner suburbs have changed their residential composition significantly. Housing prices and rents have risen, on average, much faster than elsewhere in the metropolitan region. The average income of residents has also risen faster than average, reflecting the movement in of members of the Creative Class (Burke and Hayward, 2001; O'Connor and Healy, 2002; Dodson and Berry, 2003).

This highly uneven pattern of development is creating new and intense forms of *social division*, groups of urban 'haves' and 'have-nots' whose lives are increasingly segregated, raising major concerns of both an economic and social nature. If left unchecked they threaten the high degree of openness, tolerance and cohesion that has characterised Australia's multicultural urban life and which forms one necessary foundation of liveability and lifestyle so important to attracting and keeping footloose human capital. This, too, is a large challenge for strategic planning.

### 5.1 Creative Regions

Florida builds his analysis of successful regions on the point raised immediately above. Cities that have ethnically and culturally diverse populations with open and tolerant attitudes are attractive places for the Creative Class to live and work. Innovative high-tech industries and finance *follow* their lead and locate in such city regions to tap the creative capital already there. This adds to the diversity and economic opportunities in the region, attracting the influx of further creative workers in a 'virtuous circle' of growth.

> The same basic pattern can be found in almost every ... high-growth technology region. Before these regions were high-tech hotspots, they were places where creativity and eccentricity could be accepted and celebrated. Boston has always had Cambridge. Seattle was the home of Jimi Hendrix and later Nirvana and Pearl Jam, as well as Microsoft and Amazon.

> Austin was home to Willie Nelson and its famous Sixth Street music scene long before Michael Dell ever stepped into his now famous University of Texas Fraternity house. New York had Christopher Street and SoHo long before Silicon Alley [the new media cluster located on Manhatten; see chapter 7.2] erupted. All of these places were open diverse and culturally creative first. Then they became technologically creative and subsequently gave rise to new high-tech firms and industries (Florida, 2002c, pp.206-207).

Florida argues that the reasons given for the clustering of activities in space – i.e. the agglomeration and other economies noted in chapter 5, including those stressed by Porter – provide only part of the answer. For Florida '... the real force behind this clustering is people. Companies cluster in order to draw from concentrations of talented people who power innovation and economic growth. The ability to mobilize talent from such concentrations is a tremendous source of competitive advantage for companies in the time-driven creative economy' (ibid, p.220). Far from being irrelevant in the age of cyberspace, 'place' has become the central organisational unit of the economy, playing the role assumed by the large corporation in earlier times. Increasingly, innovation and productivity growth is being initiated and controlled by the activities and decisions of creative people and their managers, concentrated in a relatively small number of large and diverse metropolitan regions in the advanced capitalist nations.

Florida therefore proposes what he calls 'a theory of creative capital', to distinguish it from the conventional human capital approach. This '... theory says that regional economic growth is driven by the location choices of creative people - the holders of creative capital – who prefer places that are diverse, tolerant and open to new ideas' (ibid, p.223). Based on a series of interviews and focus groups, Florida argues that these places display a number of key features:

- *'Thick' labour markets*
  Larger metropolitan regions tend to have a diverse range of employment opportunities at each level of skill and remuneration. That is, the labour market is *horizontally* as well as vertically structured. Since, the average time creative workers spend in any one job and working for any one employer is falling – less than two years in many cases – working careers are increasingly horizontal. People move readily and regularly from one job to another at similar levels as well as 'climbing the ladder' to achieve higher rewards, status and power. Hence, creative workers are likely to look for and favour cities where the opportunities for frequent sideways movements are greatest. This, of course, imparts a further impulse for cumulative growth as well favoured regions attract more creative workers who attract more employers who increase employment opportunities still further.

- *Lifestyle*
  In focus groups and surveys run by Florida and others, creative workers place overwhelming emphasis on the importance of various lifestyle characteristics of their preferred locations. Cities with vibrant nightlife and music scenes, accessible recreation and leisure facilities, and 'a cool vibe' are powerful attractors for this group. Florida refers (impressionistically) to cases where creative workers chose their location in a particular city *before* looking for a job. The importance of lifestyle quality is underscored by the 'just-in-time' nature of work in the creative economy. The Creative Class work long and irregular hours and place a premium on their time. They need to be close to their favoured lifestyle pursuits, able to access them at any time of the day or night. Hence, these facilities and experiences must also cluster in the city region.

- *Social interaction*
  Cities have always provided places outside workplace and home for people to meet and socialise – so-called 'third places'. Creative (and other) workers increasingly face insecure lives in both the home and the workplace. High levels of separation and divorce and frequent job changes undermine the traditional sources of social stability and human interaction. The rise of one-person households and home-based work has further isolated some people. Third places like coffee shops, bars, bike paths, gymnasia and the like provide neutral meeting-grounds for acquaintances and strangers, spaces in which time-harried workers can relax, unwind and relate. Large cities are likely to provide a range of such facilities, often clustered into identifiable precincts, further enhancing their attraction to the Creative Class.

- *Diversity*
  Creativity (the capacity to contribute to the creative economy) is not limited to any particular social class, ethnic group or gender. Creative workers are as likely to spring from recent immigrant or minority groups as from members of the cultural 'mainstream'. "Like the diverse workplace, a diverse community is a sign of a place open to outsiders" (Florida, 2002c, p.227). Hence, a city that gathers a reputation for tolerance, acceptance and openness to different ethnic groups and people of different sexual orientations is much more likely to attract creative workers from those groupings than other cities. The residential clustering of particular groups define specific localities as 'home' for incoming members of those groups and provide the local economic and cultural base for mutually valued facilities, like retail and religious activities. The development of a Vietnamese district, Jewish quarter or gay community are examples of this process at work in cities like Melbourne. Diverse cities are also safe cities, places where strangers interact on equal terms. Florida quotes evidence that younger women say they feel safer living in gay neighbourhoods.

But diverse and tolerant communities also, Florida argues, send clear signals to all creative workers that this is a community likely to be open to new ideas, accepting of new lifestyles, supportive of their capacity to contribute economically and culturally. If this is true, then diversity has a double advantage in the new economic environment. It directly mobilises the talents of creative workers from minority groups and of women, and indirectly serves as a sign attracting all creative workers to the region in question. Florida (paraphrasing another urban commentator) argues that '... a great city has two hallmarks: tolerance for strangers and intolerance for mediocrity. These are precisely the qualities that appeal to the Creative Class – and they also happen to be qualities conducive to innovation, risk-taking and the formation of new businesses' (ibid, p.227). It could also be argued that in highly diverse environments, unusual and unexpected meetings may sometimes give rise to quite unexpected but very productive synergies.

- *Authenticity*
  Creative workers seem to prefer 'authentic' as opposed to manufactured urban experiences. By this, Florida means that these people value a mix of old and new, an organic growing together of urban neighbourhoods and districts in which heritage buildings and artefacts are conserved rather than swept aside in large-scale block redevelopments. Authenticity is also about *difference*. Unique local features are valued over mass-produced, standardised experiences and landscapes. For example, local street markets, cafes and second-hand stalls may be preferred to modernist shopping malls and franchised chain retail outlets like McDonalds or Starbucks. Urban design that accentuates randomness, mixed uses and chance meetings are preferred to what is seen as the 'sterile' sameness of carefully planned and arranged spaces. Particular cities and districts within cities may also develop their own peculiar 'audio identity' – a music or performing arts culture definably theirs. Cities that identify, protect and celebrate their differences from each other are, in this view, attractive locations for members of the growing Creative Class. This is more than an argument for urban heritage and cultural assets as potent weapons in the battle to attract tourists. A unique local constructed environment is even more important in attracting and keeping the creative locals who in the long term drive the region's prosperity. Authentic locales make perpetual tourists out of creative residents!

- *Identity*
  Florida, following others, argues that the traditional anchors of identity and belonging – the family, the company, the political party and (it might be added) the church – have lost their grip on the lives of many urban dwellers. In the age of super-professionalism sport may also be 'de-tribalising'. Attachment to place, to neigbourhood, city quarter and region may be becoming an increasingly important

source of stability and determinant of identity, especially for members of the Creative Class. Where you work rather than for who figures higher in the list of key factors influencing Florida's interviewees when they map out their career paths. Place conveys status. Places at the top of the pecking order – London, Los Angeles, New York, Paris – have long enjoyed pre-eminent status and continue to attract disproportionate numbers of people working in areas like new media and the cultural industries. Other places, like Glasgow, Milan, the San Francisco Bay Area and Seattle have carved out new niches in particular industry sectors like ICT, aerospace and fashion. A new urban pecking order is emerging, reflecting the locational and lifestyle aspirations of creative workers. How this maps onto the regional and national economies will be addressed below.

Together, these six factors defining the critical importance of location go to make up what Florida calls 'the quality of place' (as opposed to the earlier concept of 'quality of life'). Quality of place:

> ... refers to the unique set of characteristics that define a place and make it attractive. Generally, one can think of quality of place as having three dimensions:
>
> - What's there: the combination of the built environment and the natural environment; a proper setting for the pursuit of creative lives.
> - Who's there: the diverse kinds of people, interacting and providing cues that anyone can plug into and make a life in that community.
> - What's going on: the vibrancy of street life, café culture, arts, music and people engaging in outdoor activities – altogether a lot of active, exciting, creative endeavours (ibid, pp.231-2).

### 5.2 Quality of Place: Establishing the Pecking Order

Florida has developed and applied a number of indices to rank city-regions in order of their relative attraction to the Creative Class. Those cities that score highest on quality of place variables like diversity, creativity and authenticity rank at the high end. He finds, in general, strong positive correlations between cities at the top of this hierarchy and regions that are growing quickly (in regional gross product and employment), attracting high-tech industries, supporting high rates of innovation and, of course, capturing and keeping high proportions of creative workers.

He proposes the following specific indices:

- The *Creative Class index*: defined by the proportion of the region's total workforce employed in 'creative core' and 'creative professionals' occupations
- The *innovation index*: defined by the number of new patents registered in a region in a given time period per capita
- The *high-tech index*: defined by two factors; (1) the region's high-tech industrial output as a percentage of the high-tech output of the country as a whole; (2) the percentage of a region's total output that comes from high-tech industries compared to the national average
- The *gay index* (also called the *diversity index*): defined by the proportion of same-sex couples in the nation who live in a region divided by the proportion of the national population who live in that region. A ratio greater than one means that gay people are over-represented in the region; a ratio less than one implies under-representation
- The *bohemian index*: defined by the proportion of artistically creative people (e.g. actors, painters, performers, film makers, writers, etc.) in the nation who live in a region divided by the proportion of the national population who live in that region. A ratio greater than one means that 'bohemians' are over-represented in the region; a ratio less than one implies under-representation
- The *talent index*: defined by the region's share of people with an undergraduate university degree or higher
- The *melting pot index*: defined by the region's relative share of foreign-born people

In addition, Florida offers two composite indices:

- The *composite diversity index*: combining the three equally weighted primary indices – the gay index, the bohemian index and the melting pot index
- The *creativity index*: combining the four equally weighted indices – the innovation index, the high-tech index, the gay index and the creative class index

Florida ranks 288 regions in the United States against each of the above indices. Table 1 presents Florida's rankings of regions with greater than 1 million people, using the indices outlined above (excluding the composite diversity index). The top ten regions listed in rank order against the composite creativity index are also ranked on the underlying and other indices applied to the entire set of 288 regions.

Table 1: Ranking Large U.S. Regions in the Creative Economy

| Region | Creativity Index | Creative Class | Hi-Tech Index | Innovation Index | Gay Index * | Melt Pot Index | Talent Index | Bohemian Index |
|---|---|---|---|---|---|---|---|---|
| San Francisco | 1 | 12 | 1 | 5 | 1 | 4 | n/a | 5 |
| Austin | 2 | 7 | 13 | 6 | 23 | n/a | 9 | n/a |
| San Diego | 3 | 30 | 14 | 13 | 4 | n/a | n/a | n/a |
| Boston | 4 | 6 | 2 | 12 | 41 | 8 | 5 | 4 |
| Seattle | 5 | 20 | 3 | 34 | 11 | 16 | n/a | 7 |
| Raleigh-Durham | 6 | 5 | 16 | 8 | 52 | n/a | 2 | n/a |
| Houston | 7 | 22 | 19 | 39 | 16 | n/a | n/a | n/a |
| Washington-Baltimore | 8 | 4 | 5 | 85 | 18 | 14 | 4 | 13 |
| New York | 9 | 25 | 15 | 54 | 20 | n/a | n/a | n/a |
| Dallas | 10 | 55 | 6 | 40 | 15 | 17 | n/a | 15 |

* 'Diversity Index'. Note: n/a – not available. Source: Florida [2002c, p.246, p.251, p.254, p.256]

A cursory glance at Table 1 conveys what Florida's detailed statistical analysis confirms: viz. city-regions that rank highly on one index tend to rank highly on most, if not all, indices. If, for example, one is searching for a powerful predicator of where high-tech industry is locating, then Florida's analysis shows that the gay index is the best bet. The correlation between these two indices for large regions is 0.72. This relationship has strengthened over the past 40 years, suggesting that diversity may convey compounding advantages on regions attractive to high-tech producers and their support chains.

The National Institute of Economic and Industry Research (NIEIR) has applied Florida's index approach to its regular study of the economic health of Australia's regions carried out for the Australian Local Government Association (NIEIR, 2003). The metropolitan centres are divided into sub-regions for this exercise. Table 2 summarises this study's rankings with respect to the greater metropolitan regions of Melbourne and Sydney. Each sub-region is compared against Florida's indices in terms of (a) its rank against all Australian regions surveyed and (b) its rank against U.S. city-regions.

Table 2: Ranking the Sydney and Melbourne Regions Against Creativity Indices

| Region | Creativity Index | | Innovation Index | | Hi-Tech Index | | Diversity Index | | Bohemian Index | | Melting Pot Index | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Au | U.S. | Au | U.S. | Au | U.S. | Au | U.S. | Au | U.S. | Au | U.S. |
| Global Sydney | 1 | 6 | 2 | 54 | 1 | 24 | 2 | 1 | 1 | 5 | 3 | 1 |
| Sydney Inner West | 6 | 58 | 6 | 164 | 10 | 86 | 3 | 1 | 3 | 6 | 2 | 1 |
| Sydney Mid West | 11 | 128 | 22 | 238 | 4 | 53 | 14 | 46 | 13 | 133 | 1 | 1 |
| Sydney Outer North | 9 | 130 | 10 | 164 | 5 | 56 | 38 | 253 | 5 | 57 | 11 | 2 |
| Sydney Outer South West | 39 | 268 | 37 | 259 | 25 | 246 | 40 | 261 | 51 | 210 | 20 | 8 |
| Sydney Outer West | 17 | 209 | 30 | 243 | 21 | 225 | 12 | 43 | 30 | 166 | 23 | 12 |
| Sydney South | 18 | 212 | 13 | 201 | 16 | 160 | 31 | 193 | 28 | 162 | 13 | 3 |
| | | | | | | | | | | | | |
| Melbourne Inner | 2 | 7 | 1 | 49 | 2 | 33 | 1 | 1 | 2 | 5 | 8 | 2 |
| Melbourne East | 10 | 136 | 11 | 196 | 3 | 45 | 32 | 208 | 7 | 91 | 12 | 2 |
| Melbourne North | 12 | 144 | 33 | 248 | 6 | 71 | 11 | 33 | 11 | 126 | 9 | 2 |
| Melbourne South | 8 | 105 | 9 | 164 | 11 | 91 | 7 | 18 | 4 | 44 | 10 | 2 |
| Melbourne West | 14 | 178 | 36 | 259 | 7 | 71 | 22 | 105 | 15 | 137 | 5 | 2 |
| Melbourne Westernport | 23 | 239 | 21 | 238 | 12 | 96 | 39 | 262 | 24 | 150 | 14 | 3 |

Note: in each column, the first figure is rank within Australia, the second figure is rank against U.S. regions.
Source: NIEIR [2003, Appendix 5].

