Business models for relocalisation to deliver sustainability

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Abstract

Sustainability implies the interconnectedness of social economic and environmental problems and hence the need to develop systemic solutions, a challenge that successive GIN conferences have sought to meet. This paper seeks to demonstrate the interconnected nature of sustainability in terms of product, process, scale and structure, as well as consumption norms. In the process, we intend to demonstrate that relocalisation is not only the key to the successful realisation of the principles of sustainability, it is also the basis of viable alternative business models that can deliver added value and economic resilience to local communities.

Those working from a cultural and social perspective have sought to emphasise the significance of local economic structures in engendering a sense of belonging and mutuality (Douthwaite 1996, Korten 1999, Hines 2000, McIntosh, 2002), but hitherto mega-capital and its process of globalisation has sought justification through the perceived economic rationality of scale and standardisation. The success of scale economies has been based on externalising the environmental and social costs of reaching geographically extensive markets. It is now beginning to be appreciated that the era of post-modernism is ushering in a new perspective in which the relentless triumph of hard capital, hard automation, and the centralised mass production of undifferentiated consumables is finally being challenged. The key has been to find business models to supplant those in place now (Hart, 1997).

The central thrust of this paper is that the embedded structures of production are closely intertwined with both the characteristics of the product and with the dominant technologies of production. These characteristics result in and demand particular patterns of consumption. Critics of unsustainable business find little difficulty in identifying the problems (Korten, 1995, 1999; Gray 1998, Shrybman 1999, Klein, 2000), but arriving at remedial solutions has proven more difficult. It is our contention that attempts to create sustainable business must change the terms of competition and create a new nested set of product, process, structure and consumption to create a new vernacular economics (Daly, 1999; Hawken et al, 1999; McIntosh 2002).

The paper will draw on examples from various sectors including paper production (e.g. Desai and Riddlestone, 2002), chemicals, book publishing, steel production and the automotive industry to illustrate the themes outlined above. We conclude that the decentralised economy constructed from micro-businesses can provide the skeleton upon which the body politic of localities can at last be rebuilt.
Introduction

A central tenet of economic and business logic is that of capturing economies of scale to deliver lower costs, expand the market, and derive profits. It is a simple, appealing and inherently plausible idea that has underpinned the massive growth in material welfare enjoyed by billions of people around the world for the past 100 years. Notwithstanding notions such as lean production, flexible specialisation, and mass customisation, all of which ameliorate rather than replace mass production, it remains a dominant ideology throughout industry. Hence there is the acceptance of large companies operating large plants to reach spatially extensive markets as axiomatic and the fundamental starting point from which any analysis flows – whether environmental or economic.

In the old debate of hierarchies versus markets, it is evident that companies tend towards centralisation and control as a means of simplifying complexity. However, this also amounts to a suppression or denial of diversity, almost a negation of actual market demands. In this sense it is the price paid for ‘low cost’ material welfare – sensitivity to differences in demand at the local or individual level is obliterated by the pervasive power of mass production.

These may appear to be contentious ideas, because the benefits of mass production are so evident and so widespread that it must be foolish to challenge it. Still, seen in a broader historical perspective perhaps mass production via large scale facilities and concentrated ownership structures can be seen as a necessary but temporary phase. Our proposed vision for Micro Factory Retailing (MFR), explained below (also Wells and Nieuwenhuis 2000; Nieuwenhuis and Wells 2003), is radically different to the current structure of multi-brand, multi-location companies founded upon the logic of mass production and economies of scale. How could such a dramatic trend change come about? Batchelor (1994: 124) quotes Sabel and Zeitlin, who point out that:

...the persistence and development of manufacturing strategies other than mass production oblige us to review its place in history, as well as how it functions. Rather than habitually ascribing to it the status of an ideal of industrial efficiency, to which all other forms are in various respects inferior, subordinate or anachronistic remnants of some older, soon-to-be outmoded way of thinking, it can be argued that mass production was but one of a range of manufacturing strategies, each of comparable technological viability. The decision to pursue mass production at the expense of these alternatives arose, not because of ‘an immanent logic of technological change’, but because of ‘some implicit, collective choice, arrived at in the obscurity of uncountable small conflicts.

The case for mass production is determined by specific technology choices and by particular phases in the development of markets. Over time, the technologies and concepts at our disposal change, as do markets and with them so also do the possibilities of how to serve them. This paper explores some of the possibilities of local, small-scale business as the means both to achieve sustainability and better serve modern markets.
Small-scale in terms of operational parameters does not necessarily mean fragmented ownership and the end of the large corporation. Ownership is itself a difficult issue, because the ‘natural tendency’ of capitalism is towards monopoly; to eliminate competition. These contradictory themes are recognised. It could be argued, for example, that large companies are those that are doing the most in environmental terms, have the technological and financial resources to make changes for the better, support disclosure of information and adherence to environmental quality standards, and so forth. In contrast, traditional small businesses often escape regulation and are ‘backward’ in managerial terms.

As a theoretical concept, ‘local’ defies precise definitional boundaries. It is a dynamic, socially embedded concept that embraces elusive phenomena such as a sense of place and belonging, of a certain cohesiveness, of integration between members of a social group or tribe and the physical boundaries of that group in the world that they inhabit. Perhaps before mass transportation the concept of ‘local’ could be more easily reduced to ‘within normal walking range’. In the modern world the notion of ‘local’ is less precise. People living in the same space may have radically different ideas of what constitutes local. That fluidity and imprecision is recognised. From this analysis it is concluded that locality has meaning that is contextual and relative, and may therefore often appear rather illusive. Yet certain ‘tribal’ affiliations, often linked with language, are surprisingly persistent, surviving centuries or millennia, and even challenging the more modern nation state (Stephens, 1976). Recent moves toward more devolved government in Italy, Spain, Belgium, France and the UK are a response to the re-emergence of these persistent tribal affiliations in Europe. However, the focus here is on the economic dimensions of locality, and with the related concepts of the decentralised or distributed economy.

