Publicly funded design support for small and medium manufacturers: how it might be best managed

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Acknowledgements: the authors would like to thank Michael Thomson (UK), Gavin Cawood (UK), Bo Dybkær (Denmark), Tom Edgar (UK), John Fu (China) and Richard Eisermann (US)

Abstract

The paper looks at how best to build competitive advantage through design-based projects in New Product Development conducted by small and medium enterprises in the manufacturing sector. Partly under the impact of IT and globalisation, the publicly funded design of a new product for a small or medium enterprise no longer involves, if it ever did, simply client, designer, state funding agency and state-funded broker of design services. It also brings together a wider group, which typically includes sub-contractors, market researchers, specialists in intellectual property and, occasionally, higher education institutions. A moot question is how best to organise these different interests to make New Product Development projects succeed.

This paper is an extensive survey of the international literature and practice of state-funded design supports for small and medium manufacturers. Briefly, too, it draws lessons from 119 publicly funded projects in New Product Development and design conducted over more than 10 years by the Design Unit at De Montfort University, Leicester, a higher education institution in the UK. Both our survey and Design Unit project data suggest that, especially if they are working in the context of an active state industrial policy, higher education institutions, being specially dedicated to the embedding, communication and management of knowledge, may be particularly well suited to assisting small and medium enterprises in product design and New Product Development. In terms of their tenacity and continuity, as well as in terms of their ability to help small and medium enterprises get hold of public funds, higher education institutions may be in a good place: not just to bring individual New Product Development projects all the way to success, but also to push small and medium enterprises toward embedding design and its management within their organisations.

The Design Unit's experience also suggests that small and medium enterprises may gain from what a higher education institution can provide by way of managing and integrating, in a close-up and intimate manner, the different players and interests that usually surround New Product Development today.

The hope is that, by closing the gap between design research and design practice, higher education institutions, with their mission to acquire new knowledge, can begin to make state design support for SMEs more directed and more entrepreneurial.

Keywords: industrial policy, design management, manufacturing innovation, competitive advantage, New Product Development, small and medium enterprises, design policy, design support, product design

Introduction

How should the state help small and medium manufacturing enterprises, which generally have neither funds for, nor much, if any, in-house expertise in product design, practice that discipline? The EU defines SMEs as firms with fewer than 250 staff and turnovers of €50m; small firms have up to 50 staff and €10m in turnover, and 'micro' enterprises, up to 10 and €2m (at the time of writing, these turnovers equal US$68m, $14m and $3m). How should the state help SME manufacturers use design to win out on world markets?

The question has merit, because Western innovation, including new product development (NPD), may have faltered (Geoghegan-Quinn, 2013; Gordon, 2012). On the other hand, Apple, Dyson, Jaguar Land Rover, Nissan and others confirm how product design can still team up with technology to great effect. 3D printing has reinforced such signals. New materials such as graphene cry out for designers to turn them into useful applications (Royal Academy of Engineering, 2013). If the way goods are designed becomes more complex (Marsh, 2012, p. 214), can the state can help manufacturer SMEs in product design – and if it can, how?

In 2010, the *Economist* lamented 'the global revival of industrial policy' (Economist, 2010). Since then, others have renewed longstanding debates about different forms of state support for technological innovation – particularly among start-ups, and young, high-growth or R&D-intensive firms (Mazzucato, 2013; National Endowment for Science, Technology and the Arts, 2011). There is, however, a gap in current knowledge. Around 'design policy', or general state intervention in design, a big literature centres on the general *promotion* of design. By contrast, very little centres on state-funded schemes that *directly support product design* as a collaborator of and inspiration to manufacturer research and development (R&D), or technology. As a result, few lessons exist about what institutional and funding arrangements might best suit state-backed design supports for SMEs. By 'design supports', we refer to practical assistance given to any aspect of the product design process – from defining a brief, through locating sources of finance, developing concepts, specifying materials and identifying component suppliers, and on to prototyping, manufacture and sales.

This paper is a review of the literature around state-funded design supports for manufacturer SMEs. Interestingly, on this question the *Journal of Product Innovation Management*, *Design Studies* and the organs of the Design Management Institute contain very little writing that is peer-reviewed; most of the literature around state-funded design support for manufacturer SMEs is 'grey', for the issue has not been the subject of scholarly publication.