A number of interesting points emerge from a consideration of Table 2.

1. Global Sydney – comprising the CBD, Lower North Shore, the Eastern Suburbs and the Inner South – ranked highest of all Australian regions on the composite creativity index, followed by Melbourne Inner (comprising the CBD and suburbs to the immediate north, east and south). Both these regions scored at the top or near-top of all the individual indices. In addition, the NIEIR study found that these two sub-regions had very high concentrations of members of the Creative Class – 37.9% of the workforce in the case of Global Sydney and 37% in the case of Melbourne Inner. This degree of

concentration is very similar to the three top ranking U.S. regions, Washington D.C (38.4%), Raleigh-Durham (38.2%) and Boston (38%). The comparison is slightly less close when looking only at 'the super-creative core' of the Creative Class. Both the Australian sub-regions have one-eighth of their workforces in this category, which would place them eleventh on the U.S. scale.

2. Melbourne South and Sydney Inner West also ranked high on the creativity index, just after the central areas of the smaller capitals, Perth, Adelaide and Brisbane.

3. Global Sydney and Melbourne Inner rank at or near the top of all the indices for Australia.

4. The core regions of Australia's largest cities rank very highly against U.S. regions on the diversity, melting pot and bohemian indices. In fact, Melbourne Inner and Global Sydney have a greater concentration of gay couples than any U.S. region, while Sydney would again top the melting pot index with Melbourne second. Other parts of these two Australian metropolitan regions would also rank highly on these indices in comparison with U.S. regions. For example, all Melbourne sub-regions (with the exception of Westernport) have higher proportions of foreign born residents than all but one U.S. region – i.e. higher than cities like Chicago, Los Angeles, San Francisco and Boston. Global Sydney and Melbourne Inner rank higher than all but four U.S. regions on the Bohemian Index.

5. However, when considering innovation proclivity and the support of high-tech industries, Melbourne and Sydney slip down the U.S. ladder. Only Melbourne Inner makes the top 50 on innovation. Global Sydney does best on the high-tech index but still ranks below 23 U.S. regions. Elsewhere in the metropolitan regions only Sydney Mid West and Melbourne East figure significantly on the U.S. high-tech index. No other Sydney or Melbourne sub-regions (or any other regions within Australia) appear prominently on the U.S. innovation index.

Florida argues that the drivers of regional development have been reversed. No longer are large high-tech firms choosing to locate in regions for a variety of cost-related factors, which then acts as a magnet attracting key workers to follow in search of employment. His theory of 'creative capital' holds that creative workers choose where to live and work on a variety of lifestyle factors and *this* attracts high-tech firms to follow. Testing his theory, both Florida and NIEIR find statistically significant correlations between the high-tech index and other key indices. Table 3, drawn from the NIEIR study, summarises this point.

Table 3: Correlations between Creativity Indices, Australia and the United States

| | Bohemian Index | Melting Pot Index | Talent Index | Diversity Index | Composite Diversity Index |
|---|---|---|---|---|---|
| **High-Tech Index – Australia** | 0.80 | 0.61 | 0.73 | 0.74 | 0.72 |
| **High-Tech Index – United States** | 0.62 | 0.43 | 0.72 | 0.77 | 0.68 |

Source: NIEIR [2003, p.6.23].

In general, the correlations are higher in the Australian case. Whereas the highest correlation to the high-tech index in the U.S. is with the gay (diversity) index, in Australia it is with the bohemian index. That is, in Australia, areas where high-tech industries are located also display very high concentrations of artists, writers, scientists, media workers and the like – though, of course, this does not necessarily imply a causal relationship either way.

What is clear from the correlations and rankings discussed above is that Global Sydney and Melbourne Inner are quite different from other parts of their metropolitan regions. NIEIR's nation-wide review also demonstrates how different these two sub-regions are from all other Australian regions (though somewhat less so with respect to the cores of the smaller mainland capital cities). Central Melbourne and Sydney are, as argued earlier (Daly, 1999) tightly connected to the global economy. In the case of Melbourne, O'Connor and Healy (2002) suggest that the inner region is being 'lifted out of' or partly disconnected from the metropolitan economy, increasingly connected by flows of capital, information and key workers to other regional cores like it in the global economy, with radical implications for segmented labour and housing markets in the city at large. What is most suggestive from the mapping exercises of Florida and NIEIR, in the context of the present study, is that innovation is an ongoing activity that tends to strongly cluster in space, notably in particular parts of a small number of large city-regions that are linked across the globe. Australia's largest cities, Sydney and Melbourne, figure here but only as second-order nodes in a global economy of 'World Cities' located in North America, Europe and North East Asia (Sassen, 2000, 2002; Smith and Timberlake, 2002).

### 5.3 Porter's U.S. Analysis

Porter (1998a, p. 227) argues that a growing region depends on a relatively small number of successful clusters that tend to be 'outwardly oriented.' Such clusters are not constrained by the current size and growth of local markets but export goods and services to a range of markets in other regions. Locally oriented industries like construction, assembly plants and sales offices may be subsidiary parts of global chains but are essentially dependent for growth opportunities on the level of success of the exporting clusters. "The outward-oriented clusters based in a geographic area constitute the area's primary *long-run* source of economic growth and prosperity" (ibid, p.228). In this view, Porter follows the influential arguments of Jane Jacobs (1969, 1984).

Porter also argues that clusters tend to reflect a *spatial division of labour* at the sub-national scale with particular clusters locating in those regions that offer the best mix of natural and humanly produced advantages for their particular businesses. The more advanced the national economy, he suggests, the more likely that a dispersed but specialised pattern of cluster location will emerge and intensify. This process is reinforced by well-developed transport and communications infrastructure within national boundaries, clear and consistent political jurisdictions and rules, and sophisticated financial intermediation. Porter also points to the greater willingness and capacity of regional and local government agencies to work at attracting and keeping new industries that may coalesce into clusters (in relation to both national governments in the developed world and all governments in developing countries). Conversely, he observes that developing economies are much more likely to see all or most investment and economic growth concentrated in one or a few major metropolitan regions, in part because the pre-conditions noted for advanced economies – e.g. good, efficient internal transportation – do not exist, but partly also because central government dominance, restrictions and cronyism are likely to starve other regions of effective development opportunities. The lesson Porter draws is: "(a)n economic geography characterised by a number of metropolitan areas, each specialising in an array of clusters, appears to be a far more productive industrial organisation than one based on one or two huge diversified cities" (ibid, p.236). It is not clear whether this conclusion holds for smaller economies like Australia facing intense international competitive pressures from firms located in larger economies enjoying a considerable head start.

In this light, Australia would appear to occupy an anomalous position; it is an advanced industrial country characterised by a very high degree of metropolitan primacy[5]. In Victoria, Melbourne accounts for around 70 per cent of the state's population and

[5] Porter (ibid, p. 236) also mentions Japan as an exception here, pointing to the super-concentration of industrial production in Tokyo and Osaka, concluding that: "(t)he Japanese case illustrates vividly the major inefficiencies and productivity costs resulting from such an economic geography .... Addressing its pattern of economic geography is a major policy issue facing Japan."

Gross State Product and an even higher share of industrial value added. Already by the end of the nineteenth century, Australia displayed a polarised size distribution of urban centres; an incompletely articulated urban hierarchy that saw the virtual absence of middle-sized centres so prevalent in areas of new settlement like the United States and even other British Dominions like Canada. Melbourne, as in the case of the other mainland state capitals, has come to dominate its hinterland. Historical factors like the manner in which the separate crown colonies were settled and grew in the nineteenth century clearly provide part of the explanation for our unique development history, as does the importance of those cities as seaports in the export of commodity staples to the Northern Hemisphere. In the twentieth century, deliberate government policies in relation to industrial protection, overseas immigration, the location of government agencies and functions, and physical infrastructure provision have all reinforced the dominance of the capital cities. However, if Porter is correct, this pattern of spatial development may be increasingly irrelevant or even inimical to economic success in the new world of competition. Selective decentralisation of cluster-based activity – in this case, away from Melbourne towards, for example Geelong, Ballarat, Bendigo and up the Hume Highway corridor – may emerge naturally out of the competitive search for advantage in the new global economy. The key policy question here is: are there sensible ways in which government can facilitate a more productive spatial pattern of cluster specialisation? In particular, what role does infrastructure investment and management play in achieving such an outcome?

There are two other features of industry clusters stressed by Porter. First, as suggested above, sets of clusters may overlap functionally in ways that create further positive externalities for all participants. New business opportunities may become apparent across cluster groups as specialised information and experiences are exchanged between a larger number of linked enterprises. Developments in one cluster may spark advances in other related clusters. For example, in the case of Massachusetts, the recent growth of new services like telemedicine and online medical consulting has stemmed from the interaction of firms forming what might be described as the health, information technology and knowledge creation clusters. An important point to note here is the idea of a functional intersection of clusters. This may or may not also entail a spatial intersection or 'clustering of clusters'. In the example given, the intersection does have a strong focus on Boston. However, as long as internal communications linkages are strong, intersections may extend across space, also cross-cutting municipal, state and even national jurisdictions, if the constraints of time proximity allow.[6]

[6] Porter's example here is the chemicals cluster that stretches from Germany into the German-speaking region of Switzerland. Cross-national linkages are more likely to emerge where distances are short, and where the language spoken, legal systems and other economic institutions are common or at least compatible. The notion of 'virtual networks', addressed by Cooke et al. (2002), noted above, is relevant in this context.

Second, clusters can work for all firms, not just those reliant on high-tech methods and products. The benefits of cluster formation inhere more in the organisational form – in the incentives and opportunities for exchange, mutual learning and innovation – than in the technology. This also suggests that the prevalence and potency of increasing returns – the cost and productivity advantages of getting there first – have as much or more to do with strategic location and the often unexpected generation of positive 'spillovers' as the scale of operation. The fact that clusters-driven growth is *not* confined to particular industries nor technologies has very important implications for government policy. In particular, narrowly conceived policies focused on particular sectors or regions are unlikely to work.

Porter's research team at the Institute for Strategy and Competitiveness, Harvard University, has embarked on an ambitious 'Cluster Mapping Project' of all regional economies in the United States. 'The purpose of the Cluster Mapping project is to assemble a detailed picture of the location and performance of industries in the United States, with a special focus on the linkages or externalities across industries that give rise to clusters' (www.data.isc.hbs.edu/isc/index.isp). The data used to map clusters are employment numbers and wage levels for industries based on the official U.S. Census Standard Industry Classification categories. Innovations, defined by patents lodged, are allocated to industries and clusters by the residential location of the inventor/patent owner. Industries are divided into 'local' and 'traded'. The former are spread widely across all regions and sell primarily to local markets. Traded industries are concentrated in a relatively small number of regions and sell to a broad range of other regions. Clusters are determined statistically by correlating industry employment across regions. Those industries located near each other are assumed to do so in order to reap positive externalities and so are held to form functioning clusters. This statistical analysis is carried out at various geographical scales, from state-wide down to metropolitan. A particular industry can be part of more than one cluster, given the tendency for clusters to cluster. The approach is described in the following terms:

> Clusters are constructed using two principles. First, select a prominent 'core' industry in a field or part of the economy. Calculate the locational correlations of all other industries with the core. Those industries with statistically significant correlations with the core define the extent of the cluster. Second, calculate locational correlations between all pairs of industries in a general field and potentially related fields. Those sets of industries with statistically significant and substantial intercorrelations among each other define the cluster. In both cases some industries may have spurious correlations to a cluster because of co-location of several strong clusters in the same geographic area. Spurious correlation is eliminated using Input-Output tables, industry definitions and industry knowledge (ibid, p.236).

Associated with the Cluster Mapping Project, Porter (2001) has carried out a detailed nation-wide study of innovation in key clusters and regions – *Clusters of Innovation: Regional Foundations of U.S. Competitiveness* – for the Council on Competitiveness. The innovation indicators used for each cluster were:

- Patents – the number of patents and patents per worker employed
- Establishment growth – the growth rate of new businesses
- Venture capital investment – the value of venture capital invested
- Initial public offerings (IPOs) – the number of new companies listed on the stock exchange
- Fast growth firms – the number of firms on the Inc.500 list of fastest growing firms in the national economy

The innovation outcomes of identified clusters in particular regions were then compared to standard indicators of regional economic performance – e.g. employment growth, average wages and growth in wages, unemployment, etc. In general, there are strong intercorrelations found between the presence of traded clusters (i.e. industry clusters exporting to a broad range of regions) and high regional economic performance (see the comparisons in Table 4). Clusters like financial and business services,

Table 4: Comparisons of Economic and Innovation Performance, United States, 1999

| Performance Measure | Traded Clusters | Local Clusters | Natural Resource-Driven Industries |
|---|---|---|---|
| Share of Employment | 32.1% | 67.1% | 0.8% |
| Employment Growth: 1993-1999 | 2.5% | 2.8% | -0.1% |
| Average Wage | $41,678 | $26,049 | $31,264 |
| Relative Wage | 134.0 | 83.8 | 100.5 |
| Wage Growth | 5.0% | 3.8% | 2.5% |
| Relative Productivity | 144.1 | 79.3 | 139.5 |
| Patents per 10,000 Employees | 20.48 | 1.38 | 6.40 |

Source: Porter [2001].

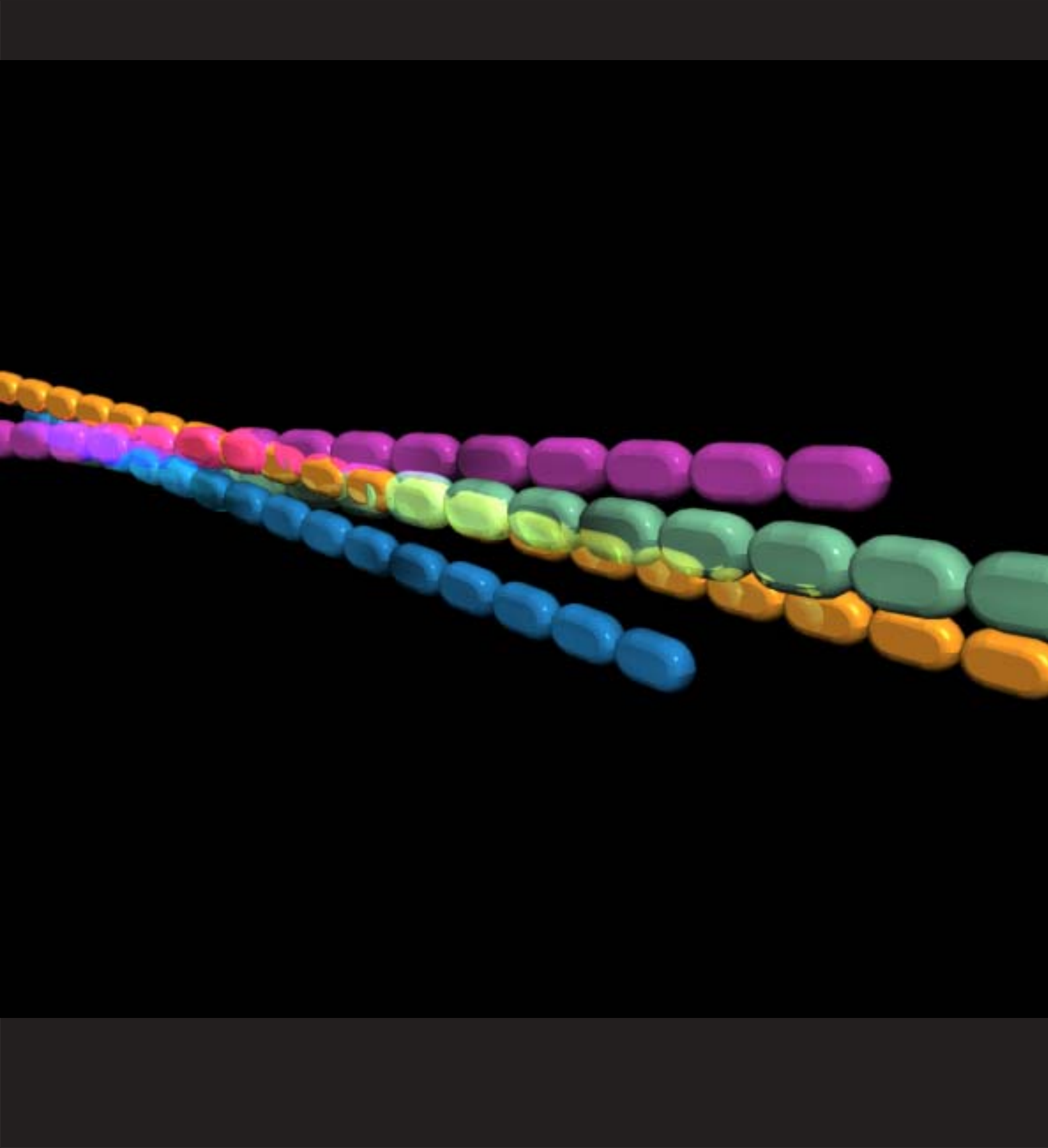
information technology, communications equipment and aerospace industries rank at the top of the economic performance table, as do pharmaceuticals and biotechnology. It is precisely the former clusters (along with entertainment as a middle ranking performer in Porter's study) that, to varying degrees, utilise or feed into the emerging digital design domain.