The second half of the paper seeks to present more concrete aspects of relocalisation and sustainability. Thus the somewhat abstract and macro-level discussion is linked to the micro or business level with a consideration of economies of scale in industry, although here the emphasis is actually on diseconomies of scale. Finally there is consideration given to business models that flow from the philosophy of small-scale sustainability. Most of this discussion is based on the automotive industry.

The socio-cultural basis of locality

Our spatial world is traditionally thought of as operating at several distinct levels: global, international, national, regional, metropolitan, and local. These terms combine one or more of several distinct characteristics: physical size both absolute and relative, natural geographic boundaries, cultural aggregations, legal entities, political entities, and domains of economic power. In between these levels, geographers have constructed other plausible concepts, for example the ‘hinterland’ concept or the notion of the ‘triad’ countries / regions (Ohmae 1985). The environmental dictum of ‘think global, act local’ embraces the two extremes of spatial scale, but in practice both extremes are rather fluid in definition. Hence, any call such as that made here for ‘relocalisation’ forces consideration of what we mean by ‘local’ at all. Hines (2000, 30) explores this to some extent and highlights the need for different localities depending on what we area of economic activity we are considering: “The parameters of the area within which each industry would site would be predominately the nation state, although for some goods (eg agricultural products), the area might be sub-
Locality is a discourse, continually re-defined and contested in many different domains, thus for many, in the wake of the formation of the European Union, ‘Europe’ has become a new locality, adherence to which is valued. While it may be convenient and analytically helpful to separate the many strands of that discourse into more manageable portions, it is important to be mindful that cultural impulses for new thinking can come from many sources. A typically British example is that of gardening. Take as an example this plea by Brookes (2003): ‘A rethink is long overdue. Away from the commodification of gardening to the discovery of the character and specialness of each and every garden.’

This argument in favour of diversity, difference and originality in gardening is matched by an analysis that calls for a return to vernacular inspiration and a celebration of locality, ‘What we actually need is a radical rethink of horticulture. We need a new system of land management that proceeds not from the artificial environment of the Edwardian walled garden, but from the land itself.’ So, Brookes argues for a return to a vernacular horticulture that uses local materials and plants, but also makes the more nebulous and spiritual link by saying also that, ‘Re-establishing a sense of local distinctiveness...Rediscovering our sense of place might be good for us as well as our gardens.’

Obviously for large proportions of the population such concerns with respect to gardening are meaningless and irrelevant. But, there are similar debates over a range of cultural activities from language to music, fashion, sport, food, cars (how Italian is a modern Alfa?) and many more. Perhaps the tide of change encapsulated by post-modernism amounts to a statement that mass consumption society has reached natural limits, and that dissatisfaction with the uniformity of mass materialism is generating market fragmentation on an unprecedented scale.

Still, as a counterpoint we can understand that at some levels the forces of globalisation can uproot people from locality, and while there may be material and other benefits from such a process there are also individual and social costs. Perhaps this is a time limited phenomenon, that social and cultural practices simply have to ‘catch up’ with globalisation so that we collectively can feel comfortable with living in the global village. Certainly there is a strand to this debate that reveals the sense of powerlessness, even an inability to understand the sheer complexity of the modern inter-connected world, which in turn results in profound alienation. Yet we saw earlier that the European regions that pre-date the nation state have proved surprisingly resilient. At the very least, this suggests that attempts to undertake the journey of sustainability must consider the issue of locality and the meaning that the concept of locality has in people’s lives.

The environmental basis of locality

Environmental problems can become manifest at a variety of spatial scales from the highly localised pollution incident (e.g. Bhopal), to regional questions over biodiversity, trans-national concerns over boundary-crossing sulphur dioxide emissions, and to the global impact of ozone depletion or carbon dioxide emissions. In many
cases the local appearance of specific environmental problems can be linked to global issues. Hence, for example, local pollution incidents in cotton production may be linked to the use of GM crops, artificial fertilizers and pesticides because this is a least-cost, globally-traded commodity.

Of course in certain instances the incidence of local environmental problems is simply a function of geographic or geological accident. Only certain locations have iron ore, or can support cotton plants, and therefore only certain places can experience the particular problems associated with ore extraction or cotton farming. Rivers may allow pollutants to travel along particular trajectories, adversely affecting those living along their course. Often the problem of the ‘nimby’ (not in my back yard) arises when people in a locality feel that they are taking on an unfair environmental burden on behalf of society as a whole – for example with the siting of waste incinerators, an airport, coal mines, wind generators, or new housing developments.

Yet this ‘nimby-ism’ hints at an interesting consequence of contemporary patterns of industrialisation and economic development. The waste incinerator is in part seen as ‘unfair’ because it processes waste for a wider community of people, not all of whom will experience the perceived or actual negative consequences of operating such a plant. However, the plant is large (larger than the needs of the locality affected) because at this scale it is both economically and environmentally efficient. Moreover, by having a few large incinerators the problem of management and regulation of such facilities is simplified. Should the worst happen and something go terribly wrong, only a proportion of the population would be affected, or so the current thinking goes.

There is often a difficult choice between dispersed pollution and other negative consequences from having a multiplicity of small-scale manufacturing operations, and the concentration of potentially much higher levels of such negative consequences on one site. Multiple sites might be very difficult to regulate, especially given the reliance on voluntary disclosure. In the US, for example, car plants and other industrial facilities are expected to provide data on toxic releases (the Toxic Release Inventory data). This has been used by, among others, those interested in establishing which are the ‘greenest’ car plants (ACEEE 1999, 2002). It might also be argued that there is a level of entropy efficiency for many processes that should be optimised for most efficient production, so that economies of scale are effectively matched at the environmental level: for a given unit of output you get less waste, fewer toxic emissions etc.

This is an old argument, centralisation and hierarchy result in control and efficiency. Given contemporary communications and computer technologies it is not immediately apparent that such crude mechanistic systems of control any longer offer real efficiency advantages, though it might be said that multiple dispersed sites would be wasteful of resources, with too much duplication. This ignores the waste of over-production (see below). It might be countered that a concentrated site also might result in a concentrated problem, rather than it being ‘diluted’ across space.