A significant aim of our paper is to argue that, in the realm of support for competitiveness among manufacturer SMEs, market-orientated Higher Education Institutions (HEIs) might be better placed than mainstream state bodies, design consultants or small in-house design teams. As evidence for this, the paper briefly offers data from 181 projects in design and NPD done by an HEI in the UK for such companies. We end by debating the benefits, to manufacturer SMEs, that may come from HEI management of design in NPD projects.

Late in 2013, a British government report on UK manufacturing prospects until 2050 called on manufacturers to invest in R&D, ICT and also in design. On UK policy toward innovation, it noted: 'A number of the most recent developments in policy have been designed to establish a richer institutional architecture linking

universities and the business community, and the development of sectoral and technological strategies' (Foresight, 2013, pp. 209, 210). So even in Britain, where the schism between HEIs and business is frequently lamented, the worlds of higher education and manufacturing do link up. They do so, however, around 'sectoral and technological strategies' for innovation, and hardly at all around design strategies.

The literature and practice of publicly funded design supports for manufacturer SMEs shows two things. First, such supports have brought mixed results, and remained limited until the 21st century saw them open up in earnest around the Asia-Pacific region. Second, institutional architectures in which *HEIs* use design to aid competitiveness in manufacturing businesses are, around the world, surprisingly rare so far.

Publicly funded supports for design as an aid manufacturing competitiveness: British beginnings

In the UK, design supports for manufacturer SMEs go back to the 1970s (Design Council, 2008, pp. 23, 26), the peak of post-war British state props to industry. However it was Margaret Thatcher's regime, and that regime's fondness for entrepreneurs, that turned out to do much more for design. In 1982 the DTI scored a world first. Its Design Advisory Service Funded Consultancy Scheme, run by the DTI-funded Design Council, would give firms – most, but not all of them SMEs, and many of them manufacturers – up to 15 days of free design consultancy, with extensions paid for on a 50 per cent basis.

Though the £3m on offer over three years cheered Britain's designers, it was tiny: in 1983, the Organisation for Economic Co-operation and Development reports, the British state directly spent more than £1bn on R&D alone (OECD, 2014). Nevertheless, the DTI's Assessment Unit gave the Funded Consultancy Scheme a grilling. The Unit liked the cost-benefit ratio shown by design in 93 cases, but noted that, once the scheme changed in 1985 to embrace clients in the service sector, graphics projects had multiplied at the expense of those in product and engineering design. Most damningly, the Unit held that the service had fallen short of the Design Council's central objective – to ensure that design became 'an integral part of corporate strategy and incorporated at all stages of product development' (DTI Assessment Unit, 1988, para. 9). Later, too, other critics argued that, after spending £22.5m on 5000 projects between 1982 and 1987, the scheme had seen a quarter of these projects unexecuted, or ending in disappointing commercial results. Small firms, and especially micro enterprises, were 'very much more likely' either to be guilty of briefing of consultants poorly, or to run into 'severe problems of design management' (Roy and Potter, 1990, pp. 322, 334, 335).

With manufacturer SMEs, then, publicly funded initiatives that include product design long ago met problems in *embedding* design, the *communications* that surround the design process, and the *managing* of design. So while the state can act as a *broker* of and a *funder* for the direct practice of design, introducing manufacturer SMEs to design consultants and paying for at least some of their work, these functions alone don't guarantee success in NPD – and, still less, the absorption of design into a manufacturer SME's overall culture. Moreover when public funds paid for consultants, problems of communication were not peculiar to product design. By the late 1980s and early 1990s, publicly funded consultants to UK private sector firms handled not just product design, but also technology, marketing, strategic planning, quality, and human resources. In all these

fields, just the communications problems that inexperienced firms met in using state support often demanded 'pre-consultancy activities' aimed at helping them 'more clearly articulate their needs' (Bessant & Rush, 1993, p. 89).