The Porter study's detailed analysis of five regional centres – San Diego, Wichita, Atlanta, Pittsburgh and the Research Triangle in North Carolina – illustrates the staged manner in which these regions developed on the back of the high performing traded industry clusters noted above. The *key lessons* here appear to be:

- Successful and innovative regions take time to grow – several decades to reach full 'take off'
- Narrow jurisdictional definitions of regions are often a barrier that need to be overcome – innovation and strong growth occur in a broad regional frame
- Success depends on the identification and enhancement of unique assets and advantages that create new competitive advantages in some clusters that, over time, spread to other clusters in the region
- Policies that concentrate on supporting a few clusters in a region is a risky strategy: it is far better for a development strategy to encompass a wide range of clusters and encourage overlapping cluster development in the region
- Concentration on high-tech clusters alone is likely to fail – such industries and their linkages account for too small a proportion of the regional economy to make a real difference; innovative capacity and outcomes need to be built into many clusters within the region
- Key factors influencing the successful creation of innovative regions are: the level of natural factor endowments; government policies and support; the quality of civic leadership; entrepreneurship; and the possession within the region of specialised assets
- Universities and specialised research institutions are the key drivers of innovation in most successful regions, whereas a strong compulsory education system (up to year 12) and economic infrastructure facilities are essential baseline requirements
- Effective mechanisms for the commercialisation of innovation are essential to strong regional economic outcomes
- Access to specialised talent (Florida would say, creative class members) and training facilities are more important than the presence of abundant labour supplies

- Government policies and actions can have a significant impact – for good and ill – on innovation outcomes. Lack of coordination between government agencies, within and between jurisdictions, can be a major barrier

Porter's ambitious and path-breaking cluster mapping and innovation studies provide a wealth of information on the dynamic linkages that drive regional development in the United States. For the purposes of this study, focused on design and the digital economy, however, his categorisation of industry clusters is not particularly helpful. We attempt in chapter 7 to reach a more useful definition of design-relevant clusters, nevertheless drawing on the work of Porter, Florida and others, discussed earlier. This conceptual frame will be applied subsequently in the larger project, noted in chapter 1, in order to identify and analyse cluster development in the Victorian economy, with particular reference to the digital design domain.



# 06 National Systems of Innovation

The concept of industry clusters, discussed earlier, has been generalised to refer to *the overall institutional context* within which innovation unfolds in the national economy. The analysis of 'National Innovation Systems' focuses attention on the economic, cultural and political conditions that systematically constrain and steer the innovative activities of individual firms within and without industry clusters, in particular national economies. The term was introduced in the late 1980s by Nelson (1988), Lundvall (1988) and Freeman (1988) (see also: Dosi [1999] and the contributions to: Edquist [1977]; Bryant and Wells, [1998]). Each country, in this view, develops a characteristic and, to a degree, unique innovation system that reflects the particular historical set of forces integrating its economy into the global economy.

> The institutions making up a nation's innovation system include not only individual firms (of varying size), but also supporting organisations and agencies in both the private and public sectors, *and* the incentive structures and behavioural norms that determine how efficiently new knowledge is generated and disseminated throughout the economy.

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> The core elements of innovation *systems* are therefore constituted by a country's institutions, organizations and the resulting inter-relationships that come into play in the production, diffusion and use of new and existing economically useful knowledge. The elements of the system include the innovation activities carried out by institutions of government and other public-sector bodies, notably universities and other science-intensive institutions, and the different players in the private sector. Innovation is both more frequent and better managed, leading to more substantial competitive advantage, when the elements of the broader environment surrounding firms' activities are well articulated into a system of information-sharing than

> in situations where each element works largely in isolation (Marceau, 2001, p.149; italics in original).

> ... innovation involves much more than R&D, and the set of institutions that influences the technological capabilities of a nation and how these are advanced extends far beyond those that directly impinge on innovation. The character and effectiveness of a nation's system of schooling, training, and retraining not only determine the supply of skills from engineer to machine tender, but also influence the attitudes of workers to technical advance. So too do the patterns of labour-management bargaining and negotiation, dispute resolution, and the degree of mutual commitment of firm and workers. Financial institutions, and the way firms are governed and controlled, profoundly influence the technical activities that are feasible and that managers choose to undertake (Nelson and Rosenberg, 1993, p.13).

The key determinants of the success of a national innovation system in encouraging innovation on the ground include:

- the number, density and quality of the linkages established between and within industry clusters
- the efficiency with which information is gathered and processed into market-relevant knowledge and transmitted through the linkages created
- the incentives created within the firm to collaborate and learn through R&D and other activities
- the strength of external competitive pressures placed on individual firms, especially by government regulation, international forces and the demands of knowledgeable customers
- the degree to which popular attitudes support risk-taking, productive change and progressive improvement in economic tasks in the economy

It should now be clear why innovation systems are characterised as *national*. The nation state is the political and constitutional jurisdiction within which the drivers listed above most coherently operate. In spite of the 'globalisation' of economy and culture during recent decades, national governments still exert considerable influence on the operations of industrial and financial firms, even those large multi-national enterprises that operate in many different countries (Nelson and Rosenberg, 1993). The national government wields the policy levers that in part determine the shape, coherence and effectiveness of the innovation system, as defined. For example, the national government is normally:

- the basic guarantor of legal order and security, the platform on which all economic activity ultimately rests
- the dominant taxing power
- the prime regulator of international economic flows, through foreign exchange, investment and trade policy
- guarantor of the currency and the integrity of the financial system through the reserve powers of the central bank
- the largest purchaser in the economy through its provision of a range of 'public goods' (e.g. defence, customs) and 'merit goods' (e.g. education, R&D, health)
- regulator of industry structure, conduct and competition through anti-monopolies legislation, corporations law and the like
- regulator of labour relations and conditions
- responsible for both the macroeconomic management of the economy in pursuit of high levels of economic activity and growth and provider of a social security system or safety net for people who fall outside the mainstream economy by virtue of age, infirmity, inappropriate skills or misfortune

Marceau (2001, p.151) thus stresses:

> ...the continuing importance of policies in place in the home nation because these are the basis of institutional and practical arrangements pertaining in the innovation systems most relevant to firms' activities. Such policies include labour market, intellectual property, education and training, R&D and regulatory arrangements and frameworks, and policy making capacity.

In this context, Smith (1998, p.18) highlights two factors differentiating the broad institutional environments between countries that influence innovation processes:

> Firstly, there are persistent variations in systems of governance: both in the sense of formal regulatory systems of corporate governance, and more broadly in the sense of rules of the game for corporate behaviour.... Secondly, many countries construct and maintain quite specialised technological capabilities, reflected in patterns of R&D expenditure, patenting, scientific publication and so on ... such that firms appear to develop competencies and capabilities within specific national contexts, even where they are multinational in terms of production and operations...

Smith also distinguishes two main trends in the study of national innovation systems, each stemming from the pioneering work of two of the initiators noted above. The first approach follows Lundvall's (1988) account of innovation occurring through the co-development (i.e. co-evolution) of learning processes and competitive specialisations resulting in new, unexpected and unplanned for opportunities. The second tradition draws on Freeman's (1988) account that stresses deliberative decision-making by governments, industry actors and others within specific institutional frames and sets of rules. Both approaches, however, target education and training (and the role of tacit as well as formal knowledge) as central to successful innovation trajectories within countries. Smith argues that the two approaches are not mutually exclusive but do highlight different systemic drivers of innovation and point to somewhat different policy imperatives for government.

In federations, such as Australia, lower levels of government - particularly at state or provincial level – share some of the key tasks and responsibilities listed above. This suggests that nested within the national innovation system are regional and sub-regional innovation systems. '(The) institutional context in which firms work can be viewed as national, regional and local, or existing at sectoral levels. Each one can usefully be viewed as a system of rules, institutions and inter-organisational interactions' (Marceau, 2001, p.148). This suggests that state government agencies in Australia have a significant potential impact – for good or ill – on the nature, rate and outcomes of innovation within the state and metropolitan economies. 'Getting the policy settings right' – e.g. establishing a 'smart infrastructure' grid, adequately funding R&D, playing a leadership role in the dissemination of strategic market information or providing well-targeted, timed and calibrated subsidies – will assist positive innovation outcomes in the jurisdiction in question.

Notwithstanding the argument made in an earlier quote, much of the research carried out into national innovation systems over the past decade has narrowly focused on government's role in directly stimulating research and development, through tax or cash subsidies to industry and by expenditure and directives to educational institutions, notably universities and specialist research institutes. The theoretical basis for this support resides, as noted in chapter 2.1, in the notion of 'market failure' – the idea that, if left to themselves, individual private firms would under-invest in R&D, since they are each unable to capture all the benefits of such activities. For example, firms that invest in the specialised skilling of staff and development of new production techniques risk losing the competitive advantage created if and when key workers leave and work for other firms. In this situation where some of the benefits of R&D investment are 'public' or exist as positive spillover benefits to third parties, there is a role for government to ensure that firms collectively do not under-invest because they can't internalise all resulting benefits and may look to 'free-ride' off the investments of others. Governments at all levels in the advanced industrial countries have therefore become

major investors in R&D activities within their jurisdictions over the past century, especially since World War II.

R&D in many industries has become increasingly dependent on the application of scientific knowledge to technical processes, resulting in new products and new industries – like electrical equipment and commercial dyes in the nineteenth century, biotechnology and information technology into the twenty-first century. However, even in such obviously science-based industries, the causal relationship is rarely linear. At many points in industry development and new industry creation, technique drives science – i.e. the practical market-driven need to overcome barriers and improve quality, reliability and functionality of existing products and processes stimulates scientific exploration and discovery (Nelson and Rosenberg, 1993, pp.6-8). In some cases major strides cannot be achieved in identifying and meeting market demands until appropriate new business models are developed and introduced - an example here is the recent explosion of e-commerce that is changing the way that some established industries, such as book retailing, go about their core business activities while opening up opportunities to piggy-back other products (music products, etc.). Even in high-tech industries much of the investment in bringing new products to market lies outside the narrow definition of R&D:

> It is insufficiently appreciated that successful innovation in high technology industries often is not so much a matter of invention, as a patent examiner would define invention, as it is a matter of design, in the sense of trying to devise a product or process that will achieve a desirable cluster of performance characteristics, subject to certain cost constraints (ibid, p.8).

The role of design in achieving continuous improvements in performance outcomes within existing technological paradigms is likely to be at least as central in the case of non-high tech industries.

Drawing on the contributions to Nelson and Rosenberg (1993), some of the key elements characterising the national innovation systems of (selected) large OECD countries and Australia are summarised below.

### 6.1 United States

Mowery and Rosenberg (1993) identify three defining characteristics of the U.S. innovation system in the early 1990s.

- the enormous scale of R&D investment and the strategic role of the Federal Government in R&D funding

- the critically important role of small, start-up firms in the commercialisation of new technologies
- the facilitative role of the Federal Government in relation to: (1) anti-trust or competition policy and (2) military R&D and procurement

Quite clearly, these three drivers interacted over a long period to help produce the strong and globally dominant American industrial paradigm. Industrial R&D – i.e. the growth of independent R&D capacity within larger firms and specialist private agencies – emerged as a powerful factor in industry development from late in the nineteenth century gathering pace in the twentieth, in part in response to the stringent application of the Sherman anti-trust Act. Excess profits were less likely to come from price-rigging and other anti-competitive activities and to be more dependent on technologically driven innovations that could legally be protected through patenting. In the second half of the twentieth century booming industrial R&D was also underpinned by escalating Federal defence expenditures. Defence, of course, also drew a rapidly growing direct investment by the Federal Government in R&D, complementing and, in some cases dwarfing, industrial R&D. Mowery and Rosenberg (1993) argue that government R&D was initially driven much more by concerns over national security than by any strategy tied to boosting national economic growth. The other main conduit for government R&D has been funding provided directly to universities and other research agencies, public, semi-public and private, particularly to support basic scientific research on which many new technologies have depended. Some state governments have also provided significant levels of R&D support, especially in agricultural and natural resource development areas related to their local economic bases. In all, these forces have lead to a situation where total R&D (public and industrial) in the U.S. currently exceeds total R&D in all of the other OECD countries combined.

Historically, and especially over the past 20 years in what is called 'the information age', many major innovations and their applications have been pioneered by small firms and start-up firms, although their full commercialisation and introduction to the market may have been engineered by larger established firms behaving as 'close followers'. The most spectacular examples of this phenomenon are offered by the ICT and bio-technology fields where successful start-ups have grown quickly to establish and dominate a new technological paradigm – Microsoft is only the most dramatic case here. This suggests that the institutional context, embedded incentives and rule structures prevalent in the United States is particularly conducive to the recurrent appearance, efficient selection and rapid growth of new, smaller enterprises. Apart from broader cultural orientations favouring individualism and celebrating entrepreneurialism and ready access to the largest domestic market by purchasing power, a more prosaic factor may be the fact that the U.S. has developed the world's

most sophisticated financial system with a buoyant venture capital market and equity markets in general.

Mowery and Rosenberg (1993, pp.52-61) argue that the 1980s was a watershed in the U.S. innovation system. Productivity decline in the national economy and rapid growth in the Asian economies lead by Japan gave rise to the notion of 'convergence' – the process by which the other advanced industrial nations were 'catching up' with the United States, both in terms of productivity levels and per capita GDP (living standards). Technological transference and America's growing trade deficit were supposedly levelling the economic playing field. The corporatist model of development driving Japanese capitalism was widely believed to be outperforming the neo-liberal Anglo-American model. Globalisation of industries like automobiles in which the U.S. had long been world leader posed new competitive threats to sectors of domestic industry. The pronounced and seemingly permanent balance of payments surpluses run up by Japan was turning that country into the world's largest foreign investor and its banks into the largest global operators. From being the world's largest creditor nation in the 1970s, the U.S. went to being the largest debtor in the 1980s.