Large-scale high-throughput production tends to be capital intensive and inflexible. A potential consequence is therefore that there is an over-production trap. This is the problem: that large-scale production does indeed generate economies of scale (lower economic cost per unit of output) with high levels of output but only at high levels of
output. Thus the pressure to achieve that high level of output is considerable and may override any actual market demand. Hence, the environmental dimensions of locality are to some extent inter-twined with the economic. Moreover, in the search for ever-greater levels of production efficiency it may be the case that optimum production capacity grows over time. This allows higher unit throughput per unit of capital investment, and usually also reduces variable costs (notably labour). Lower unit costs in production allow lower unit prices in markets, and – all things being equal – the market will be expanded.

But in total, does this not lead to over-production, over-supply and, ultimately, over-consumption? It is our contention that, at least as far as the automotive industry is concerned, this is indeed the case. Our research suggests this is the story for almost all commodity materials and products from oil, aluminium and steel, to semiconductors, computers and cars. To a degree such over-production is masked by technological innovation to increase the unit price of the product (e.g. galvanised coated steel commands a higher price than standard cold rolled steel), and by the expansion of the market which forces a re-evaluation of the ‘normal’ level of consumption.

The evidence for the case on over-production in the automotive industry is not necessarily straightforward, not least because the used or ‘nearly new’ market can be used to manipulate product supply. It also involves high rates of discounting for new products, high rates of product value depreciation, ownership rates that greatly exceed the ability of people to use the vehicles, and premature scrapping of vehicles (or high levels of used car exports, as in the case of Japan). More subtly it might include all manner of activities traditionally grouped under the term ‘marketing’ and the general tendency towards ‘baroque’ products wherein functionality is gradually displaced by elaborations of increasing irrelevance, but where some profits can still be made (cf. Nieuwenhuis & Wells 2003: Ch 1). From the sustainability perspective over-production is undesirable therefore because constitutes a waste of resources and unnecessary pollution. Over-production is a strong possibility with large-scale capital-intensive manufacturing facilities.

One further dimension to the question of the environmental aspects of relocalisation is the movement of goods, services and indeed people to and from the workplace. Centralisation and economies of scale expand the geographic scope of the market, but also of the production system itself. To take the iron and steel industry as an example, this was initially founded on the basis of locally co-occurring deposits of iron ore, coal and limestone so that even where the output travelled reasonable distances, the input materials did not. As the production technology developed, so too did the scale of facilities to the point where local deposits of sufficient volume and quantity of all the required materials were not necessarily available, and to the point today where materials such as iron ore are routinely shipped thousands of miles.

An alternative case is that of the brewing industry. Again this was initially a local industry, not so much because of input material constraints (humans have been remarkably ingenious in finding local produce that can be turned into alcohol), but because the finished product is largely ‘added value’ water. As such beer or wine is heavy relative to unit value, while for much of its history beer and many wines were also perishable and until the advent of cheap mass transportation it was simply uneconomic to move these products long distances. In a very real sense then,
centralisation in the beer industry has been made possible by low transport costs and improved methods of preservation. By comparison, the wine sector is still surprisingly fragmented, despite some very large concerns which at least market globally, even if they produce in one locality (e.g. E & J Gallo of California). It might also be argued that transport costs are low because of the ‘unrealistic’ low price for oil, which does not fully take its finite nature and environmental impact into account. Hence brewing companies benefit from the low internal costs of transport, while the wider environmental ‘external’ costs are passed on elsewhere.

The economic basis of locality

From an ecological perspective there is a challenge to be made to the predominance of production in both mainstream economics and in Marxist thinking. While there have been attempts to produce an environmental economics (Pearce et al, 1989; 1991), radical critics argue that this is a deeply flawed project (Hayward, 1994). Not least, environmental economics remains reductionist; it attempts to reduce all things to a monetary value and hence to remain within the rationality of economics. This is therefore seen by critics as an attempt to put a price on the priceless, to subject the wider environmental sphere to the narrow economic sphere.

Still, the localisation of a distributed economy is not just a statement of how to do things ‘better’ from an economic perspective. On the contrary, it is a deliberate attempt to reintegrate economics with the concerns of politics and society, The basic principles outlined here are derived from Schumacher (1973: 26-35):

- Material wealth, particularly as measured by metrics such as Gross Domestic Product, has no correlation with individual happiness or peacefulness.
- Continued ‘growth’ on such measures is doomed to meet the physical limitations of the natural world.
- Contemporary economics is based upon the non-valuation of natural ‘free’ goods or the short-term valuation of irreplaceable natural resources.
- The distributed economy is founded on the notion of the economics of permanence.
- Science and technology should be orientated towards the peaceful, the non-violent, the gentle, the organic and the non-invasive.
- Technologies should be cheap enough to be accessible to everybody, suitable to deployment at a small scale, and able to foster creativity.
- Work should be enriching and rewarding, not enslaving humanity to the regimen of the machine.
- Wealth and power should not be concentrated into a few hands, in particular the capital cost of a workplace should not be substantially more than the average annual wage.

The broader social and cultural dimensions of locality are beyond the scope of this paper, although the comments above argue that they must be part of the wider definition of sustainability. The focus is on the economic dimensions of locality, and therefore for this paper relocalisation is about returning economic activity to a local level. Embedded within this idea is that of relocalisation being a dynamic process of progression towards local (economic) self-sufficiency. The circuits of production and consumption, of wealth creation, of saving and investment need to be on a trajectory
that reverses the existing paradigm of globalisation. It is recognised here that the issue and process of globalisation is itself deeply problematic because it implies a degree of geographic spread and cohesiveness that simply cannot be supported by the available empirical evidence, but as a shorthand counterpoint it can be considered that relocational is the negation of globalisation (Hines, 2000).

For some, therefore, relocational can only be achieved by economic protectionism against the adverse effects of free trade, with a strategy that, ‘...centres on the replacement of the present political and economic theology of globalisation with an emphasis on local production and the rebuilding of local economies.’ (Hines, 2001: 45). Hines (2001) goes on to outline seven main policy steps that should be taken to protect local economies including tariffs and a reorientation of trade rules. For Hines the issue is simple in that, 'Localisation means, very simply, that everything that could be produced within a nation or region should be.' (Hines, 2001: 45).