By 1993 the broker/funder model of state-backed design for SME manufacturers went unmentioned in the Design Council's account of its £12m-a-year work (Owen, 1993). Still, in later years, governments, as well as regional and urban design communities (Howe & Powell, 1993; Setzer, 1996), did try to boost design support. In Catalonia, Spain, regional government gave 80 firms subsidies of €15,000-110,000 (US$20-150,000) to pursue industrial design (Felip-Hösselbarth, 1996, p. 52). Yet in Catalonia, as elsewhere, the habit was to promote design, designers, design education and design prizes more than it was to fix or fund the take-up of product among manufacturer SMEs. In 2004, an international workshop on design support did conclude that promotion was ceding ground to support for SMEs (Cawood, Lewis, & Raulik, 2004, p. 73). However from the 1990s on, SMEs in Britain were no longer directly funded to pursue design. Instead, they had to fend for themselves in a separate, ever-growing maze of local state support schemes. The Design Council turned toward workshops and mentoring. Its involvement with discrete projects in NPD was now rather tenuous.

A year after the Cox review of design in Britain (Cox, & Dayan, 2005), the Design Council began a new scheme, 'Designing Demand' (DD), funded by Britain's Regional Development Agencies. Since their formation in 1998, RDAs had been charged with aiding SMEs. In DD, 23 approved Design Associates found designers for client firms. They initiated design projects ('Generate') for a growing SME, through five days of consultancy, over 6-12 months, aiming to impart new skills in design management to staff. With technology start-ups, they offered workshops on NPD, branding and user experience, plus 12 monthly meetings so as to cut time to market in NPD ('Innovate'). With mature, larger SMEs, DD offered up to 15 days of mentoring ('Immerse'), over 12-18 months, aiming to gain bigger profits through design-led strategies.

Immerse was said to raise client turnover, profit and employment by 14, 9 and 13 per cent (Design Council, 2008, p. 2); but by 2008, it had reached just 10 clients (Design Council, 2008, p. 32). Given the nature, depth and length of Immerse, the Design Council conceded, returns from it might not be evident 'until some time after client participation' (Design Council, 2008, p. 35). Meanwhile, projects under Generate turned out to be chiefly about branding, not product design – and Innovate missed its targets. Thus while RDA funds for Design Council support schemes were a modest £2m (US$3.6m) or so, the Council nevertheless felt a need to commission eight separate evaluations of its business support schemes, 2005-08 (Design Council, 2008, pp. 76-80).

In the 1980s, support for SMEs had met snags embedding, communicating around and managing design. In the 2000s, DD met more snags. No DD project ran longer than 18 months – little time to see a serious NPD endeavour through to market launch and beyond. Nor, somewhat more remotely, can it have helped that the tenure of a typical senior executive at the Design Council was almost as short (Design Council, 2008, pp. 24, 25). So the fourth problem state support for design encounters among SMEs is that of *tenacity and continuity*.

The fifth problem? *Applying for, funding and evaluating design supports easily becomes very bureaucratic – especially when money is tight*. As a result, *state bodies active in design are now obliged to offer their clients what we might call 'funds guidance' through the thicket of state support schemes*.

Britain's state-backed design support for manufacturer SMEs had been pioneering, but had strayed from manufacturing NPD and delivered mixed results. By the early 21st century, efforts elsewhere also encountered problems.

Worldwide, publicly funded design supports for the competitiveness of SMEs have been modest

Historically, in Asia, design support for manufacturers SMEs was for a long time weak: instead, design promotion and education were the watchwords (Heskett, 2005, pp. 125-7). Not just in South Korea, but also in Australasia, North America and Europe, the adoption of design among businesses has been a 'broad objective'; but, apart from tax credits, policy has centred, rather, on local design referral programs, public and business education, awareness campaigns, design-related higher education, public procurement strategies, and national and regional branding (Vinodrai, 2009, pp. iii, 7, 9). Still, in the 2000s northern Europe did move to put design into hard-edged state programmes for technological advance. Denmark's fashion sector won €7m (US$9.5m) of public funds for user-driven innovation; Enterprise Estonia made product design eligible for its R&D Projects Financing Programme; the Finnish Funding Agency for Innovation spent €25m (US$34m), 2002-5, on industrial design. Reporting on these facts, one analyst (Cunningham, 2008, pp. 9, 46, 52-4), hinted that the EU should support design through its Framework Programme for R&D. Yet his main recommendations centered on *awareness raising, as well as research*, about design – not on applying it in manufacturer SMEs.