Among other responses to the perceived international challenges, U.S. industry and government policy refocused on R&D as a critical economic driver, underpinning the search for productivity enhancing technological improvements. This effort involved the resurgence of industry-university research collaborations and, under the spur of general government funding constraints, a much greater involvement of universities in the 'D' part of R&D, including the full commercialisation of intellectual property generated by the research activities. Government research priorities were more clearly articulated and brought into alignment with industry development goals. Government also enacted new rules protecting intellectual property and international trade policy aimed at increasing the domestic economic returns to R&D investment. Mowery and Rosenberg also point to the growing trend towards collaboration between U.S. firms, universities and foreign firms in research and development – the internationalisation of the innovation process.

These authors also suggest that the dynamic and dominant role of start-up companies may be on the decline. The increasing entry cost to high-tech industries, in particular, is making firms much more dependent on gaining access to the venture capital market, which favours firms with a track record and existing equity base. Allied to this, new start-ups are more likely to be acquired by larger established firms on the search for an expanded or new market position. In addition, a rethinking of anti-trust regulations to ensure that the impact of competition policy does not stifle investment and innovation in an increasing returns world (see chapter 2.2) may provide a less favourable economic environment for SMEs to prosper, at least in the core industries of the new economy.

In terms of the earlier discussion, this implies a move from the Schumpeter I to Schumpeter II model of innovation.

It is somewhat ironic to reflect that much of the U.S. debate and many of the policy responses during the 1980s were sparked by increasing concerns that American capitalism was on the wane, soon to be overtaken by Japan. In fact, the 1990s has seen a dramatic reversal of fortunes. U.S. capitalism boomed throughout the entire decade and the domestic stock market went on one of the longest bull runs in history. A new financial asset class and stock exchange emerged to trade equity in 'new economy' companies, both established and start-up. Underlying the financial boom lay the firm fundamentals of rapid technological advance, high investment rates and very buoyant consumer demand – including a rising demand for the high-tech products of the fast-growing information technology and pharmaceuticals sectors. Most impressive of all was the productivity turn-around or 'miracle' in the U.S. economy. Multi-factor productivity (MFP) grew at twice the rate of the 1980s during the 1990s (Dowrick, 2001, p.28), placing the United States in the top ten OECD countries in relation to productivity growth. Some authors – notably Oliner and Sichel (2000) – argue that two-thirds of this productivity surge is due to the production and widespread take-up of information and communications technology throughout the whole economy during this decade. Gordon (2000), on the other hand, claims that the impact of ICT has been much more localised, focused on the rapid growth of that sector and associated software industries; in Gordon's view, the pronounced increase in U.S. MFP was largely cyclical (rather than structural), making up for the previous decade of slower growth.

Also important during the 1990s in boosting productivity and economic growth has been (Barro and Sali I Martin, 1995; Quiggin, 2000; Dowrick, 2001):

- the intensification of work – i.e. the trend apparent in a number of countries including the U.S. – for average hours worked to increase, especially in knowledge intensive industries
- liberalisation and rapid growth of international trade
- the introduction of industry and educational policies aimed at improving skill levels in the workforce

These factors, in differing intensities, appear to have been important in accounting for the improved productivity performance of all the advanced industrial nations over the past 15 years.

## 6.2 Japan

Japan in the post-World War II period rebuilt its industrial base through a state-directed policy of import-substitution and the wholesale import of foreign technology, largely from the United States. Only in the 1970s, when Japanese industry had largely caught up technologically with the West, were trade policies progressively liberalised. By then, the central role of the Japanese national government, through its key agencies – the Ministry of International Trade and Industry (MITI) and Ministry of Finance – was well established and the interlocking elites of business, government bureaucracy and the Liberal Democratic Party created what has been called 'a corporatist state' (Brain, 1999; Hutton, 2002). The major industry clusters or Keiretsu linked producers, suppliers, banks and service firms in tight configurations covering industry sectors like consumer electronics, automobiles and shipbuilding.

Interestingly, for an economy with so much direct government regulation and 'guidance', public R&D levels have been modest. For example, in 1960, government R&D expenditure, delivered mainly in the form of subsidies and tax relief to industry, was just under 8 per cent of industrial R&D; by 1983, this proportion had fallen to 2.5 per cent and by 1989 to 1.2 per cent (Odagiri and Goto, 1993, p.88, p.104). Technological innovation and productivity growth in Japan have been driven by the intense domestic and, subsequently, international competitive forces facing Japanese firms, especially after import and inward foreign investment controls were loosened after the first oil shock in the early 1970s (ibid, p.89). Over the next thirty years Japanese industry invested heavily in R&D while internationalising its economy, becoming the world's leading creditor nation by 1990. By the late 1980s Japan had 37 R&D workers per 10,000 population, second only to the U.S. (39) and well ahead of countries like Britain (18) and France (21) (ibid, p.104). The number of patents lodged annually rose rapidly in Japan during this period, as did the proportion of Japanese patent applications in the United States – up to 20 per cent by the end of the 1980s (ibid, p.105). As a result, multi-factor productivity rose sharply – by 1.7 per cent per annum between 1978 and 1986 (ibid, p.105).

However, as noted above, the 1990s has been a different story, with the Japanese economy triple-dipping into recession during the decade and still in the grip of a deep-seated deflationary lull. Productivity growth has stalled. Many of the established institutional structures of Japanese corporatism are under pressure, including the national innovation system to which we turn.

Japan's system of innovation has traditionally displayed the following characteristics:

- The predominance of long term growth objectives (over short term profit or dividend maximisation) in larger firms

- An export focus by firms of all sizes
- High industrial R&D investment
- Complex and permanent patterns of inter-firm networks, involving large industrial firms, financial institutions (often with cross-shareholdings and inter-locking directorates) and smaller suppliers and user firms, utilising sophisticated coordination mechanisms like 'just-in-time' inventory systems
- Long-term employment of both managers and workers in the core firms (so-called lifetime employment contracts), with a penumbra of smaller contracting firms, often tied into long term contracting arrangements
- Largely coopted trade unions organised on industry or sector lines
- Strong links between large firms and government regulatory and spending departments, especially in the leading industry sectors like electronics, ICT and construction
- A strong educational focus on science and engineering

The past decade has placed increasing cost pressures on traditional lifetime employment practices, even in the large firms. High industrial R&D has not underpinned buoyant economic growth. Established inter-firm linkages and traditional management practices and labour relations are, it has been claimed, reducing the capacity of Japanese firms to innovate and compete internationally against a revivified U.S. capitalism and the increasingly integrated European economies. Fierce competition by firms located in the newly industrialised countries is threatening traditional Japanese markets worldwide. Finally, the parlous financial stability of Japan's banking system, weighed down by accumulating bad debts and depressed asset prices, is acting as a drag on its industrial sector.

### 6.3 Great Britain

Throughout the twentieth century Britain progressively lost competitive position and international markets to U.S., German and (later) Asian exporters, particularly in manufacturing, shipping and related industries. Only in financial services did (and does) the City of London maintain its dominant position, though even here the City has seen the rapid movement in of U.S. and other European financial institutions since the late 1980s.

The 1960s was a decade of pronounced national government intervention in the restructuring and modernising of industry, the boosting of R&D investment, both public and private, and the rapid expansion of the higher education system.

However, productivity growth in the British economy lagged other major industrial countries in the 1970s and economic growth also lagged. Many of the earlier policy interventions were reversed during the 1980s, under Prime Minister Thatcher. In the government's view, Britain's economic woes followed from too much government intervention and direction – the attempt to 'pick winners' was held to be counter-productive, the major barrier to 'freeing up' the competitive forces and opportunities of the market to drive innovation, productivity improvements and growth.

Walker (1993) points to a seeming contradiction here. From the 1960s to the early 1980s, R&D investment in Britain fell as a percentage of GDP and against the other major OCED economies. Although R&D picked up against GDP in the 1980s, this growth was below that occurring in other countries. Nevertheless, productivity growth in Britain during the 1980s and into the 1990s was amongst the highest in the OECD. Walker suggests that this follows from the much greater emphasis in Britain during this period on microeconomic reforms, including privatisation of many public businesses and services and changes in the industrial relations system designed to create more flexible labour markets. 'The combination of a pliant labour force and strong incentives to reduce costs and maximise profits brought large gains in productive efficiency, but those same incentives discouraged investment in R&D and in new productive capacity' (ibid, p.171). The dominance of the financial sector in Britain is seen to stifle long term 'patient' investment in new developments in favour of quick returns from known areas – the so-called problem of 'short termism'. Profit as a share of GDP rose through the 1980s but instead of being invested in new developments was, Walker argues, more likely to have been distributed as dividends to shareholders or used to pay taxes and finance company mergers and takeovers.

A second reason for Britain's relatively poor R&D record since the 1960s may have been the productivity gap that opened up with the other industrial countries, leaving British firms to focus efforts on low-wage, low-technology industries, unable to compete with the 'first-movers' in the rapidly growing high technology sector. R&D in this situation is focused on improving existing technologies in well-established low-tech industries, including services like hospitality and tourism, rather than directed to carving out competitive advantage in the new growth industries. This industry trajectory fits precisely Marceau et al's (1997) model of 'the low road' to economic growth.

Apart from Britain's declining position with respect to R&D investment, the following key features of the role of its R&D regime can be identified (Walker 1993, pp.172-76):

- Like the United States, a relatively high proportion of R&D is concentrated in defence-related industries
- Britain invests far less per capita in public expenditure on basic research than (for example) the U.S, Japan, Germany and France

- Over the past 20 years and especially in the 1980s, government's share of R&D fell
- International collaboration on R&D increasingly characterises innovation activities; Britain is part of an integrated European innovation system
- Multinational companies, many head-quartered in other countries, dominate R&D and innovation activities in many industries

Whereas a strong defence sector in the United States seems to have encouraged innovation and transmission of new products and processes to other sectors of the national economy, this has not been the case in Britain. The reliance on defence technology may have acted as a break on innovation in the latter for a number of reasons. First, it locks up or concentrates the limited skills available in the economy in a narrow sector. Second, the emphasis in defence industries tends to be on product rather than process innovation, which may impact negatively on productivity growth in the longer term. Third, defence industries largely operate in protected markets, dependent on negotiations with government officials, rather than in markets characterised by intense competition.

Perhaps the other major weakness in Britain's national innovation system resides in its education and training system. Britain has always had a lower participation rate in post-compulsory education than other major industrial nations. The current Blair Government is seeking to close this gap by aiming at a situation where 50 per cent of eligible people will be in higher education. Britain's elite schooling system is far less meritocratic than elsewhere. The standard of tertiary training for engineers, in particular, seems to be lower than in countries like Germany and Japan.

Finally, Walker points to two cultural factors implicated in Britain's slide from technological leadership and innovation engine. First, coordination and collaboration – so important in generating and disseminating new ideas and opportunities – is weakly inscribed in Britain's innovation system. The British tradition of individualism at both individual and institutional levels constrains collaboration. Second, the 'culture of technology' has subsided, reflected in the relatively low status accorded to engineers and to technical training in Britain compared to countries like Germany, Japan and the United States.

### 6.4 Germany

The foundations for Germany's innovation system were laid in the nineteenth century. Germany industrialised rapidly in the second half of the century, drawing on British technological expertise and skilled labour in the basic heavy industries but outperforming the latter in new industries like industrial chemicals. The system of

technical education pioneered before World War I produced a growing stream of skilled engineering and other technical workers throughout the twentieth century. Germany introduced the concept of a research-based university and in-house company R&D to the world. In spite of involvement in major wars and (after World War II) partition for almost 50 years, Germany's innovation system has displayed a remarkable robustness.

The key elements of this system are (Keck, 1993):

- A heavy export focus on the European market, with a complementary political investment in the increasing economic integration of Europe, culminating in effective leadership of the European Union
- R&D investment as a proportion of GDP is just under 3 per cent, similar to Japan and the U.S. but higher than Britain
- About two-thirds of total R&D investment is private, a higher proportion than in the U.S. and Britain but lower than in Japan
- Almost a third of total industrial R&D is carried out by just six firms: Siemens, Daimler-Benz, Bayer, Volkswagen, Hoechst and BASF, concentrated in the automobile, chemicals and electrotechnical industries, while five firms account for 29 per cent of U.S. patents held by German companies
- Germany has among the world's highest rates of participation in secondary and vocational education
- Expenditure per capita on higher education is about the same as the U.S. but well behind countries like Britain, Japan and Australia; however, the general quality of German universities is high
- Relative to the size of the university sector, both Japan and the U.S. spend more on university-based R&D than Germany
- The Max Planck Society forms a network of specialist research institutes linked with universities and focused on basic research in the natural sciences; they are jointly funded by the federal and state governments
- Since the 1980s, federal government technology policy has sought to direct public research funds to designated areas of technology, including aerospace and energy
- An industrial relations system in which organised labour is tightly incorporated into industry development, minimising labour disputes and facilitating the introduction of new technology
- A banking system that enables the banks to support long term investment activities by firms and to facilitate inter-firm linkages

Clearly, since reunification the very different institutional and cultural systems of West and East Germany have resulted in differential capacities for innovation across the sectors and regions of what is now (again) a single country. A major challenge remains the need to facilitate innovation in industries and districts of the East where the old institutional order has left an inertial legacy of stagnation, inadequate infrastructure and conservative attitudes.

### 6.5 Australia

As a small developed nation with an open economy, Australia's innovation system is likely to differ significantly from that in the large countries discussed above. This is certainly the case.

> The distinctive characteristics of the Australian national innovation system are a low level of science and technology expenditure, a high level of government involvement in financing and undertaking research, a low level of private sector research and development, and exceptionally high dependence on foreign technology (Gregory, 1993, p.324).

Gregory argues that this particular trajectory has evolved from three structural features of the Australian economy. First, Australia is heavily dependent on agricultural and mineral exports. The efficient export of primary products throughout Australia's post-colonisation period has not required the systematic development and application of new technologies. Most sophisticated manufactured products could be and were imported, including shipping and refrigeration services. Some innovation and technological advances were home grown but usually directly related to rural industries or (as in the case of the flight black box) taken up and developed overseas.

Second, the small size and high wages of the Australian population encouraged the growth of small scale and low-tech manufacturing. High costs limited exports and, from the 1920s, high tariff protection allowed Australian industry to avoid the spur of foreign competition until well into the 1980s. Domestic manufacturing was, in almost all cases, technologically dependent.

Third, from the nineteenth century onwards, governments at all levels directly and significantly intervened in the provision of goods and services. In this context (described by some economic historians as 'colonial socialism'), government investment in R&D has played a significant role. By the end of the 1980s R&D investment in Australia accounted for only 1.2 per cent of GDP, near the bottom of the OECD table, but government provided about 40 per cent of total R&D (Gregory, 1993, p.326). Government R&D is very heavily concentrated in the primary sector, accounting for

more than 90 per cent of total R&D in this sector of the national economy. This rural bias is reflected in the activities and priorities of the Federal Government's main research organisation – the Commonwealth Scientific and Industrial Research Organisation. The government has attempted to stimulate private sector rural R&D by introducing special industry levies and funding agencies.