However, note the slide from ‘nation’ to ‘region’, quite different geographic entities. Moreover, within the same short article other phrases are used including ‘domestic markets’, ‘local economies’, ‘nations’, ‘local governments’, ‘communities’, ‘community life’, all of which carry different meanings. Furthermore there is a logical limit to the ability of a ‘locality’, however defined, to provide for economic self-sufficiency if it is to exist beyond the level of subsistence. It cannot be expected that every village, or town, or even region, can possibly provide for all the materials and products that are found to be necessary in contemporary economic life. Similarly, Hines’ (2000: 30) suggestion quoted earlier that the nation state may be the optimum unit in most cases has different implications for Luxembourg and the US. Daly (1999: 68) quotes J. M. Keynes on this issue: “I sympathize therefore, with those who would minimize, rather than those who would maximize, economic entanglement between nations. Ideas, knowledge, art, hospitality, travel – these are the things which should of their nature be international. But let goods be homespun whenever it is reasonably and conveniently possible; and above all, let finance be primarily national.”

Protectionism might be one means of creating a more stable and ‘fair’ economic regime. It has to be doubted whether in the current or foreseeable political future, one based on the prescriptions of free trade liberalism enshrined in the World Trade Organisation regime, there is scope for such overtly protectionist sentiment. However, even if such a regime were put in place, it is likely that it would ultimately fail unless and until there are viable, competitive business models that allow the inhabitants of the decentralised economy to compete.

Decentralised or distributed small-scale production has largely been associated with two main areas: agriculture and, more recently, energy. Small-scale food production is widespread in developing countries, and some form of local self-sufficiency is seen as vital to support both economic and promote wider policy aims, for example reducing population drift from rural to urban areas (see Thomas et al. 2000, for example). A recent example for the localised production of an intermediary product, rapeseed oil, has emerged in Denmark (see Folkcenter, undated) where small-scale production allows local participation and ownership, and hence the retention of value-added within the local economy. Local energy production is a feature of the economic architecture envisaged by some for the ‘hydrogen economy’, based around small-scale fuel cells serving physically proximate energy needs and thereby obviating the
losses caused by energy transmission. Lovins proposes that hydrogen fuel cell cars can provide distributed energy, feeding any excess into the grid, when not in use (Weizsäcker et al. 1997).

Similar claims have been made with respect to domestic gas cooking facilities where the waste heat could be converted to electricity and fed into the grid. It is already the case that in some countries domestic and industrial solar energy systems can return spare electricity to the grid and be paid for so doing. Other candidates for decentralised production of energy include photovoltaic systems, micro-hydro systems, wind power, tidal power and bio-diesel. Bio-diesel is an interesting example because at a normal industrial scale a typical plant is able to produce 20,000 tons per annum. However the plant is technologically complex, capital intensive, and dedicated to only one feedstock. Alternatively, small scale bio-diesel is possible at batch volumes of 45 tons per annum, or flow volumes of 1,800 tons per annum. At this scale the technology is less complex, requires lower capital investments, and can be adjusted to suit the locally available feedstock (see http://forums.biodieselnow.com/topic for more on this).

Is a decentralised economy more robust? The implication is that such an economy is self-sufficient, able to withstand the vagaries of global economic turbulence, autonomous, the people within it are masters of their own destiny and therefore genuinely free. Those who promote greater international trade would argue that economic growth is boosted by such trade, that places enjoy comparative advantage and then trade to the benefit of everybody. It is not always clear whether such an argument for self-sufficiency is in favour of ‘robust but poor’, a denial of material benefit, or whether it is possible to have both economic independence and material welfare.

The significance of scale in sustainable business

It is inevitable given all of the above that any moves towards relocalisation have embedded within them the issue of the scale of capital investment. Local patterns of production and consumption mean smaller markets for products and services, a fragmentation of economic effort. In some respects this is the antithesis of a doctrine of neo-classical economics – the primacy of economies of scale. As is shown later in this paper, in practice the process of relocalisation does not necessarily entirely revoke economies of scale, but suggests that they may be achieved in different ways. In particular, the congruence between economies of scale, centralisation (or concentration) of capital, and globalisation represents the dominant – but not the only possible, mode of organisation for production and consumption. Put in terms of business models, the profitability opportunities afforded by sector consolidation and the creation of monolithic corporate entities are apparently immutable and inevitable; but they are also historically specific. In this case, as the business context changes, so the business models must also change.

Three Case Studies: steel, beer and automotive

Such changes are already evident in some industrial sectors. Two of note are steel and beer. In the steel industry the process of centralisation, standardisation of production and the drive for least cost economies of scale resulted, by the 1970s in what might be
described as a US model of industrial production. These were very large plants: integrated wide strip mills using iron ore as input and able to produce over 5 million tonnes per annum, at very low costs per tonne, but with little product variety and only average quality. Thereafter, Japanese mills gained the ascendancy, with somewhat lower break-even volumes (4-5 million tonnes per annum), higher product variety but in particular higher product quality. About the same time, the electric arc mini-mill emerged as a viable competitor in so-called commodity products (e.g. long products such as bars used in railway tracks). These mills used scrap steel, and could break even at under 1 million tonnes per annum, but could not make the high grade cold rolled wide strip that the integrated mills could produce. However, the mini-mills have increasingly eroded the market share of the integrated mills (especially in the US where energy costs are low) and extended the range of ‘commodity’ products they are able to produce, thereby undermining the total volumes the integrated mills needed to survive. The retreat up market to concentrate on higher value added steels by the integrated mills eventually resulted in losing the very volumes needed to retain their status as low cost producers. It is interesting to note that now European integrated mills have sought to emulate the mini-mill with such technologies as continuous casting to capture lower break-even volumes (circa 2 million tonnes per annum) with much higher product variety. (Wells, 2001a; Ranieri et al, 2003)

In the brewing industry the position is somewhat different, because concentration in the sector has continued on an international scale resulting in dominant companies, such as the Belgian company Interbrew, that own a large number of leading brands. In part this may be because the sector is strongly reliant upon driving down costs through the opportunities offered by large-scale purchasing, and because of the importance of marketing expenditures in promoting brands. The practice of brewing products within national or regional markets ‘under licence’ or acting as local ‘bottlers’ further complicates the picture. Still, it is evident that at the margins of the market (admittedly perhaps in the region of 5% by volume in North America and Europe) emergent micro-breweries and ‘real ales’ have continued to survive and even prosper. The micro-brewery concept in the US is particularly interesting. From limited fieldwork this sector appears to trade on the basis of a premium price for a distinctive, differentiated product. This is important because it suggests that small-scale production need not be about cost reduction, and actually might be encouraged within the more affluent societies that hitherto have derived material wealth from classic mass production.