Around the world, that was the broad pattern. A report noted that 'numerous initiatives in support of design exist at EU level; these however do not form a coherent, global European design policy. Improving European competitiveness is [anyway] not the primary objective of these initiatives, which often address life improvement objectives'. In a heroic, international table of 32 state and regional bodies active over 11 kinds of 'design-supportive actions', the report found 26 national or regional states providing technical assistance and consulting services in design, but only 12 providing grants and tax incentives (Bitard and Basset, 2008, pp. iii, 48) .

The *state's tendency to evade both the direct funding and the direct application of product design* is a remarkable feature of its general efforts in design. An EU 'staff working document' (European Commission, 2009) on such efforts usefully classified three levels for them: (1) awareness-raising and promotion to a broad audience (awards, conferences, publications, exhibitions); (2) brokering and funding design support for firms (generally SMEs), and (3) having design objectives, targets and actions agreed by ministers – as in Korea (1993) or Denmark (1997). However the 69-page document made clear that EU member states bother much less with design at level 2 than with design at the other levels. Even the document's discussion of the EU's Framework for State Aid for R&D and Innovation gave no budget figures for design support (European Commission, 2009, pp. 33, 39, 40, 46).

Now, political liberals might say that the state's miserliness around design for SMEs shows that 'neoliberal' forces have triumphed against publicly funded industrial supports. Yet this seems unlikely: the British state, for instance, spends billions of pounds on energy, the railways, and defence R&D. Alternatively, political conservatives might say that state stinginess on product design is right, because factories now make little input to

Western economies. Once again, however, this does not convince: if factories have lost jobs, their input to GDP remains substantial. No, something bigger than 'the shift to services' explains the state's relative neglect of product design.

Here the OECD's attitude to design is telling. Keen on SME innovation, very keen on what it is pleased to call 'non-technological' innovation such as design, the OECD favours direct state support for private-sector R&D, but holds that it can 'crowd out' private investment. It waxes lyrical not on product design for manufacturer SMEs, but on consumers doing their own design, as well as on design for the public sector – using 'service design principles and tools', and 'citizen involvement' in this (OECD, 2010, pp. 2, 35, 100, 102, 75, 154).

In such a light, today's state diffidence toward funding product design may reflect not simply society's shift to services, but rather a growing concern with design thinking, the public sector, and the need to legitimate government through the participation of users in the process of designing (Woudhuysen, 2011, p. 243). Thus the EU 'staff working document' sees design as a good thing not because it can be a distinctive companion to and inspiration for manufacturing technology, but rather because 'the progressive shift in emphasis of European innovation policy from exclusive reliance on technology towards more demand- and user-driven innovation must continue'. The same document foregrounds sustainability (which is important to manufacturer SMEs nowadays, but goes well beyond them), and notes that national initiatives in design frequently promote its broader societal benefits, stressing 'inclusiveness, accessibility and welfare' (European Commission, 2009, pp. 5, 31). Similarly Reinhard Buescher, then head of the European Commission's Unit for Support for Innovation, nodded to all these concerns, as well as to IT, when he told a conference held in 2010 that design could contribute to future growth that met the Europe 2020 Agenda, in that such growth would be 'smart, sustainable, and inclusive' (Whicher, Raulik-Murphy, & Cawood, 2011, p. 46).

No doubt product design for SMEs can be all of those things. Yet as with other more quantitative targets set for design, qualitative, rather ethical targets do not equate to cash for SMEs to spend on product design for NPD.

Perhaps, in 2014, it is too much to ask the state to fund investments in design- and technology-led NPD projects among sometimes inexperienced manufacturer SMEs. Yet state parsimony toward supports for product design does not prevent the state – including the Brussels Commission – forever commissioning fresh researchers to confirm that design pays off. Many case studies and many statistical summaries show cost/benefit ratios of perhaps 1:5. However, despite researching these ratios, the state remains unwilling to act upon them. Across the world, publicly funded design supports for the competitiveness of manufacturer SMEs have been modest. The result is that *definitive institutional arrangements for state supports to design have yet to be demonstrated.*

There has been a delay. Yet state-funded design supports for manufacturer SMEs can still become well managed.