Why, then, is private (industrial) R&D so lacking, particularly in the manufacturing sector, in Australia, by comparison to other developed economies, including those with a roughly similar population, like Sweden? Gregory offers the following answers:

- The manufacturing sector is small and has declined over the past 20 years, accounting for around 15 per cent of GDP
- The typical manufacturing firm is small, targeting the domestic market; the necessary technology can be imported
- The structure of manufacturing in Australia has traditionally been biased away from high-tech industries
- Most large firms are foreign owned or parts of foreign multinational enterprises; innovation occurs elsewhere in the corporate group and is transferred to Australia when necessary

Since the early 1980s successive Australian governments have sought to reverse these historic trends and forces locking Australia into a low-tech/no innovation trajectory[7]. At the macroeconomic level, the Australian dollar was floated and foreign exchange regulations relaxed. Tariffs have been progressively (though not evenly) lowered across industry, in line with both bilateral and multilateral trade agreements. Microeconomic reforms have been instituted at all levels of government through the mechanism of the Coalition of Australian Governments. In addition:

- Policy has shifted towards a commitment to making R&D investment more closely aligned with industry needs and market opportunities
- In consequence, universities and CSIRO have been encouraged, indeed required, to raise more research funding from industry, though both collaborative and consultancy relationships
- One particular policy innovation has been the introduction of the cooperative research centre program, which targets research areas of strong economic potential and requires private sector matching funding for core government grants, a strong

[7] For a varied range of indicators of Australia's 'knowledge-based activities', which track both the continuities and changes in Australia during the decade of the 1990s, see DISR (2000a).

involvement by industry partners in establishing the research program and an emphasis on the commercialisation of resulting research outcomes. Over the past few years, the Australian Research Council has also identified national priority areas for preferential funding, where those areas are seen to contribute towards improved technological development, productivity and growth

- Tax subsidies are available for eligible R&D investments – initially granting 150 per cent tax concessions at the company income tax rate, subsequently reduced to 125 per cent
- During the 1980s, utilising its procurement power, the Federal Government introduced the Offsets Program for high-tech imported products like telecommunication equipment, information technology and aerospace products. This required overseas suppliers to government to deliver identifiable marketing, R&D, technological and other advantages to Australian firms, in return for the government's business. The offset requirements were relaxed to the extent that the foreign supplier undertook R&D investment in Australia at a given level of its sales in Australia

The final element of Australia's innovation system identified by Gregory concerns changes to the overall higher education system. Since the late 1980s and increasingly over the past decade, the government has expanded student numbers enrolled at university, both at undergraduate and postgraduate levels. A new system of funding (the Higher Education Contribution Scheme and postgraduate equivalent) has required students to directly contribute a proportion of the cost of their education, repayable through the taxation system. As a result student numbers have grown rapidly during the 1990s, due also to the big increase in foreign full-fee paying students, making higher education one of the country's biggest export industries. However, there is no evidence that the proportion of graduates in science and engineering is increasing – rather the reverse. Any positive impact of the growth and reorientation of higher education during the 1990s on the innovation capacity of the economy would appear to be indirect, at best, dependent on the larger pool of tertiary qualified workers.

Marceau (2001) also stresses the small scale and domestic focus of Australian industry. She notes that Australia ranks relatively lowly on the main innovation indicators like R&D investment and argues that achieving better innovation outcomes depends on two key factors. First, Australian governments and industry leaders need to better understand the forces driving and barriers blocking innovation in the global economy. Second, is to use international experience ('lessons from overseas') to develop a policy approach that moves beyond a narrow focus on R&D and away from a view that there is 'one best solution'.

In fact, it could be argued that, in Australia's case, we have moved too far away from 'the one best solution' to a situation characterised by a huge variety of unconnected, small-scale, often short-lived policies aimed at encouraging innovation. In 1999, the federal Department of Industry, Science and Resources (DISR, 1999) compiled a check-list of such programs offered by the federal and state governments to support innovation. The list almost reached 150 separate programs, including those mentioned above. For example[8]:

- *R&D Start-Core:* providing grants for R&D projects to companies with an annual turnover of less than $50 million in each of the three preceding years and concessional loans to companies employing less than 100 workers; $739 million to be provided over four years (Department of Industry, Science and Resources).
- *Innovation Investment Fund:* provides access to equity capital by small new technology companies on a 2:1 basis with private equity raised through designated funds management firms; $230 million over 10 years (Department of Industry, Science and Resources).
- *Technology Diffusion Program:* encourages Australian firms to access new technology, here and overseas, by facilitating 'technology alliances', including research collaborations, and funding international conferences; $101 million over four years (Department of Industry, Science and Resources).
- *Building on IT Strengths:* provision of support aimed at increasing the competitiveness of the information technology sector in Australia; including an IT Incubator Program establishing at least one centre in each jurisdiction to foster the commercialisation of IT intellectual products and providing start-up capital and business development assistance to new firms; $78 million over five years (Department of Communications, Information Technology and the Arts).

There is no coherent thread tying together the various and diverse policies supporting innovation in Australia, no clear and persuasive logic justifying an overall interventionist program. These policies have emerged piecemeal, often in response to industry or jurisdiction specific factors, reinforcing the view in orthodox economic policy circles that these responses represent so many examples of 'rent seeking behaviour' of firms and departmental bureaucrats, yet another variant of the much maligned 'picking winners' approach.

[8] The funding department is included in brackets.

In fact, Marceau and others argue that the key to understanding how innovation happens and how it can be encouraged is to concentrate not on supporting individual firms but on identifying and credibly supporting interacting groups, clusters or 'complexes' of firms and other agencies.

> A shift towards greater investment not in individual firms but in collective activities and in the institutions that provide good sources of innovation, knowledge and skills, and the encouragement of their use, thus seems necessary to ensure the application of the knowledge generated, as well as the applicability and relevance of that knowledge to a given sector (Marceau, 2001, p.157).

This view suggests a policy shift away from *both* the traditional industry policy focus on the single firm *and* the orthodox economic focus on getting the macro economy policy settings right and leaving everything else to the market. It represents 'a third way' concentrated on finding and facilitating cluster development, utilising whatever policy mix is most appropriate in the circumstances.

There are signs that elements of this more focused approach are emerging at the federal level. In 1998 DISR published an important collection of papers on the new economics of innovation (referred to in chapter 2.2). This was followed by a call to establish 'Action Agendas' for important industry sectors in the Australian economy, whereby in each case, government and industry players are brought together to collectively identify the key factors and changes needed to improve competitiveness in that sector. 'Sectors' here need to be defined to include the real interactions occurring, especially with respect to innovation drivers, rather than be confined to traditional or official definitions of the constituent industries. A 'National Innovation Summit' was held in February 2000 at which 500 industry, government and research participants attended. The Summit, organised jointly by the Business Council of Australia and the Federal Government, proposed a 'comprehensive package' of recommendations designed to enhance Australia's national innovation system.

Following the Summit, an Innovation Summit Implementation Group (ISIG) was established to refine the proposals coming out of the Summit, develop concrete action proposals and a way of prioritising actions. ISIG established a number of working groups and delivered its final report to the Federal Industry Minister in August 2000 (DIST, 2000b). The recommendations included:

- A suite of policies aimed at raising the profile of innovation activities and creating 'an ideas culture'
- Increasing the effective tax benefit from the R&D tax (125 per cent deduction) relief scheme
- Doubling the cooperative research centre program over five years and boosting research infrastructure funding
- Generalising the Building on Information Technology Strengths incubator model
- Establishing a 'pre-seed' research funding scheme
- Doubling the Commercialising Emerging Technologies Program
- Increasing support for international industrial R&D collaboration
- More effectively showcasing Australia's technological capability and raising the country's profile as a 'high technology receptor'

The ISIG report and recommendations follow earlier reports – *Investing for Growth* (1997) and *Knowledge and Innovation* (1999) – which had proposed significantly increased R&D investment and research funding (respectively). It was followed in late 2000 by a report – *The Chance to Change* (2000) – from Dr. Robin Batterham, Australia's Chief Scientist, reviewing the effectiveness of Australia's science, technology and engineering base in supporting innovation. Finally, in 2001, the Federal Government published its major policy statement on innovation and economic growth – *Backing Australia's Ability: Real Results, Real Jobs*. The report committed an extra $2.9 billion over five years to the following programs:

- A doubling of the then current funding level for Australian Research Council competitive research grants
- An increase in research infrastructure grants to university and other research institutes (over $500 million)
- An investment of an additional $176 million in centres of excellence in the 'key enabling technologies', ICT and biotechnology
- Extension and enhancement of selected existing programs, including the R&D tax relief scheme, the R&D Start program and the Cooperative Research Centres program
- An increase in funded university places

Although representing a significant boost in federal research-related funding, much of the flavour of the earlier reports and studies focused on the power of industry clustering and inter-firm knowledge links as providing the necessary institutional architecture for an innovative milieu is missing from *Backing Australia's Ability*. The cluster or sector-specific 'action agendas' have been merged into an overarching national attempt to get the general educational and taxation settings right, with funding and information likely to continue flowing down the established government and industry channels. In this sense, *Backing Australia's Ability* can be seen to reinforce (and tweak at the edges) Australia's existing national innovation system, rather than introduce a radical departure along lines suggested above by Marceau and other cluster analysts.

# 07 Design and the Digital World

This chapter first develops and presents a conceptual map of what is being called 'the digital design cluster', a composite industry cluster formed by the intersection of the burgeoning information and communications technology cluster on the one hand, and the design disciplines on the other. The second part of the chapter focuses on one important segment of the new cluster – the emerging new (or interactive) media industry.

## 7.1 Identifying the Digital Design Cluster

Chapter 5 presented arguments purporting to show that societies like Australia are undergoing a far-reaching structural economic transformation resulting in the emergence of 'the knowledge economy' within the broader 'old economy'. Analysts like Richard Florida (chapter 4) go further and claim that powerful forces of creativity lie at the core of this new economy. In this view, a new social division of labour has formed, broadly dividing 'creative workers', on the one hand, from workers who carry out a large range of necessary but essentially routine, derivative and supportive roles in the primary, manufacturing and service sectors of the economy.

However, there is little agreement among the various harbingers of the knowledge economy as to just where the boundary is to be drawn, that is, which occupations fall into this category and which fall outside. This category, however closely defined, also includes a large proportion of the working population, a third or more. Some members of this broad group may be more likely to be in working contact with each other, while others connect more with 'old economy' workers. Where, for example, do design practitioners fit? Do they form linkages primarily with each other and certain other knowledge workers or are they more isolated in their economic roles? Are some parts of the knowledge sector more important than others in the innovation process – and, therefore, more strategically placed to contribute to the creation of regional competitive advantage in the broader economy?

In order to begin to answer these and related questions it is useful to consider the schematic representation in Figure 5, below.

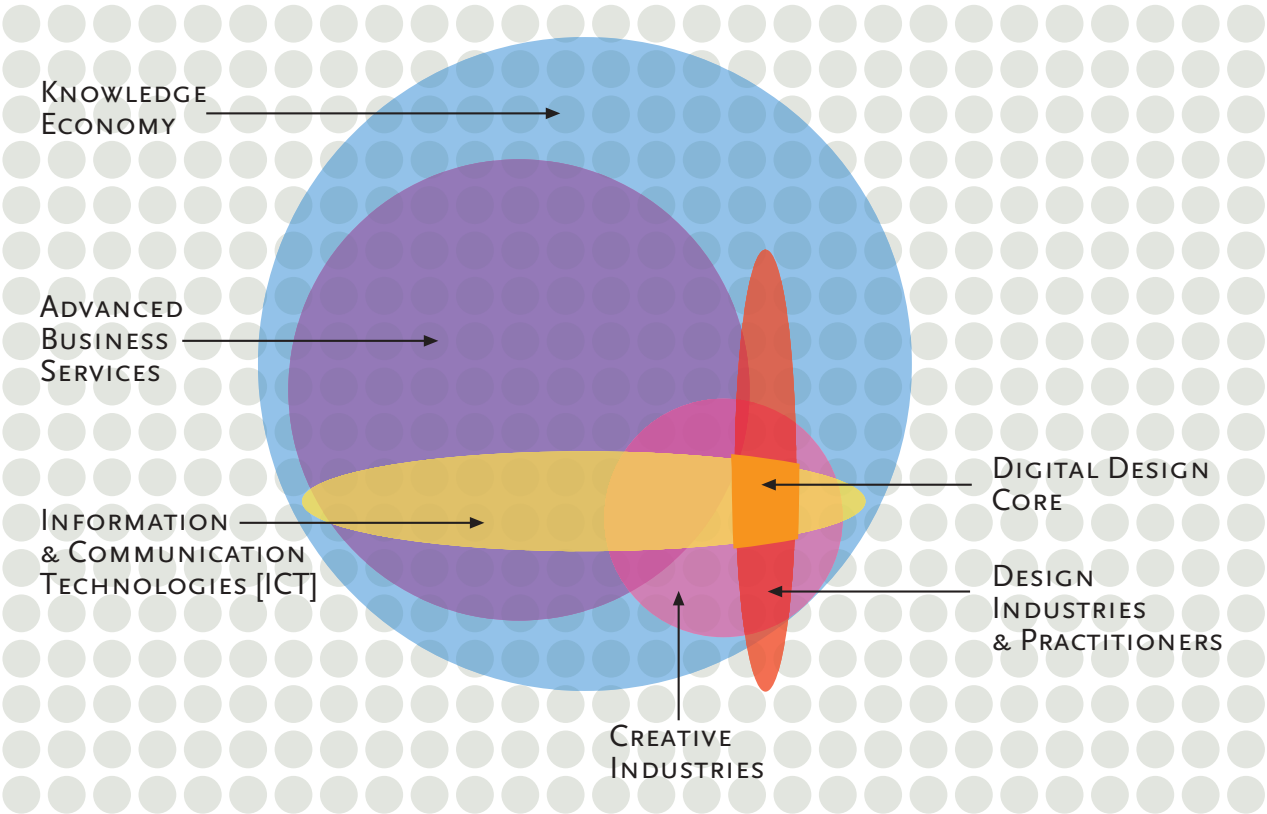



Figure 5: A Conceptual Map of the Digital Design Field

Within the broader ***knowledge economy***, as specified in preceding chapters, we can identify a group of industries referred to as ***advanced business services*** (ABS). These industries are distinguished by three interrelated characteristics (Spiller, 2002):

- the provision of *problem-solving services* to their clients/customers
- a high degree of *creativity*, in the sense intended by Florida
- the high *intellectual content* of the services provided

Table 5 presents the following indicative (non-exhaustive) listing of the industries where ABS predominate (these industry categories are based on the Australian Standard Classification of Occupations):

Table 5: A Selection of Advanced Business Services in Australia

| Industry | Category |
|---|---|
| legal services<br>accounting services<br>advertising services<br>commercial art and display services<br>market research services<br>business administrative services<br>Business Services n.e.c.<br>business and professional associations<br>financial asset broking services<br>services to finance and investment n.e.c.<br>non-financial asset investors | Producer Services |
| scientific research<br>higher education<br>technical and further education | Education |
| road freight forwarding<br>freight forwarding [except freight] | Logistics |
| architectural services<br>consultant engineering services | Design |
| data processing services<br>information storage and retrieval services<br>computer consultancy services | Information Technology |

Producer Services and Logistics have a strong clustering tendency, as argued in chapter 5. The evidence, Australian and international, summarised above suggests that Design and Information Technology services also develop strong clusters.

Partly cross-cutting the ABS sector we can identify a group of activities increasingly referred to as the ***creative industries***. Howkins (2001) defines the creative industries as those industry groupings that produce goods and services that are 'intellectual property-heavy' – i.e. that generate, as essential elements of their production,

trademarks, patents and copyright. Caves (2000, p.vii) offers a somewhat more circumscribed definition: creative industries are those '...in which the product or service contains a substantial element of artistic or creative endeavour...' Most of Caves' creative industries fit into Howkins' copyright category (see Table 6). Howkins (2001, p.viii) also notes that some creative outputs like architectural design figure as essential inputs into other products – i.e. physical buildings. In such cases, although not necessarily copyrighted or registered as a trademark, such designs are creative industry products (though the building itself is not).