Perhaps the single dimension that is most relevant to the analysis of the automotive industry is that of scale. The anarchist theorist Murray Bookchin has sought to emphasise that technology per se is insufficient. What is of equal importance is that from an ecological perspective the organisation of economic and social life also needs to approach a human scale, ‘Simply put, this means that corporate gigantism with its immense, incomprehensible industrial installations would have to be replaced by small units which people could comprehend and directly manage by themselves’ (Bookchin, 1980: 92). As Schumacher (1973:31) argued, ‘Small-scale operations, no matter how numerous, are always less likely to be harmful to the natural environment than large-scale ones, simply because their individual force is small in relation to the recuperative forces of nature.’
In the automotive industry, perhaps the best-known single example of large-scale manufacturing and the pursuit of centralised economies of scale, there are clear signs that limits are being reached. These limits are primarily economic, and appear to reflect both generic and specific diseconomies of scale. Generic diseconomies of scale apply to all sectors, and include for example the costs of co-ordinating and managing very large, multi-cultural organisations. Specific internal diseconomies of scale apply according to the sector under consideration. In the case of the automotive industry this might apply to the negative market consequences of product standardisation with all-steel vehicle bodies (Nieuwenhuis & Wells 1997, 2003). This in itself suggests that scale is being used in two senses here. First, there is the question of scale with respect to manufacturing facilities, an issue closely related to the characteristics of product design and process technology. Second, there is the question of scale with respect to the corporation as a whole. Typically, in the automotive industry, economies of scale here derive from activities such as purchasing and R&D that can be spread over several models or manufacturing plants.

Profitability in the automotive industry has declined over a long period dating back to about 1930 (cf. Haglund 2001). Even conventional city analysts such as UBS in New York are now warning of impending doom. Major restructuring efforts such as those at Ford and DaimlerChrysler cannot deliver the required cost savings, at least at the pace required. There is a problem of the destruction of shareholder value, such that some are looking now for the possible disintegration of monolithic groups. Moreover, there appears to be no more room for traditional inter-company consolidation. Only GM is still pursuing least cost market leadership but this destroys consumer value because it generates high rates of depreciation on cars already in the market. The consequence, in markets like the US, is a market artificially boosted by discounts and incentives with consumers locked into finance deals on cars that will be virtually worthless when it comes to the time for trade-ins. Kiley (2003) exposes this negative equity problem for many US car buyers. The business model is itself failing and hence the industry is economically unsustainable.

Absolute scale in the automotive industry does not appear to be the only source of competitive advantage today, even though it could be argued that in the long run the industry has tended to squeeze out smaller players through a process of consolidation. In reality size does tend to matter because if nothing else scale means that risks can be dispersed. For example, very large companies can survive the release of a poor product, or the downturn in a particular market, that smaller companies might succumb to. Global companies can therefore spread risks and afford failure on a scale that other companies cannot. They can therefore afford more mistakes and perhaps higher levels of incompetence; their large scale helps their survival. Similarly, it can be argued that only big companies can do R&D to keep up the rate of technological innovation and therefore develop the solutions needed for sustainability (against this see the case of OScar, below).

Being small in scale does not guarantee robustness for individual companies or for the decentralised economy as a whole. Indeed, because each individual economic entity is relatively weak there is a clear danger that, under some strong competitive challenge, they will simply all collapse at once. Economic history is full of examples of rapid structural change of this type, as in the automotive sector in the 1930s when high investment new technologies for mass production conspired with the world economic
crisis to condemn scores of car manufacturers (Nieuwenhuis & Wells 1997, 196-199; Nieuwenhuis & Wells 2003, Ch8; Raff 1991, 1994). This is why it is important to have business models that are deeply rooted in their local economies, to have sources of competitive advantage that cannot be replicated or by-passed by other competitors.

A further issue to consider is that of scale and ownership. This must be a part of the analysis of relocalisation and the business models presented below. It appears to be generally assumed that small-scale, local manufacturing means a ‘more democratic’ ownership structure without undue concentrations of wealth and power. Even where such enterprises are privately and individually-owned the relative concentration of wealth is not great, and the business is presumed to be more embedded in the locality through many formal and informal mechanisms. Perhaps this is an overly romanticised picture. Equally, most large-scale manufacturing businesses are not owned by individuals, the shares are traded on stock exchanges and ownership is often dominated by institutions such as pension funds, notwithstanding the growth in so-called ‘shareholder democracy’. Again the automotive industry is a good example. Of the major vehicle manufacturers there is a mixture of ownership patterns with some families still significant as shareholders (Quandt at BMW; Ford at Ford; Porsche and Piëch at Porsche, etc.) and in management, but with an overall domination by institutions.

Illustrations of local sustainability: business models for a new era

Local assembly facilities within our MFR model could be centrally owned by corporations, use a franchise system, be jointly owned by a collective of MFRs, or be locally owned by a local business (e.g. a former car dealer) or individual. In the rejection of mass manufacturing it is important for new alternatives to redefine their business models based on concepts such as product stewardship and producer responsibility as well as localisation. The operationalisation of these concepts is by no means straightforward. Also, Gillespie (2001: 54) warns that: “…green consumerism is spreading the message that by substituting good materials and designs for bad ones, then it is possible to marry the growth economy and protection of the environment. Many Green theorists are profoundly sceptical as to whether this is in fact the case.”