Product design supports for manufacturer SMEs today: stasis in Britain, some progress in northern Europe

In Britain, where direct design support for manufacturer SMEs was born, the subordination of design to wider state goals has diminished the Design Council's DD programme. Concerned with popular happiness, Gross National Wellbeing and the 'nudging' of consumer behaviour (BBC, 2006; Office for National Statistics, 2011; Cabinet Office, n.d.), policy now focuses on how design can change not manufacturer SMEs, so much as user behaviour (Design Council, 2012).

A new evaluation of DD says that it created more than 900 jobs, safeguarded another 1500, and boosted firm revenues by nearly £100m (US$163m). Yet while DD's annual costs averaged £2.5m (US$4m), 2006-10, the programme, which the Design Council has delivered since the abolition of the RDAs in 2010, now has to get by with just £1.3m (US$2m) a year – from the Department of Business Innovation and Skills, the latest successor to the DTI. Today, too, DD clients usually bear half its cost (Design Council/Eden Partners, 2012, pp. 4, 10).

As the Design Council has moved away even from mentoring manufacturer SMEs, so Britain's Technology Strategy Board has taken up some of the slack (TSB, 2014). Elsewhere in Europe, however, both opinion and action have at last tilted toward publicly funded support for manufacturer SMEs. Noting that few of the EU's 23 million general SMEs can easily participate in what it called 'huge' EU programmes, a report to the EU by a group of design industry bodies calls for 'innovative approaches' to funding design innovation programmes 'specifically targeted' at them. Significantly, too, the report advocates more co-operation between SMEs and universities, research centres and providers of design services. It lists no fewer than 77 organisations responsible for design promotion and support in Europe (Thomson and Koskinen, 2012, pp. 51, 53, 85-6).

A new EU 'staff working document', though once again nor amounting to official policy, also favours design-based training and mentoring programmes for SMEs, admitting that they are 'weak'. It wants 'to identify interested intermediaries willing to include design innovation management in their services'. It promises that strategic design will be part of the EU's Horizon 2020 Framework Programme for Research and Innovation; that COSME, the EU's 2014-20 Programme for the Competitiveness of Enterprises and SMEs, will promote NPD, and that projects under the name WORTH will support design in SMEs (European Commission, 2013, pp. 7, 8).

Horizon 2020 is significant here. Over 2014-20, it will allocate about €1bn for 'SMEs and small caps'; main grants to consortia of such firms will focus on items such as miniaturisation, design, demonstration, testing, prototyping, scale-up studies and performance verification (European Commission, 2014). COSME and WORTH, however, are different. Across all economic sectors in the EU, COSME has a proposed budget of €2.5bn (US$3.4bn); but the design bit of it, which covers textiles, apparel, furniture and home decoration, is worth just €87m (US$119m) across the 28 countries of the EU. About 80 per cent of that will go to research business models. Only in 2015-16 will design, one of several 'soft measures', be targeted at small and micro enterprises (Wojdyr, 2012, pp. 2, 7-12). As for WORTH, this 'transnational platform' for linking designers across borders to

SMEs aims, with just €1m (US$1.4m), to support 30 to 40 new design-based products in fashion and furnishings over two years (European Commission Entrepreneurship and Innovation Programme Committee, 2012, p. 14).

There is a chance that the EU will fund SMEs to pursue design. However design is but one of many options for Horizon 2020 support, and, elsewhere, budgets – like formal commitments – look flimsy. Yet EU budgets for *research* about design, or for its *integration into innovation policy*, look relatively firm. The €3.85m (US$5.3m) European Design Innovation Platform, won in December 2013 by a Design Council-led consortium, aims to build a web platform, organise events and get 14 EU design centres to help member states that are lagging in design catch up (Design Council, 2013). Similarly, €4.8m (US$6.6m) has been awarded to speed the take-up of design not in SMEs, but in national, regional and EU-wide innovation policies (European Commission DG Enterprise, 2013).

The real public supports for product design in Europe may lie more on the ground, among north European nation states. In Norway, the industry ministry charged the Design Council (NDC) with developing a design-driven innovation programme. One of the three endeavours undertaken gave prize money for winners of a competition; another, Design Pilot, has since 2009 funded 69 projects in the private and public sectors, starting to show results that it claims are 'impressive'; another, the Design-Driven Innovation Programme (DIP), pays private firms up to 50 per cent of the cost of each project (NDC, 2013a & 2013b). That the Norwegian Centre for Design and Architecture, born in 2014, will report to the country's industry ministry (NDC, 2013c) also suggests that the Norwegian state may move to fund more design services for SMEs.