Table 6: Examples of Creative Industries

| Industry | Defining Element |
|---|---|
| ADVERTISING | COPYRIGHT |
| ARCHITECTURE | IMPLIED COPYRIGHT/'DESIGN RIGHT' |
| ART | COPYRIGHT |
| COMPUTER SOFTWARE | COPYRIGHT AND PATENT |
| CRAFTS | IMPLIED COPYRIGHT |
| FASHION | TRADEMARK AND COPYRIGHT |
| FILM | COPYRIGHT |
| INDUSTRIAL DESIGN | COPYRIGHT |
| MUSIC | COPYRIGHT |
| PERFORMING ARTS | COPYRIGHT |
| PUBLISHING [PRINT & ELECTRONIC] | COPYRIGHT |
| RESEARCH & DEVELOPMENT | PATENT |
| TOYS AND GAMES [EXCL. VIDEO GAMES] | TRADEMARK AND COPYRIGHT |
| TELEVISION & RADIO | PATENT AND COPYRIGHT |
| VIDEO GAMES | TRADEMARK, PATENT AND COPYRIGHT |

Source: Howkins [2001, chapter 3].

Howkins (2001, p.116) estimates that the total value of output produced annually by the creative industries is in excess of $US2 trillion globally, about 45 per cent of which is sourced in the United States.

The creative industries, so defined, provide services or product to both other producers (this is clearest in the case of software producers) and directly to consumers (e.g. music CDs). Many of these industries also have broader 'cultural spillovers'. For example, a particular city or region may acquire a reputation for particular creative products or events – such as a music or performing arts festival – that contribute to a 'milieu' which acts as an attractor for associated economic activities and skilled workers/ performers, which further adds to the city's reputation and enhances its milieu, attracting further like developments – and so on, in a virtuous growth circle.

Allen Consulting Group (2001) distinguish between 'core copyright industries' and 'partial copyright industries'. Industries in which copyright underlies most of the value of output are 'core' in that sense; examples are music, film, publishing, games and interactive media. Partial copyright industries produce outputs that only partly depend for their commercial value on copyright protection; examples here include advertising, architecture and the other design professions. In the year to June 2000, the total value of output of all copyright industries in Australia was about $18 billion, around 3.3 per cent of GDP – by comparison, this is about two-thirds of the contribution of new dwelling construction – up from 2.2 per cent five years earlier (Allen Consulting Group, 2001; quoted in NOIE, 2001, p.12). Over the same period, total employment in this sector grew by almost 3 per cent per year and exports rose to around $1 billion, still much less than the value of imports (ibid, p.12).

In Britain, the Creative Industries Taskforce (1998) identified four key elements characterising creative industries:

- outputs are critically dependent on activities that involve individual talent, skill and creativity
- wealth and job creation are achieved by building and exploiting intellectual property
- creative intangible inputs add more economic and social value than is added by material manufacturing processes
- new synergies and value occurs through linking traditional cultural industries with information-rich 'new economy' type industries – e.g. museums and interactive media

Following the British Taskforce study (and drawing on the Australian Culture and Leisure Classification [ACLC] developed by the Australian Bureau of Statistics), Cox et al. (2003) identify eight sub-sectors in Australia's creative industry sector. They are:

- Heritage
- Literature and Print Media
- Performing Arts
- Music Composition and Publishing
- Visual Arts and Crafts
- Design
- Broadcasting, Electronic Media and Film
- Other Arts

Table 7 summarises the employment levels in these sub-sectors (at the 2001 census) for the Capital Cities and nationally. A number of conclusions can be drawn from this data:

- Around two-thirds of all employment in designated creative industries is concentrated in Sydney and Melbourne
- Employment concentration is particularly pronounced in the music, broadcasting and design sectors
- Sydney is the largest employer across all sub-sectors
- The order of other cities – Melbourne followed by Brisbane, etc. – is constant across the sub-sectors
- The largest sub-sectors are (in descending order): Literature and Print Media; Design; and Broadcasting, Electronic Media and Film

Table 7: Employment in Creative Industries by Capital City, 2001 [number of employees]

| Creative Industries Sub-sector | Sydney | Melbourne | Brisbane | Adelaide | Perth | Greater Hobart | Canberra | Australia |
|---|---|---|---|---|---|---|---|---|
| Literature and Print Media | 25,276 | 17,722 | 7,350 | 4,242 | 6,025 | 892 | 1,446 | **62,953** |
| Performing Arts | 3,928 | 2,603 | 1,200 | 823 | 925 | 153 | 200 | **9,832** |
| Music Composition and Publishing | 2,664 | 1,673 | 508 | 373 | 467 | 52 | 187 | **5,924** |
| Visual Arts and Crafts | 3,933 | 3,058 | 1,216 | 730 | 1,018 | 181 | 298 | **10,434** |
| Design | 22,153 | 16,986 | 6,223 | 3,694 | 5,256 | 541 | 1,086 | **55,939** |
| Broadcasting, Electronic Media and Film | 18,574 | 10,695 | 4,125 | 2,616 | 3,380 | 553 | 1,032 | **40,975** |
| Heritage | 7,207 | 5,374 | 2,642 | 1,662 | 2,555 | 507 | 2,154 | **22,101** |
| Other Arts | 1,598 | 1,246 | 406 | 254 | 823 | 21 | 87 | **4,435** |
| **Total Creative Industries** | **85,333** | **59,357** | **23,670** | **14,394** | **20,449** | **2,900** | **6,490** | **212,593** |

Source: Cox et al. [2003, p.16]

Employment in the creative industries grew by 12.3 per cent between 1996 and 2001 for Australia, as a whole. Melbourne (16.3 per cent) and Sydney (13.6 per cent) grew quickest, followed by Canberra and Perth. Employment in the Design sector grew by 20.4 per cent over this period (28.3 per cent and 25.1 per cent in Melbourne and Sydney, respectively), second only to growth in Music Composition and Publishing (26.7 per cent) (Cox et al., 2003, p.28).

The data presented in Table 7 are misleading to the extent that they lump in together all employees within the respective industry categories. In fact, not everyone employed in the creative industries can be said to be a 'creative worker'. Table 7 includes, for example, both museum curators and sales staff in the museum shops. Similarly, there are many creative workers employed in other industries throughout the economy (this fact is exhibited in Figure 5, above, in which the creative industries circle intersects with only part of the broader 'Knowledge Economy' space).

Table 8: Employment in Creative Occupations, Capital Cities, 2001

| Occupation | Sydney No. | Melbourne No. | Australian Capital Cities No. |
|---|---|---|---|
| Designers and Illustrators | 4,943 | 3,494 | 11,559 |
| Journalists and Related Professionals | 4,577 | 2,344 | 9,578 |
| Architects and Landscape Architects | 3,755 | 2,771 | 9,487 |
| Marketing and Advertising Professionals | 2,912 | 1,672 | 5,896 |
| Performing Arts Support Workers | 2,385 | 1,291 | 5,165 |
| Computing Professionals | 2,304 | 1,511 | 5,088 |
| Media Producers and Artistic Directors | 2,854 | 1,187 | 4,955 |
| Musicians and Related Professionals | 1,828 | 1,311 | 4,690 |
| Film, Television, Radio and Stage Directors | 2,269 | 1,211 | 4,676 |
| Photographers | 1,283 | 1,042 | 3,383 |
| Librarians | 790 | 789 | 2,652 |
| Actors, Dancers and Related Professionals | 1,112 | 726 | 2,574 |
| Authors and Related Professionals | 1,030 | 847 | 2,445 |
| Visual Arts and Crafts Professionals | 781 | 740 | 2,224 |
| Artists and Related Professionals | 734 | 505 | 1,735 |

Source: Cox et al. [2003, p.16]

Cox et al. (2003) therefore draw from the 2001 census employment data on the 15 creative occupational categories exhibiting the highest employment in the creative (and other) industries in the seven Capital Cities. The key results are summarised in Table 8.

The dominance of Sydney and Melbourne as employers (and self-employers) of creative workers is clear.

Cox et al. (2003, pp.24-27) also provide data on median incomes received in the creative industries and occupations in Australia's Capital Cities. (The data is based on the Australian Bureau of Statistics *Australian and New Zealand Standard Industry Classification*.[9]) Key results are:

- The *highest* median (weekly individual) incomes in 2001 were earned in: Radio and Television Services, undefined ($1,008); Television Services ($941); Radio Services ($873); Recorded Media Manufacturing and Publishing ($855); Film and Video Services, undefined ($855) and; Architectural Services ($830).
- The *lowest* median (weekly individual) incomes were: Video Hire Outlets ($315); Newspaper, Book and Stationery Retailing ($440); Motion Picture Exhibition ($442); Retailing, n.e.c. ($461) and; Recorded Music Retailing ($466).
- Median incomes were highest in Sydney ($838) and Canberra ($814), compared to the national average of $765; this is comparable to the overall distribution of earnings in Australia
- Melbourne's median income in the creative industries was $763, right on the national average.

The fact that average incomes are much higher in the industry sectors listed in the first dot point, above, suggests that many more creative jobs are located in those industries than in the retailing-oriented industry classifications listed in the second dot point.

Cox et al. (2003, pp. 31-37) present Australian Bureau of Statistics data from 1996-97 on revenue, costs and value added by selective creative industries. A noticeable gap is that no data is available for the design industries. Key findings are:

- Film and Video Production and Distribution *and* Music and Theatre Production have value added multipliers of about 1.8; i.e. for every $1 million of output, GDP increases by $1.8 million

[9] The ANZIC classification is broader and less useful than the ACLC classification when focusing on the creative industries and occupations.

- Architectural Services *and* Film and Video Production and Distribution have the highest employment multipliers (38 and 37, respectively); i.e. for every $1 million of output, employment in the economy increases by 38 and 37.
- Total revenue and value added for:
    - Film and Video Production and Distribution: $2,615 million and $888 million
    - Total Television Services: $4,182 million and $2,810 million
    - Motion Picture Exhibition: $1,046 million and $348 million
    - Total Performing Arts: $1,634 million and $383 million
    - Book Publishing: $1,361 million and $382 million

Figure 5, above, suggests – albeit, in a schematic way – that two more intersections are relevant to identifying the *core digital design* industries and practitioners in the Australian economy. Design, as noted earlier, cuts across many industries and sectors in the economy, both those that may be regarded as 'creative' and others. Likewise, *Information and Communication Technologies* (ICT) are impacting widely throughout the economy, including, of course, within the creative industries described above. In a study of the ICT cluster in Finland, Paija (2001, p.19) argued that: '...the supply side of ICT and related services (i.e. the provision of the technology) has grown to become a sizable business in its own right'. The digitisation of production and distribution processes and the creation of digitised content and applications have become central components driving growth in advanced industrial economies like that of Australia. The coupling of ICT (in a world of technological 'convergence') and design methodologies and practices – the orange core in Figure 5 – opens up further opportunities for the creation of new and more efficient value chains – i.e. new, larger, more differentiated and complex industry clusters. Realising the value that creating opportunities opened up by the design driven creation of new digital applications and content in areas like automotive, fashion and broadcasting will depend on the success with which new inter-firm and agency linkages can be forged and maintained. This, in turn, will depend on how global competitive forces play out in the Australian and Victorian economies and the industry and other policy settings put in place by governments at all levels.

The rapidly growing ICT sector has seen the emergence of globally articulated industry clusters. Figure 6 provides a schematic representation of this cluster, based on Paija's

(2001) Finnish study[10]. The ICT value system entails a complex and highly integrated set of activities and inter-firm linkages. The core industries comprising the cluster depend for their successful operation and growth on a phalanx of supporting and related industries. The outputs of the ICT cluster are, in turn, significantly impacting on the value chains of firms throughout the international economy, creating new opportunities for value creation and further innovation, both within and outside the ICT cluster. Greater dissemination of existing digital technologies and content applications *and* continuous innovation in the sector is changing the calculus of time proximity. That is, more business can be conducted *in situ* without travel and during travel between production locations, thanks to advances in areas like wireless connectivity. However, face-to-face contacts remain central to effective value chain and system management and large 'world cities' continue to act as magnets for corporate headquarters, high-tech workers, serious R&D and innovation. These are the regions where the 'crunch decisions' are made, most new ideas are tried out and highly skilled workers and their families prefer to be.

*Design* is a notoriously difficult concept and practice to define. Self-proclaimed designers rarely, if ever, agree on *what* Design is. One option is simply to define design as whatever people who claim to be designers do. For our purposes, however, the following definition will suffice.

> In broad terms ... design can be understood as occupying the interface between people and new products and processes, as the means whereby superior performance requirements are incorporated into those goods and services. In this sense, design has a physical dimension (in relation to new products for industry and individual consumer take-up) and a service dimension (e.g. environmental design, business design, organisational design, communication design). Design also combines, in varying degrees, an aesthetic purpose (form) with utility (function) (Wells, 2002, p.1).

*Digital design* is emerging as a new domain of activity, one that 'marries' traditional and new design methods and tools to the new digital technologies and applications – hence, it is represented as the intersection of design and ICT in Figure 5 – creating the possibility of qualitatively new knowledge and outcomes. Figure 7 provides a schematic representation of a Digital Design Cluster. It is not possible to conceive of a digital design cluster without an ICT component; this suggests a 'co-clustering' or 'interactive

[10] This study is included in a collection of European case studies on innovation and industry clusters published by the OECD (2001). Related cases included there are studies of emerging ICT clusters in Ireland, Flanders, Spain and Denmark; the Dutch embryonic multimedia cluster; studies of construction sector clusters in various countries; and a review of cluster-related public policy approaches in the UK, The Netherlands, Denmark and Finland.

clustering' of the ICT and design domains. Innovative outcomes are the result of the new possibilities introduced by this co-clustering process. Traditional design practice – both as output (of useable products or services) and as inputs to complex products – is (potentially) transformed by the information, tools and applications created by the developing ICT sector. New design methodologies, in turn, create demands on and drive further innovations in ICT (hence, the two-way arrow in Figure 7).

Figure 7 provides a schematic view only of the new cluster. Understanding the nature, scope and growth of such a cluster in any concrete, real world case requires detailed research. One important and growing domain within the digital design cluster – viz. new media or interactive media – will be discussed in the next section, focusing on recent empirical studies of developments in New York and London. Later findings from the overall project, separately published, will then provide a detailed analysis of this and the other digital design domains in the context of the Victorian regional economy.