Thus, making cars more efficiently, with less waste and even making fewer of them does not in itself make automobility sustainable. This issue is explored and developed in more detail in Nieuwenhuis and Wells (2003).

The examples below give some indications of the manner in which relocalisation might be achieved. The over-arching concept is that of Micro Factory Retailing or MFR (Wells and Nieuwenhuis, 2000; Wells, 2001b; Nieuwenhuis and Wells, 2003). The concept of Micro Factory Retailing (MFR) is in essence a business model for the automotive industry in a distributed economy. The MFR concept is not an account of an existing business. It is an ideal type, a vision, a view of what might be rather than what is. MFR is an attempt to provide an individual understanding of how a specific industry could try to meet the many and varied demands of sustainability. MFR represents a radical reshaping of the relationships between product technology, process technology, business organisation, and the purchase and use of cars. If new patterns of production and consumption are to emerge, MFR might be one means of achieving these new patterns. Despite these comments, the MFR concept is grounded
in reality; the reality that parts of the MFR concept are in evidence in the industry today – albeit not in one single place.

The current approach to vehicle manufacturing involves the construction of large car plants able to manufacture and assemble all-steel cars in large numbers. Manufacturing economies of scale are realised and per-unit ex-factory costs are low. In order to sell this many cars, geographically extensive markets are required – which in turn means long logistics chains and dense networks of retail outlets. To date, most vehicle manufacturers have not had to bear a great deal of the investment cost in the dealer network. Neither have they sought to capture a high proportion of the total lifetime revenue stream created by a car in use. Between the manufacturing plant and the customer are stockpiles of cars throughout the system, managed by long customer lead times. The essence of lean production has been to seek compliance from the supply base and the vehicle distribution network to the demands of the vehicle manufacturing process thereby reducing stock levels in the system – not to optimise the system as a whole.

Despite many measures, traditional manufacturing and distribution faces problems (Nieuwenhuis and Wells 1997, Wells and Nieuwenhuis, 2000). The high capital costs with very ‘lumpy’ investment in plant and models inherent in Budd’s all-steel body technology are leading to high risk, though most producers do not perceive this risk, regarding it merely as normal and inevitable. The resulting over-supply is leading to discounting and rapid erosion of residual values of cars in the market. At the same time, the introduction of a new model can often lead to long delivery times for customer-ordered cars. Thus at any one time several plants may be working well below breakeven, while others are working beyond their notional capacity in order to keep up with demand. Thus the concept of an aggregate level of ‘overcapacity’ is not particularly meaningful in the car industry.

The inflexibility of manufacturing is leading to an inability to adjust output to demand and difficulties in switching from one model to another – responding to increasingly violent market fluctuations is difficult with existing technology. The reliance on continued sales of cars as the main source of revenue is increasingly untenable in developed markets, while costs rise as shorter model lifetimes lead to lower per model volumes. Thus high break-even points are leading to over-supply and the need to maintain extensive logistics lines to a large number of sales outlets. Finally, the environmental costs of production, particularly (but not only) with respect to the paint shop can no longer be ignored. One critical environmental failing, though one that is rarely recognised, is that of waste through over-production. This is a theme that the ecological efficiency school would do well to consider, as already suggested by Gillespie in his quote above.

With micro-factory retailing, the terms of competition are changed. Rather than seeking to match the high-volume, low unit cost approach of traditional manufacturing and distribution, micro factory retailing (MFR) refutes that logic by placing small factories within the markets they serve - and so eliminates the distinction between production and retailing. Rather than having one large plant producing, say 250,000 cars per annum the MFR approach would involve 50 plants, each assembling 5,000 cars per annum (i.e. 250,000 in total).
Importantly, this approach makes feasible alternative materials and design concepts that are only viable at ‘low volume’, and which in many ways allow significant improvements in the industrial ecology of the automobile, but which in traditional thinking are not economically viable at ‘high volume’. It does so through the mechanism of multiple low volumes generating economies of scale in different ways to the traditional centralised factory. There would be no separate distribution channels or sales outlets: the factory is also the sales, maintenance, service and repair location. Powertrain components and other generic items, such as spaceframe extrusions, could be centrally produced in conveniently located highly automated facilities for distribution to the decentralised assembly plants, thus benefiting from economies of scale in the production and development of these major subassemblies. Shipping these items would have a much lower economic and environmental impact than shipping finished cars. Ironically this would conform to the early Ford dictum of “Manufacturing near the source of supply and assembling near the point of distribution” (Post 1961: 24). The MFR concept is not just normal car manufacturing on a small scale, it necessarily involves a radically different product technology and body production process. We outline some processes below which embody some of the elements of MFR.

TH!NK

The basic design concept was a two-seat city battery electric vehicle for urban commuters and utilities (Wells and Nieuwenhuis, 1999). Given that the original company behind PIVCO (who created the TH!NK, and eventually sold out to Ford) was a specialist in thermoplastic mouldings, it is not surprising that the design called for a largely plastic body. A further important principle under-pinning the design of TH!NK was to employ generic parts wherever possible, and to utilise the design expertise of suppliers where necessary. The car only required an investment of $35 to $40 million up to the point when Ford stepped in and bought the company, compared to the $1 billion thought to have been spent by DaimlerChrysler on the 2-seat Smart (Automotive industries, 2000)

The TH!NK employed a lower frame constructed from 90% high strength steel cut, folded and welded rather than pressed into shape - the design for which was developed in co-operation with British Steel Automotive Engineering Group (now Corus). Normal steel pressings would have required large investments in tooling. Bolted to the lower frame was an upper frame constructed from aluminium extrusions, seam welded at the joints - this time Norsk Hydro provided useful expertise. The thermoplastic body was moulded in one operation, with separate mouldings for the doors, roof and a few smaller parts, and was non-structural. The car was front-wheel drive, with the electric motor and controller supplied by Siemens. Power was supplied by 20 blocks of 6 volt water-cooled Ni-Cad batteries, with 120 V nominal voltage and total battery capacity of 12 kWh. The batteries were supplied by SAFT in France, and had a claimed lifetime of 1,500 recharges. From a supply chain perspective, all the suppliers were at least European, but few were based in Norway except the supplier of the plastic used in the body.