In Estonia too there has been a move forward. In 2012, the country's Ministry of Economic Affairs and Communications, its business and regional development body, and the Estonian Design Centre together launched Design Bulldozer, a 20-month pilot programme based on Denmark's Design Icebreaker scheme of 1998-2001 (see below). Among the firms it has helped: a maker of snow ploughs, and a manufacturer of bed linen products (Estonian Design Centre, n.d.).

Even in northern Europe, though, the state has baulked at supporting manufacturer SMEs with product design. Managed by the Danish Design Centre, Denmark's Icebreaker scheme did give grants to more than 400 SMEs which had not used design for five years. Yet though the programme cost €1m (US$1.4m), and, at the end of it, about 200 SMEs said they would probably to continue to use designers, this was judged not good enough by the Ministry of Business Affairs, which cancelled the programme (Design Council, 2013b, p. 83). Denmark then returned to public support for product design in 2011-2. Then, the Design Pool gave 80 firms grants of up to DKK 40,000 (US$7000) to pay for up to half the costs of design projects. This time, the overall cost was just DKK 1.6m (US$300,000) (B. Dybkær, personal communication, January 13, 2013) – but again the programme ended.

In manufacturing, Denmark has long had successes in integrating design with technological innovation. Perhaps that, and the recession the country met with after 2008, explains why a government-appointed committee looking forward to design in 2020 – a committee of three academics, a designer and the managing directors of two large manufacturers – called not for the Danish state to help fund product design, but for the Confederation of Danish Industry, the Danish Chamber of Commerce and others to 'develop a joint strategy for using design as a driver of innovation' (Danish Design 2020 Committee, 2011, p. 24). Ironically, though, an influential Danish

mapping of international efforts in design policy, research and education, commissioned by the Design 2020 Committee, had earlier found that, in East Asia, efforts directly to support product design in manufacturing were particularly ambitious.

In Asia and Australasia, industrial policy brings growing solidity to design supports

In sanguine style, the Danish mapping study found that, around the world, design is increasingly emphasised 'as a tool in the overall industrial policy to increase competitiveness'. Perhaps more realistically, they added that in Singapore, Hong Kong and South Korea, 'where the industrial policy is very much about promoting certain industries or clusters of industries i.e. a form of "picking the winners"' [sic], there were also 'very strong national design policies' (Quartz+Co, Danish Enterprise and Construction Authority and the Danish Ministry of Culture, 2011, p12). In 2014, Asia's support for SMEs is certainly evident.

In Singapore, the 2010 Budget enabled the DesignSingapore Council to administer 'Productivity and Innovation Credits' in design, consisting of 400 per cent tax deductions for the first S$400,000 (US$315,000) invested on approved product and industrial design projects, up to a cap of S$800,000 (US$630,000), 2011-12, and then S$1,200,000 (US$945,000), 2013-15 (DesignSingapore, 2014). In Hong Kong the state's Design-Business Collaboration Scheme supports manufacturer and services SMEs for projects usually lasting less than a year; a 39-page guide says that collaborations between SMEs and design consultants or HEIs are paid up to 50 per cent of a design project's costs, or HK$100,000 (US$13,000), 'whichever is the lower' – and with the SME paying at least half of the approved project's cost in cash (CreateSmart Initiative, 2013, pp. 6, 7). Most significantly, in India, the Design Clinic Scheme, launched in 2010 by the Ministry of Micro, Small & Medium Enterprises (MSME) and the National Institute of Design, an HEI, aims to help, with nearly INR500m (US$8m) from the Government of India (Ministry of MSME, 2014), 200 industry clusters in sectors such as utensils, bamboo, leather and jewellery. In groups of up to three, SMEs, which can include those in services, receive 60 per cent of an approved design project's cost, up to INR900,000 (US$15,000) – again, 'whichever is lower'; groups of four or more SMEs can get INR1,500,000 (US$24,000). In this case, the matching funds demanded of SMEs amount to 40 per cent of costs (Ministry of MSME, n.d. a, 1). A commendable table breaks down 157 projects by client, designers, brief, cost and location (Ministry of MSME, 2013).