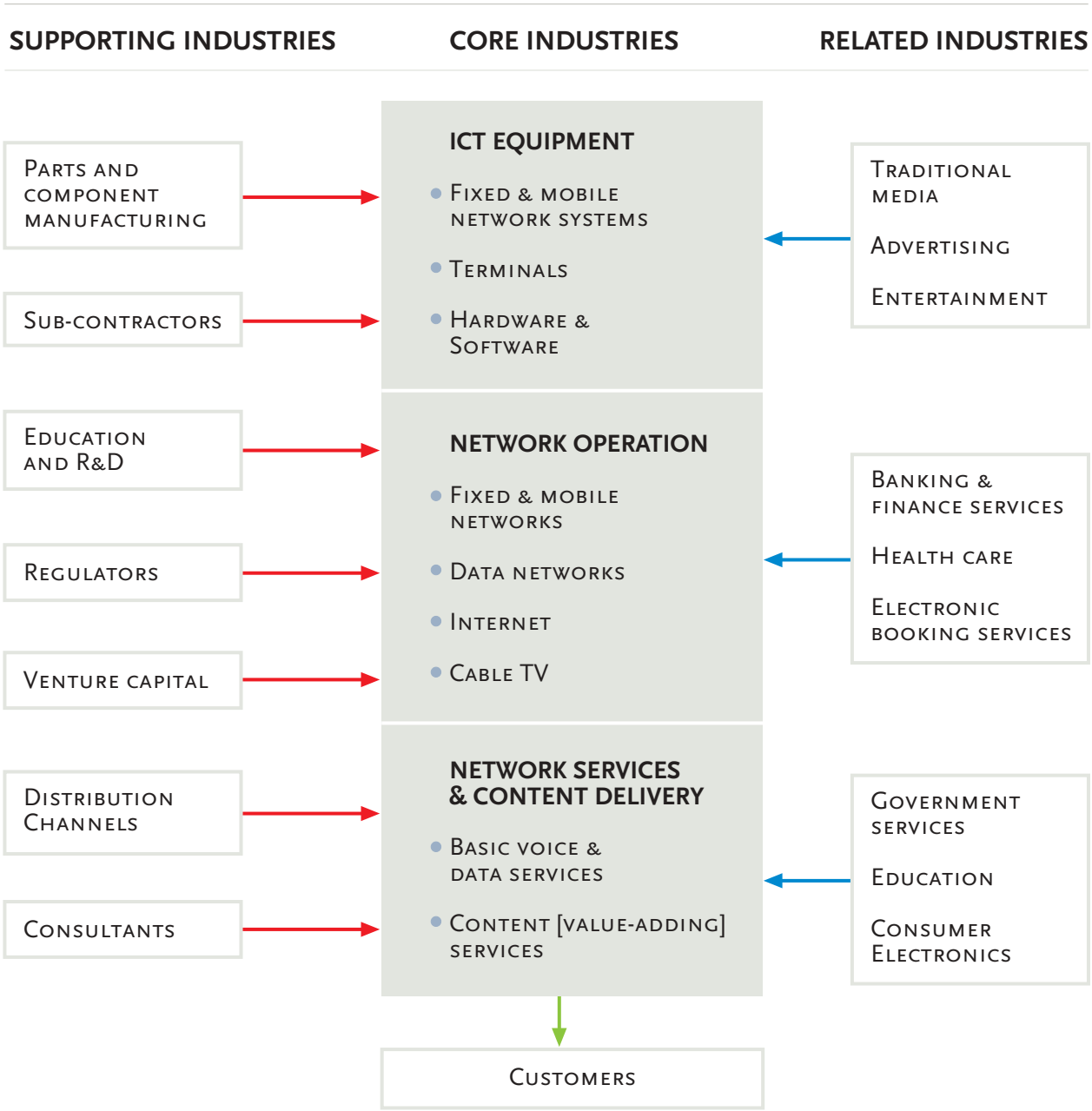



Figure 6: The ICT Industry Cluster

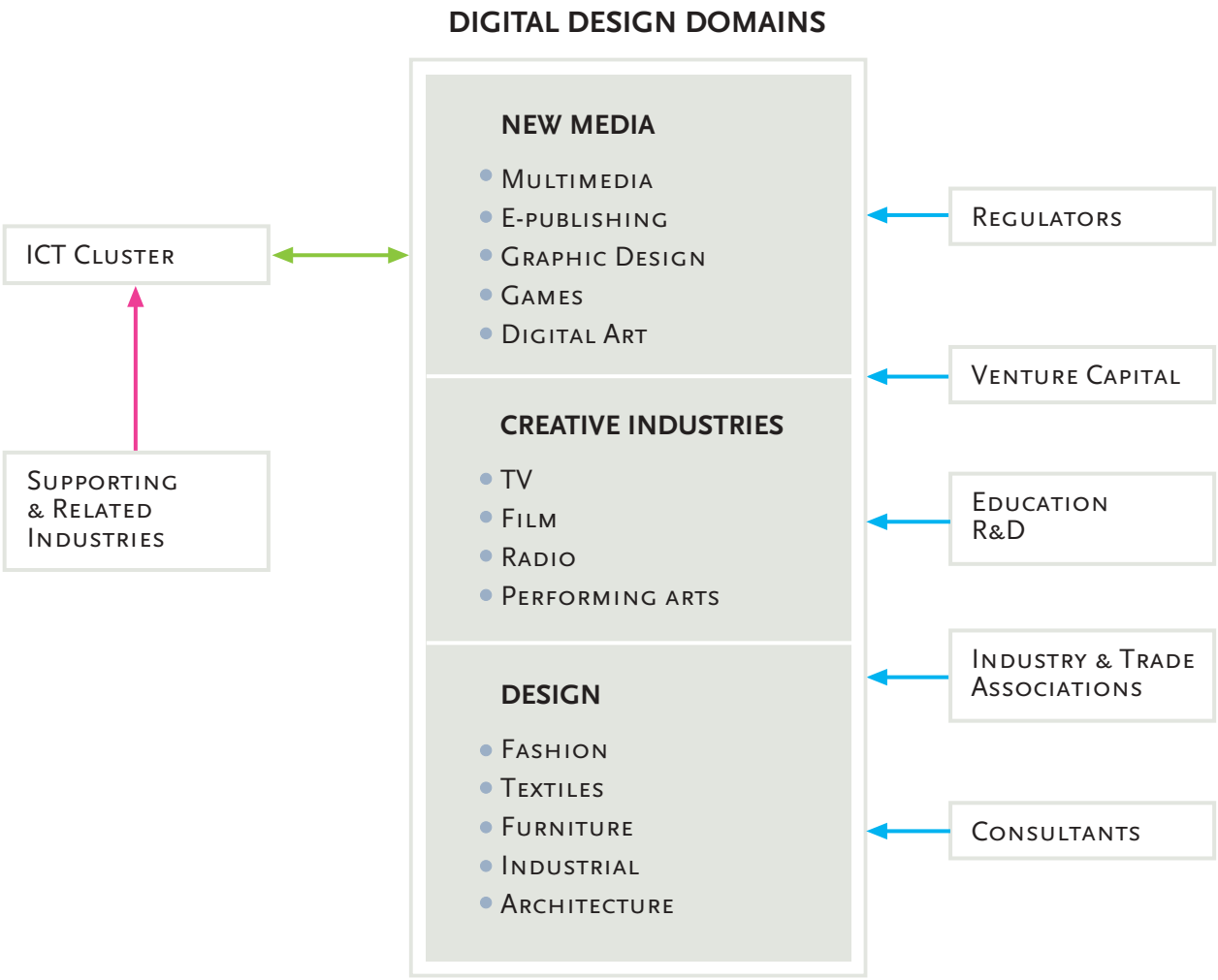



Figure 7: A Digital Design Cluster

## 7.2 The London and New York New Media Industry Studies

*New media* is a rapidly growing segment of the digital design domain. It encompasses a diverse range of activities and groups, bringing together new combinations of existing activities in fields like publishing, graphic design, advertising and software development, while opening up genuinely new terrain like multimedia and e-commerce. Increasing technological convergence and dependence on ICT is also blurring the lines of division with other segments, notably the creative industries sector. Little is known about the structure and nature of the new media and related worlds, due to their very recent appearance and rapid growth. However, two studies carried out at the end of the 1990s, one on Greater London, the other on New York City, offer fascinating glimpses of the forces and outcomes involved. This section will briefly summarise each of these studies in turn.

### *Interactive London 1999: Mapping the Capital's New Media Industry*

This study was carried out by *New Media Knowledge*, an independent university-linked non-profit organisation with a mission 'to support the professionalisation and development of the UK new media industry'. Data was gathered through an online survey and targeted face-to-face interviews. The survey returned 97 business and 121 individual responses. Face-to-face interviews totalled 36. Thus, the analysis makes no claim to be based on an unbiased sample drawn from a known universe. Indeed, the very opaqueness and blurred nature of the industry and its rapidly changing composition make such technically desirable conditions inapplicable. Regular and recurrent industry surveys monitoring these changes would therefore be one pre-condition for gaining a more accurate picture of this segment. (In the New York case, discussed below, three such surveys have been carried out over several years.)

The main findings of the London study are as follows:

- The industry is very young – 58 per cent of firms were formed since 1995 (i.e. were less than 5 years old at the time of the survey) and 64 per cent of employees are aged 30 or under
- Current average business revenue is low – £42,667 per employee – but there is general optimism regarding future growth prospects for the industry
- London is increasingly favoured as the location of new media firms; central London accounts for 64 per cent of businesses in the London region, hence concentration in space is a demonstrable feature of the industry in its current phase

- There are signs of industry consolidation as larger firms and U.S owned businesses operating in London have begun to display a market leadership profile
- The industry is highly skill-intensive but important skill shortages are evident and raise significant barriers to future growth
- Increasing specialisation of function and market is arising, especially among SMEs, as the 'Jack-and-Jill of all trades' business approach loses competitive traction
- Industry actors express some concern about the rapidity of industry growth and the problems of regulating it 'with a light touch' so as not to kill the dynamic

More specifically, the study found:

1. *Business Structure and Focus*. Almost three-quarters of the businesses surveyed were private companies and only 13 per cent were publicly listed companies. A third defined themselves as new media agencies or design. Other designations included: consultants (11 per cent); design studio (8 per cent); publisher (11 per cent); digital video producer (6 per cent); software developer (4 per cent); and education and training (4 per cent). Ninety-three per cent of businesses had 50 or less employees, almost half had less than 11 staff. The smaller businesses were more likely to describe their focus as consulting or web design. Larger businesses were more likely to be in new media agencies or design.

2. *Scale and market reach*. Average annual revenues ranged from £133,000 for the smallest firms to £4,137,000 for the largest. However, average revenue per employee was remarkably similar across the size range - between £33,000 and £43,000. Almost three-quarters of the firms grossed less than £1 million. Average revenue per employee ranged from £17,000 for software developers to £55,000 for new media agencies. The new media sector ranked well below average revenue generated in related sectors like advertising, publishing and the general software industry but above music and film. Over 70 per cent of businesses expressed confidence in future revenue growth.

3. *Location*. Over 80 per cent of respondents were located in the City of London. The main locational attractors were said to include: suitable and affordable facilities; image; ease of travel to work; access to creative talent and proximity to clients. A large majority of businesses were content to stay located in London. Those who were thinking of moving were generally looking closer to the centre of the city, underscoring the highly concentrated nature of the industry at this early stage in the industry life-cycle.

4. *Remuneration*. After salary, the most frequent form of remuneration was a share of equity in the business (36 per cent of cases). The prevalence of equity sharing was highest for managerial staff and lowest for sales staff. Other forms of remuneration included: pension entitlements; travel assistance; staff development opportunities; vehicles; commissions and profit-sharing.

5. *Education and Training*. The educational qualifications of employees varied significantly. More than 60 per cent did not have completed undergraduate degrees, while 16 per cent had doctorates. Overall, existing training for the new media industry was thought to be moderately useful and relevant but 30 per cent of respondents saw the current relevance of training to be poor or low. Private training organisations were generally relied upon over universities and other public further education organisations, due to the perceived greater practical relevance of the former. There was a strong sense that much of the skill base in interactive media could not be acquired in formal educational programs but needed to be developed on the job and through practical experience.

6. *Barriers to growth*. The three most quoted barriers to growth in the industry were identified as: finding suitable staff; a lack of awareness and understanding by clients, and; the difficulty of maintaining relations with existing clients. Other significant barriers also noted were: slowness of consumer take up; problems in managing rapid growth; irregular cash flow and doubtful debts; and keeping up with the rapid growth of relevant technologies.

The responses from individual employees and self-employed operators indicated:

1. The overwhelmingly youthful nature of the workforce. Over a quarter were under 25 years of age, 64 per cent under 30 and 90 per cent under 40. About a quarter of the respondents were 'freelancers' (self-employed).

2. The workforce was highly homogenous in terms of ethnic background; 86 per cent described themselves as 'white'.

3. The most frequent pathway into the new media industry is from higher education. Other pathways included entry by way of the music, film and public relations industries and architecture and other design professions.

4. The average length of time in the industry was just over three years.

The following two quotes from the individual respondents give a flavour of the diversity of views and experiences in the sector.

> Interactive/digital media has become a central part of our business since launching a multimedia division 4.5 years ago. We now have the busiest digital contract desk in the UK focusing on building a highly focused pool of professional freelancers and niche production companies. We have stayed very much on the bleeding edge seeing and adapting early on to the rapid shift from CD-ROM to online. We launched a new division a year ago to focus on both traditional and interactive editorial which is proving highly successful as more and more content specialists become familiar with and start to work online. For the next twelve months we see a major development for ourselves in how we use online technology to enhance and drive up the quality of service we offer.

> Wonderful industry to be in, but it still suffers greatly from lack of knowledge and clear direction on the part of most clients. Still no really compelling reason to invest in the medium for most of the commercial world here in the UK, or most of Europe for that fact.... it's sometimes quite depressing when compared with the size and growth of the marketplace in the US. But, then, what else is new?

***3rd New York New Media Industry Survey***

In late 1999 PricewaterhouseCoopers carried out the third survey of the new media industry in the New York region. The preceding study had been conducted in 1997. The latest study drew on 750 telephone interviews, a small number of qualitative interviews and 250 internet survey responses, drawn from an extensive base of more than 14,000 businesses in the New York region. The aims of the study were to capture the main changes evident since the 1997 survey, to identify the trends for the future, to gauge the impacts of the growing industry on the regional economy of New York, to cast light on why New York City continues to attract industry players and to suggest what policies might further encourage the growth of the digital economy centred on New York.

The study defined the domain as follows:

> The new media industry combines elements of computing technology, telecommunications, and content to create products and services which can be used interactively by consumers and business users.

The main segments of the new media sector include: infrastructure (including telecommunications), software development, content (applications, tools and marketing), aggregation (e.g. managing online communities) and retailing (e-commerce). The industry has evolved since the mid-1990s away from a primary concentration on infrastructure towards content, aggregation and commerce.

The key findings included the following:

1. ***Rapid growth*. Between 1997 and 1999:**

- Total employment in the industry grew by 40 per cent and total payroll by 55 per cent; this rate of employment increase was much greater than in the traditional media areas (broadcasting, film and publishing) and in other sectors like general retailing, business services and financial services
- The number of companies increased by 25 per cent and total gross revenues by 55 per cent, *on an annual basis*; total revenue was US$16.8 billion in 1999
- E-commerce is the fastest growing industry segment; the number of companies reporting e-commerce as their primary business has trebled since 1997 – however, content design and development remains the predominant core product of the industry
- 30 per cent of companies report annual gross revenue in excess of US$1 million (as opposed to 17 per cent in 1997)
- 60 per cent of companies reported profits for the year 1998 (and 22 per cent reported losses). Over two-thirds of the companies reporting profits did so within two years of commencing business

2. ***Manhattan is the magnet***

- 45 per cent of businesses in the broad region centred on New York City are located in New York City; 82 per cent of those are on Manhattan, most in 'Silicon Alley' – the region south of 41st Street. The remaining businesses are located in nearby New Jersey (28 per cent), elsewhere in New York State (16 per cent) and Connecticut (11 per cent).
- An increasing number of businesses are multi-location (46 per cent), with offices in the New York area and in other regions.

"In Silicon Alley, the companies are competing but are also supporting each other. There is a nice rich infrastructure that has grown up all along the food chain."

- In the New York Region, over the previous three years, internet-based companies raised in excess of US$6 billion through venture capital and initial public offering markets.
- 1,700 companies reported that they had relocated or expanded to New York from another location; 17 per cent of them had original locations in San Francisco/Silicon Valley and 26 per cent overseas.
- The major attractions of a New York location were seen to be: availability of a suitable technological infrastructure, quality of life and proximity to industry participants and markets, especially clients in media, advertising and publishing. Major barriers or challenges were: the cost of suitable space and getting access to talent. State and local tax policies were also seen to be impediments to continuing growth. The most difficult staff to attract were in programming, technology management and technical support areas, more so than in marketing, project management and creative fields.