The factory in Norway had a design capacity of 15,000 units per annum, although was envisaged as breaking even at volumes as low as 5,000 units per annum. The wider business plan included two aspects of relevance to relocalisation. First was the idea that the factory use internet sales and mobile service delivery to obviate the need for
dealerships, hence the factory was also seen as the point of retail and service delivery and this in itself was seen as a means of giving the company a broader income base. Second, the intention was to supply potential new markets such as California by locating ‘cloned’ factories in those markets. The spatial scale of such markets (i.e. the definition of ‘local’ in this example) and the extent of such cloning were seen as dependent upon the success of the product, perhaps envisaged as one plant per national territory.

**RIDEK**

As with many strong ideas, the Ridek concept at heart is very simple (Wells, 2003). The Ridek consists of two parts: a motorised deck (or ‘Modek’) that combines the chassis with the powertrain in one integral unit; and a self-contained body module (or ‘Ridon’) that is mounted onto the motorised deck via four fixing points. The entire concept is covered by a US patent, applied for in 1997 and awarded in 2000.

The Modek is intended to be battery powered, at least in urban areas. However, because the design range is quite small (approximately 50 miles between recharges) it is possible to keep costs and weight down. The battery can be recharged while in the Modek, or if time is of the essence the entire Modek can be swapped. This is significant because it sidesteps the need to remove batteries from the vehicle structure, an aspect of battery car use that has long been seen as a problem. Equally, it is possible for the battery Modek to be swapped for a petrol version should a longer (inter-urban) range be required.

Under the proposed business model only the Ridon would be purchased and owned by the consumer. The Modek would be owned by the municipal authority, which would have to retain sufficient numbers to allow Modeks to be exchanged as required. Modeks would then be rented or leased out to consumers, but could be serviced, repaired, maintained or upgraded at a central urban facility.

Localisation in this model is defined at the urban level. It is envisaged that the Ridek be produced by small companies in the urban area, and obviously with ownership of the Modek at a municipal level the scale of locality is defined by the scale of government. In the US case there are usually such city authorities, often already with a responsibility for transport within their territory.

**OScar**

OScar is a UK-based entrepreneurial start-up company that is seeking to bring to market a vehicle concept based on the Amory Lovins ‘Hypercar’. It combines a carbon-fibre body structure with fuel cell powertrain to create a lightweight zero emissions vehicle.

At present it is at the early stages of development, but explicitly embraces the idea of micro factories to deliver the concept. However one of the most interesting aspects of this particular project is the use of ‘open source’ design (Wells, 2001c).

One of the key barriers to entry for potential new entrants to the automotive industry is the huge cost of R&D needed for new product development. The approach adopted by OScar is similar to that used to develop the Linux operating system software that has become a rival to that used by Microsoft. The interesting aspect of this software is
that there is no intellectual property rights associated with it. Contributions to Linux are made gratis by interested individuals, there are no financial rewards as such. The claim made for this approach is of course that, even the vast intellectual resources of Microsoft are dwarfed by the wider community available via the internet.

Equally, in the more prosaic world of the automotive industry it is the case that for many instances the ‘protection’ offered by Intellectual Property Rights is at best partial and expensive, and often irrelevant compared with the vital importance of speed to market. Hence OScar solicits design contributions via a website, providing a basic architecture and concept into which those contributions are made. This is an interesting new approach to securing collective benefits from globalisation. The idea at the moment is for a small-scale manufacturing effort simply because the product is going to be a niche application. Hence one MFR-style unit could supply a market such as the UK. Again, market expansion would be met by multiplying the number of plants rather than building one larger plant.

**MDI Air Car**

Motor Development International (MDI) is the company formed to bring to market the ideas of the inventor of the compressed air engine, Guy Nègre (Wells, 2002). The technical concept and the business plan have generated much controversy in the automotive industry, and doubts over both remain. However, the case is reported here as indicative of a different means of combining product technology and business model. In this vehicle, compressed air is held in a suitable canister. As such, compressed air represents stored energy. The compressed air is then fed into a cylinder and allowed to expand, and in so doing the expansion provides the motive force to push a piston and hence turn the engine. There is no combustion, so there are no emissions at the point of use other than air- though of course overall emissions performance depends upon the energy source used to compress the air. A useful attribute of the technology is that any sort of dedicated infrastructure would not be technically difficult or expensive to install – air refilling points based on the existing tyre inflation systems could easily be added to existing petrol stations for example. Simple air compressors could be run from domestic electricity and re-charge the cylinders overnight. The detailed design of The Air Car is more complex than the above suggests, for example it involves an innovative articulated connecting rod to allow the piston to be positioned at top dead centre for a longer duration in the cycle than is normally the case with an internal combustion engine. The engine develops maximum power at 3,500 rpm and maximum torque at just 800-1,300 rpm. The slow speed and low temperature of operation (air in the cylinder head reaches 400° C maximum) mean that vegetable oil is sufficient for lubrication, and the oil will last up to 50,000 km. The car is positioned in the market, and performs rather like a battery electric vehicle without the weight and cost penalty of high performance batteries. Compared with contemporary petrol and diesel cars the range, top speed and acceleration are limited. An interesting by-product of the technology is that the exhaust air is at minus 15° C, so air conditioning for the cabin is easy to obtain. The engine concept has various non-automotive applications. However, MDI have designed a vehicle structure within which the engine and tanks can be placed. The vehicle is available in four basic body styles that reflect the urban / commercial vehicle focus of the product: family car; van; taxi; and pick-up.
MDI have tried a quite different approach with respect to their business model, an approach that has interesting pointers to achieving relocalisation. The core of the MDI approach is to grant licences to third parties that in effect take on an MDI franchise for a defined territory in return for the investment needed to create the factory to serve that territory. MDI has designed a standardised or modular factory, and claims that 50 factories have already been allocated in various locations around the world (www mdi com). In addition, the standardised factory includes office space and a showroom, because in the MDI concept the point of manufacturing is also the point of retail and service / maintenance delivery. A prototype factory is under construction in Nice. The factory therefore includes $4,200 \text{ m}^2$ of workshop space; $500 \text{ m}^2$ of offices; and $300 \text{ m}^2$ of showroom space. On a single shift, with 70 workers, the factory is expected to produce about 2,000 vehicles per annum. In terms of operations, the factory would manufacture and assemble engines, car parts, the chassis, and undertake final assembly. The large plastic body panels would be manufactured at the factory as well. Of course, in addition the factory would undertake promotion and sales, and distribution, sale of spare parts, repairs and service within the zone allocated to them. The scale of territory or definition of locality in the MDI approach appears to be approximately equal to a European sub-national region or US metropolitan area.