In South Korea the Seoul Design Support Center, funded by the Seoul Metropolitan Government, offers local SMEs consulting and R&D support, up to a level of Won 5,000,000 (US$4700) in product, visual and other kinds of design (Seoul Design Foundation, 2014). Also, until 2006, at least, the Korea Institute of Design Promotion's Design Innovation scheme, with simple delivery mechanisms, funded SMEs with up to £55,000 (US$90,000) a year for them to use designers, covering two-thirds of design development fees in exchange for a 20 per cent payback to the KIPD in the case of project success (Choi, Lim & Evans, 2012, p. 85). The Taiwanese state-backed design promotion body likewise claims to offer 'special project consultancy' to develop companies' brands and raise competitiveness (Taiwan Design Center, n.d.). In these countries, however, as indeed in Singapore and Hong Kong, few if any figures are available on the overall costs, to the state, of design support.

What is more obvious about the schemes of Singapore, Hong Kong and India is that applying for them looks like quite a bureaucratic process – not unexpectedly, given our earlier remarks about the 'thicket' of state support schemes in the UK.

Nevertheless, the success of industrial policy in Asia (Stiglitz, Yifu Lin, and Monga, 2013, p. 4), whether real or imagined, makes state supports for SMEs in the region the most solid in the world. Take the example of the People's Republic of China. In the past, that country has, in the words of Zhu Tao, president of China Industrial Design Association, 'neglected the importance of design'. But as Zhu Tao quickly adds, perhaps a little prematurely, 'we have woken up, moving from "made in China" to "designed by China"' (Zhangyu, 2014). Predictably, the 18th Chinese Communist Party Central Committee, held in November 2013, gave no word of design, preferring to reform China's science, technology and intellectual property protection (China.org.cn, 2013). Still: in 2013, just south of Shanghai, the city government of Ningbo found RNB330,000 (US$55,000) to shortlist nine companies for grants of up to half the cost of industrial design projects, up to a limit of RNB10,000 (US$1600) per project (Wei, 2013). Meanwhile in Hong Kong, often a template for future policy turns in mainland China, the local federation of industries now calls for the tripling of tax deductions not just for R&D, but also for product design and brand promotion (China Daily, 2014).

North America forms a big contrast to all this. Since its last articles on government policy in design (Cawood, Lewis, & Raulik, 2004), America's Design Management Institute has published little or nothing on the subject – confirming, perhaps, that *laissez faire* ideals in the US do not leave 'much room for intervention, however well intentioned' (Walton, 1993, p.8). However few years ago in Canada, supports for general SMEs in Singapore, South Korea and New Zealand caught the attention of a Vancouver-based consortium of HEIs, government agencies and industrial partners (Canadian Design Research Network, 2007, pp. 26, 27). Since then, despite a 2008 US summit of US design associations, educators and professionals making 40 proposals around a national design policy (Tunstall, 2009, pp. 83, 84), very little appears to have happened around design supports for manufacturer SMEs in North America.

Australasia, however, has proved itself much closer to Asian practice in design supports than to North American. The State Government of Victoria, Australia, has engaged Equip Design Integration Pty Ltd to deliver the Design to Business (D2B) Integration programme, which 'targets export-orientated firms seeking to consolidate growth potential and enhance competitiveness'. For an investment of AU$$9000 (US$8200), firms enrolled on the programme – not always manufacturer SMEs, but often – receive AU$70,000 (US$63,500) of auditing, planning and mentoring services (Business Victoria, 2013a). Along with other support schemes and design promotion, D2B Integration forms part of Victorian Design Initiatives 2012-15, a AU$10m (US$9m) commitment to design (Business Victoria, 2013b).