"I think New York City is without doubt the content capital of new media, and there is not even a close second."

"It's tough with limited resources here. The overall cost of doing business here, of getting good talent, getting services, getting the infrastructure is a negative in New York."

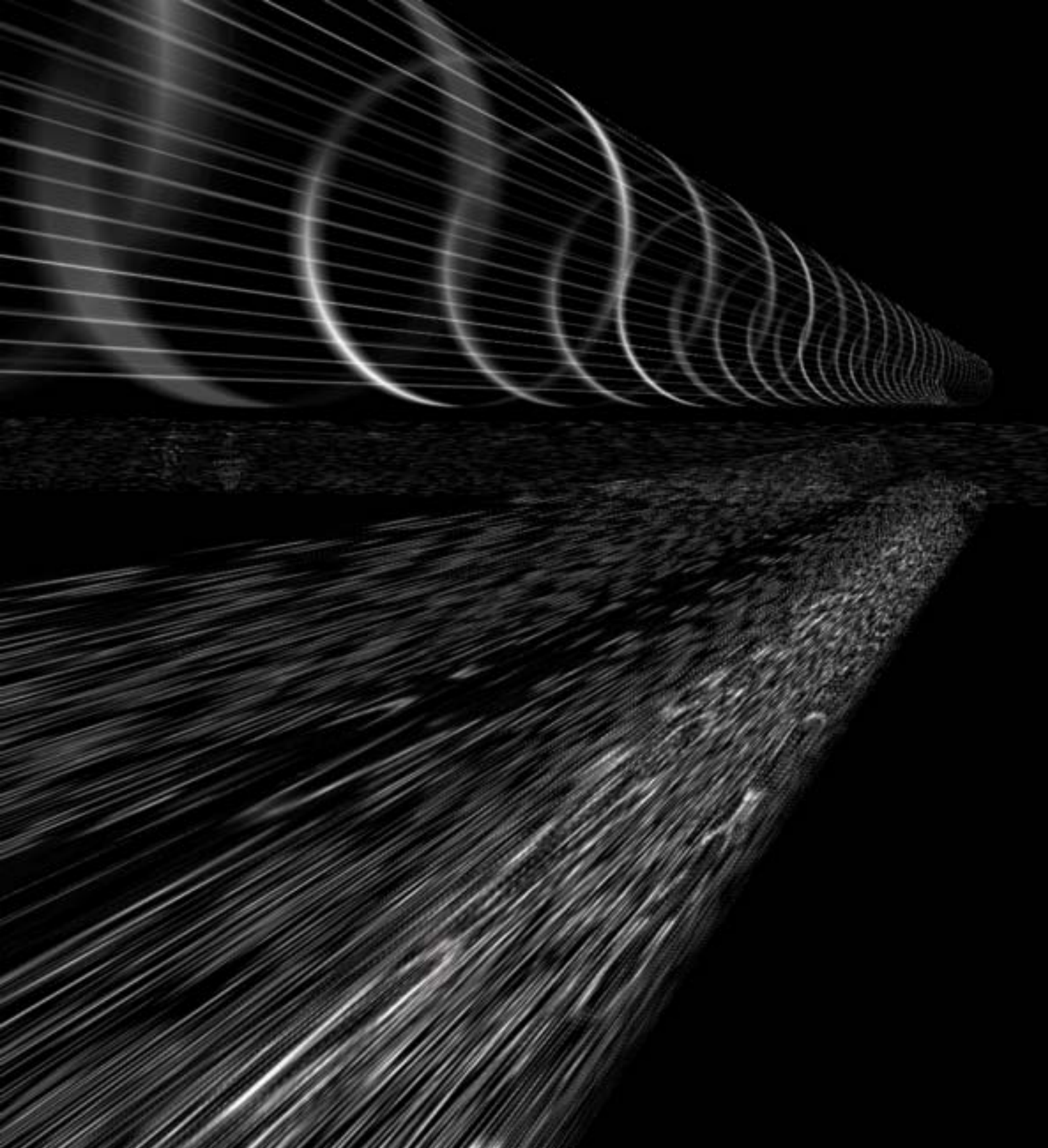
### 3. *Industry Profile*

- The customer profile of the new media industry is diverse: the main segments served are – financial services; information technology; retailing; entertainment; advertising; telecommunications; and publishing.
- The main 'content areas' (defined as the 'subject matter focus' of a given product/service) are: information/reference; advertising/marketing; financial services; retailing; entertainment; and education.
- The average number of products/services offered by companies is increasing, to just under three per company. Two-thirds of the companies engage in content design and development. Enabling services to new media and other companies (51 per cent), online commerce (43 per cent), content packaging and marketing (38 per cent), software development of 'generic' applications (31 per cent) and content creation tools (19 per cent) are also delivered.

- Self-funding is prevalent in 70 per cent of cases but represents only 9 per cent of funding raised for new media businesses. The greatest source of funding is by public offerings (i.e. listing on the stock exchange), followed by venture capital financing. Almost 60 per cent of businesses expect to seek additional funding in the next two years, mainly through venture capital (33 per cent) and private equity (21 per cent) sources.
- A third of employees are under 30 years of age, 71 per cent under 40. The gender division is 62 per cent male and 38 per cent female, similar to the situation in 1997. Almost three-quarters of respondents who reported on ethnicity/race are white, 8 per cent African American and 6 per cent Hispanic.

### 4. *Policy Priorities*

- 54 per cent of businesses raised tax reform as an important policy issue. Policy change with respect to telecommunications (22 per cent) and 'facilities' (16 per cent) were also mentioned. The most burdensome taxes were seen to be state and local income taxes and unincorporated business tax. Subsidised space for incubators and more emphasis on industry relevant education were important concerns.
- New York City and the State Government provide a number of supports and incentives for new media firms in their jurisdictions, including:
    - The Mayor's Council on New Media: a panel of industry, academic and government representatives with the task of proposing initiatives that would encourage the growth of new media in New York City
    - NYC Prospect Street Discovery Fund: US$76 million to support public-private partnerships in high-tech businesses
    - Emerging Industries Fund: US$25 million to provide pre-seed funding for companies in new media and other high-tech industries
    - Energy Cost Reduction Program: 12-year subsidies on energy costs for eligible commercial tenants in New York City
    - EDC Business Recruitment Services: provides business assistance to firms looking to move into or expand in New York City
    - New York State Emerging Industry Jobs Act: provides tax credits for companies investing in R&D in New York State
    - New Media Internet Taskforce: established to advise on policies that would facilitate the further growth of new media and use of the internet in New York State



# 08 Conclusion

The arguments presented and analysed in this paper all point to the centrality of innovation as a key driver of economic development in today's global economy. Continuous though unpredictable patterns of innovation underlie successful economic performance at both the national and international scales. Increasingly, in this view, an individual firm's competitive advantage – and therefore its capacity to survive and grow – depends on its ability to adapt quickly to changes in the *economic environment* that are themselves unpredictable. The choice of the term 'environment' is not accidental. The new economic paradigm that has developed to explain contemporary developments explicitly draws on evolutionary analogies to capture the dynamic processes and effects and, in particular, the path-dependent nature of inter-firm and inter-agency linkages through which information and knowledge are transmitted and new markets, products, processes and business models evolve.

In an increasingly integrated world economy, space or place has assumed a new importance. Far from being 'dead', space matters more than ever. Innovation occurs within a socio-technical matrix or 'milieu' that is spatially focused in particular regional economies, linked by flows – of capital, labour, trade and information. Successful regional economies are those that capture and keep assets (skilled workers, patient investors, cultural and leisure resources, good governance and the rule of law, smart infrastructure and creative people) that enhance innovation processes and outcomes. Export-oriented *industry clusters*, comprising competitors, suppliers, customers, R&D institutions, training facilities, government agencies and industry and professional associations, increasingly characterise the most successful regions, according to researchers like Michael Porter and his colleagues.

Innovation is central to growth because it contributes to increasing productivity, both by way of continuous reduction in unit costs and by creating new value-adding outputs for which a market premium can be appropriated by the innovating firm and its close followers. In a dynamic world, innovation raises the spectre of 'increasing returns', a situation in which average costs continue to decline and don't run up against the constraints posed by diseconomies of scale and scope that characterise the economic vision of neo-classical economics. Industry clusters generate competitive advantage for cluster members because, in addition to other pay-offs, they enhance the probability of positive innovation outcomes.

The other ways in which clusters enhance competitive advantage through increasing productivity, according to Porter, are:

- Improving access to specialised inputs and skilled workers
- Facilitating the faster dissemination of information
- Encouraging cooperation leading to synergies or complementarities
- Imposing the discipline of competition through surveillance
- Jointly benefiting from access to specialised resources and information sources
- Providing a platform for new organisational combinations and spin-offs

The contemporary debates on industry clusters reprise an earlier analysis of 'industrial districts', advanced a century ago by the economist Alfred Marshall. Modern variants of the 'new industrial districts' figured in the debates during the 1980s about the economic success of regions in 'the Third Italy'. Although the notion of 'inter-firm network' lay at the base of much of this work, little effort had been devoted to understanding the structural features of clusters in network terms. Research by Staber (2001) and others, described in chapter 3, sought to fill this gap. Staber argued from an explicitly evolutionary perspective that the network structure most conducive to innovation is one characterised by 'loose-coupling', 'diversity' and 'redundancy'. Flexibility and the capacity to learn by doing in an environment high on mutual trust and reciprocity was more conducive to innovative outcomes than a competitive situation marked by homogenous actors, tight regulation, sharp competition and constant supervision or surveillance.

Earlier research had pointed to the importance of SMEs in driving innovation, especially in the early phases of the industry or product life-cycle – the so-called Schumpeter I model. However, Simmie (2001) and others have argued that as an economy matures, the role of SMEs recedes and innovation is increasingly internalised within the large (often multinational) corporation and R&D institutions – the Schumpeter II model. In a mature economy, larger established operators may be in a better position to

commission the R&D underpinning technologically advanced developments and to quickly recognise and overtake (or take over) smaller pioneering firms. According to Simmie, this dynamic lies beneath the observable tendency for innovation to be clustered in a relatively small number of large city-regions. In network terms, patterns of spatial clustering may occur at different but integrated scales (see Figure 3, above). Large multinational companies head-quartered in world cities may control the flows of capital and knowledge to sets of subsidiaries, each embedded within localised clusters in other parts of the world. This spatial pattern of innovation may well pose major barriers to both smaller and less developed economies seeking to establish leading edge industry clusters, rather than suffer derivative status in a global network managed from the major metropolitan regions.

As a relatively young industry, it might be expected (on the above analysis) that digital design – though not ICT – would still be characterised by the innovative contribution of SMEs. This indeed appears to be the case for the interactive media sector (see chapter 7.2).

Porter argues that industry clustering is now a pervasive feature of advanced industrial economies. So intense are the competitive pressures to carve out and enhance competitive advantage in the global economy, he claims, clustering is as relevant to traditional ('old economy') industries as it is to new economy and high-tech industries. Research by Steinle and Schiele (2002), however, suggests that clustering is more likely in some situations than others. They identify two necessary conditions for clustering to develop:

- The production process must be capable of division into specialised tasks or phases
- The final product or service must be highly transportable – i.e. it must not be bound to a local market

In addition, four sufficient conditions for clustering increase its likelihood:

- The product or service has a long and complex value chain and high coordination costs
- There is scope for bringing together a range of complementary skills and resources
- Innovation is a pervasive feature of competitive and cooperative behaviour
- The market for the product or service is volatile and subject to sharp and unexpected changes

Richard Florida (2002c) proposes a 'theory of creative capital' to deal with the spatial clustering outcomes identified by Porter and others: innovation driving regional

economic growth is dependent on the locational decisions of creative workers. Creative people favour places that are open, tolerant and culturally diverse. Such places display a number of features:

- 'thick labour markets' – with opportunities for 'sideways' as well as vertical movement up the ladder of skills and remuneration
- a quality (even bohemian) lifestyle
- plentiful opportunities for social interaction in 'third places' (neither home nor workplace)
- ethnically and sexually diverse communities
- 'authentic' rather than manufactured environments – including an unplanned mix of old and new built form
- a firm basis for claiming and maintaining personal identity and belonging

Florida developed a set of indices aimed at measuring these features, applying them to the major city-regions in the United States. His empirical study identified the regions with the heaviest concentrations of creative people and concluded that the best single predictor of the regions undergoing the fastest growth in high-tech industry clusters was the 'diversity index' – i.e. the concentration of same sex couples in the community. Application of Florida's methodology and indices to Australian regions by NIEIR (2003) found a similar pattern of concentration. Inner Sydney and Melbourne ranked up with the top U.S. regions on a number of these indicators, including the concentration of the creative class, but somewhat lower in relation to innovation performance and high-tech industry growth. Nevertheless, the NIEIR study did establish the significant lead that the core areas of Melbourne and Sydney – and to a lesser extent, the smaller capital city cores – had over other parts of Australia with respect to innovation and economic performance.

These results have clear implications for policy makers. If researchers like Porter and Florida are right, governments at all levels need to be very aware of the forces that drive and concentrate innovation processes and outcomes. Distinctive national systems of innovation may be said to characterise the major industrial nations. How national and lower levels of government interact with other agents in the economy, including research institutions like the universities, will have a significant effect on actual innovation and growth performance of regions and the formation, growth and success of industry clusters underlying that performance. The national government inevitably plays a very important role in all this due to its responsibility for external economic and political relations, dominant taxing and regulatory powers and status as the

economy's largest consumer. Between them, the joint policy challenge of the different levels and agencies of government is to:

- facilitate productive linkages between economic agents, across and within existing and new clusters
- increase the effectiveness of information and knowledge flows within networks
- establish positive (and remove perverse) incentives for cluster growth
- contribute to the establishment of a generally positive culture of risk-taking in industry and the broader community
- regulate with a light but consistent hand
- encourage the full development and commercialisation of research by way of incentives and regulatory reform, including clear rules relating to intellectual property
- support and reward experimental behaviour

Chapter 7 applied the above analysis to a new composite cluster – digital design – formed by the intersection of the well-established ICT cluster and agencies involved in design activities and businesses. Design conceived as both input and output, utilising developing digital technologies, is a powerful potential driver of regional economic growth in city regions like that centred on Melbourne. Figure 5 presents a schematic attempt at locating this new cluster within the broader knowledge economy. Figures 6 and 7 note the main components of the composite cluster. However, existing data sources, based on standard industry classifications, do not closely capture its contours. The picture described in chapter 7.1 must therefore be seen as a rough, largely indicative account of the Australian situation. Later stages of this research project will attempt to develop a more accurate and nuanced account. The studies of the new media industry in New York and London, summarised in chapter 7.2, offer hints as to how we might proceed and a basis for comparing the Victorian situation with respect to this component of the digital design cluster.

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# Acknowledgements

I would like to thank my lab.3000 colleagues for their support and encouragement during the conduct of the research on which this report is based. I am particularly grateful to Michele Azzopardi, Melanie Clarke, Di Fleming, Michelle Milton and Chris Ryan.

I also acknowledge the contributions of Michael Trudgeon and Glynis Teo of Crowd Productions Pty Ltd who designed and produced the report, and the continuing commitment of the Victorian Government and RMIT to the work of lab.3000 and this research program.

MB, October 2003

# **Innovation by Design:** The Economic Drivers of Dynamic Regions

Professor Mike Berry lab.3000 October 2003

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