**GM AUTOnomy and HY-wire**

This concept has been given considerable publicity in the recent past. Designed by a small team within GM, the brief was essentially to reinvent the automobile in the light of the fuel cell and drive by wire. The result is a truly revolutionary concept, and an important reminder that notwithstanding the constraints that bind existing industrial organisations it is possible for radical thinking to be nurtured within them also.

In concept the GM AUTOnomy has certain similarities with the RIDEK concept outlined above. The vehicle is split, with a running chassis upon which a body can be mounted. The chassis contains the fuel cell and all related powertrain components, as well as the physical and electronic docking points for the body. With drive-by-wire there is scope for the redesign as demonstrated by the Hy-wire concept vehicle (GM, 2003).

From the perspective of centralisation and relocalisation the GM concept offers elements of both, It could be envisaged that the core chassis and powertrain would be assembled at a large-scale, centralised facility gaining huge economies of scale and thereby making the fuel cell economically viable. However, without the body attached it would be relatively cheap to transport the chassis, because many such chassis could be packed into a small space. Thereafter, small-scale local enterprises could add the bodies. Indeed, independent designers and fabricators could create bodies to be mounted on the standard chassis, thereby allowing local added value.

**Conclusions**

There is no definitive concept of relocalisation that captures all types of economic activity and all types of locality. Rather, it is an organising concept, a philosophy, a way of thinking about the world that guides analysis and action. Thus, what might be considered as ‘local’ for car production might be quite different to that considered for computers or houses or paper. Small-scale local non-Budd car manufacturers like
TVR and Morgan have survived and can survive profitably, while Buddhist mass car making is in crisis. The latter is intimately linked with the primacy given to economies of scale, the resulting high levels of investment and high breakeven points and hence to centralisation tendencies within the automotive industry.

There are some clearly discernable trends towards Schumacher’s (1973) ‘small is beautiful’ in a range of industrial sectors. However, on a macro level we also have to contend with the WTO agenda of global free trade encouraging ever-larger units of production and business – a clear trend away from micro-factories. This is actually a relatively new phenomenon; only a few years ago protectionism was still common and even now many so-called barriers to trade are still in place. Job security has also suffered. Even before WTO, the liberalisation in world trade contributed to a transfer of an estimated 9 million person years from the North to the South (Wood 1994). It is not only the developed North that is affected either; China plans for the loss of four million civil service jobs, as well as some 150 million jobs from ‘inefficient state enterprises’. This is in addition to the estimated 100 million peasant jobs lost by economic migration within China (Gray 1998: 3). It is not surprising then that even the WTO itself feels compelled to admit in its 1998 Annual Report that: ‘Empirical evidence tends to show that trade liberalization may entail non-trivial adjustment costs for certain groups’ (ibid).

Citizens and consumers in many countries are unlikely to accept this trend for very long and it seems reasonable to predict therefore that opposition even at government level will grow. Such opposition already exists at grassroots level, as illustrated by the seminal Battle of Seattle of 1999. The fact that WTO negotiators were genuinely surprised by the Battle of Seattle shows not only how out of touch many of our leaders are, but its resulting shock effect may well ultimately change the political support for the WTO. For Seattle was followed by Prague, Barcelona, Genoa and others. Though still haphazard and anarchic in nature, these protests do reflect a growing public concern with a system that has shown little or no benefits for ordinary citizens, even as consumers. Further ammunition was provided by popular books challenging many aspects of globalisation, notably Naomi Klein’s No Logo (2001).

As we have seen, an alternative scenario does exist. Both Korten (1995, 1999) and, particularly Hines (2000) suggest a re-emphasis of the local may well provide the answer. Hines (2000) sets out a new world trade regime which emphasises relocalisation. The localisation idea is promoted by a growing body of literature with particular emphasis on the revitalising of local communities (e.g. Shuman 1998, Shiva 1998, Douthwaite 1996, Hines 2000). The Rio Earth Summit of 1992 also emphasised the local in its Agenda 21, which encouraged the implementation of local equivalents on the basis of ‘think global, act local’. How is this relevant for our MFR concept? Shuman (1998: 6) explains that localisation: ‘...means nurturing locally owned businesses which use local resources sustainably, employ local workers at decent wages and serve primarily local customers. It means becoming more self sufficient, and less dependent on imports. Control moves from the boardrooms of distant corporations and back to the community where it belongs’. The main aim is that any move towards the local: ‘...has at its core the aims of providing basic needs sustainably, improving human rights, reducing the power gaps between different groupings and genders, and increasing equity and democratic control over decision making’ (Hines 2000: 31). We could add that in the automotive case it would also
enable better response to genuine customer demand, whilst restoring profitability to the sector and thus making an important move towards rendering it economically, as well as socially and environmentally sustainable.

There is, in the view of the proponents of the distributed economy, as much importance placed on how things are produced as on what is produced. It is an idea that has long been present to a greater or lesser extent in Western society, that work is its own reward if there is autonomy, skill, satisfaction in producing a good that serves real social need, and gives scope for creative input. This is a long way from the reductionist minimalism of the WTO agenda that reduces production to financial cost: consumers benefit from globalisation and free trade in the form of lower prices and therefore the WTO agenda must be good. With this growing desire for relocalisation comes a need for practical concepts to bring this about. We believe MFR is such a concept.

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