More widely, Australia's country's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), arranges for manufacturer SMEs not the direct funding and management of design in NPD, but certainly a conducive atmosphere for that. CSIRO's SME Engagement Programme helps SMEs get the most value out of their R&D; its Australian Growth Partnerships provide SMEs ('businesses that have a strong trading history as well as a high potential for growth') with capital to purchase CSIRO R&D

(CSIRO, n.d., and 2011, p.4). CSIRO devotes some resources to 3D printing, particularly with titanium, and design figures prominently in this work. Meanwhile two Australian HEIs have worked with CSIRO specialists in manufacturing and infrastructure and a private manufacturer to develop a commercially successful software package for the management of risks in product design and development in concurrent engineering (Kayis and others, 2006). And in all this, the CSIRO's basic 'capacity' for helping Australia pursue industrial policy has held good, admirers argue, 'despite a strong market dominated logic in Government, and declining public expenditure on science and innovation in Australia since the mid-1980s' (Dodgson, Hughes, Foster and Metcalf, 2011, p. 34).

As for New Zealand, Better by Design, part of the country's national economic development agency, does not offer funded support for NPD. However its 'coaches' – 'private sector practitioners with expertise in different aspects of design and business' – do spend up to two years assisting export-orientated firms. Since its formation in 2004, Better by Design claims to have helped about 150 companies 'to become more design enabled' (Better by Design, n.d. a and b). At the same time the New Zealand Investment Fund Limited, established by the New Zealand government in 2002, has its Seed Co-investment Fund invested in eight manufacturers engaged in design (NZIFL, 2014).

The significance of design supports for SMEs in Asia and Australasia is not just that they appear to be *relatively well developed and reasonably clear about their funding*. After all, the funds at stake, even in Asia, are still very modest. The point, rather, about Asia-Pacific supports for SME design is that they are *mostly pursued in concert with relatively clear, relatively recent industrial policies, particularly with regard to SMEs*; *policies that act as a counter-tendency to the evasion of direct funding for product design*. Of course, both China and Japan have strong industrial policies, but neither country has yet stepped into design support for SMEs; so in this sense industrial policy might be a necessary but not sufficient condition for an active policy of design support. We will come back to this.

We have seen that supports in Hong Kong and India, at least, explicitly involve *HEIs as partners of SMEs*, engaging them in design. We now therefore turn to look more closely at HEIs working with SMEs in design.

For SMEs, HEIs are well placed both to do design and to manage it on NPD projects in design

In looking at HEIs as participants in funded schemes for design support, we at once encounter a second elephant in the room, on top of industrial policy: the fact that, in NPD for SMEs today, most projects are now organised through a network of suppliers and others. Partly through the impact of IT and globalisation over the past 30 years, the publicly funded design of a new product for an SME no longer involves – if it ever did – simply the client, the designer, the state broker and the state funder. Such a project also brings together a wider group, which typically includes sub-contractors, market researchers, intellectual property specialists and, occasionally, HEIs. A moot question is how best to organise these different interests to make New Product Development projects succeed.

All over the world, HEIs have turned to a more commercial and instrumental view of their role (Bok, 2004; Furedi, 2009). Thus many HEIs offer *more or less simple design consultancy services* to SMEs: in the UK alone,

universities as varied as Cambridge, Dundee, Liverpool, Newcastle, Salford and Ulster offer design services to business. So too does Hong Kong Polytechnic University – and not just in product design and development, but also in textile, fashion and knitwear design.

For HEIs to engage in *design management* around publicly funded product design and NPD for manufacturer SMEs is rather different from offering design consultancy alone. As we have seen in the case of Hong Kong, HEIs there are able to share state funds for design with their SME project partners. In the case of the National Institute of Design, Ahmedabad, India, the Institute forms what it calls a 'nodal agency' for the design clinics run by the Indian Ministry of Micro, Small & Medium Enterprises, and acts as the link between the government and SMEs. The NID 'empanels' designers and HEIs, and approves applications for funds from SMEs (Ministry of MSME, 2010, p. 23). Cleverly, too, it demands a 70-100 page report from designers at the end of each project (Ministry of MSME, no date, p. 4). Apart from these arrangements, however, there is little evidence, worldwide, of HEIs taking on the management of publicly funded product design and NPD for manufacturer SMEs.

One HEI that nearly does this is Queen's University Belfast. In Northern Ireland, state intervention in industry has always been relatively strong. It is in that context that Invest Northern Ireland (INI), the only RDA in the UK still to exist, offers SMEs up to three 'innovation vouchers', each worth £4000 (US$6550), which can be used with HEIs throughout Ireland to support SMEs in ways which include the development of new products (INI, n.d., a). Also, the INI's mainstream programme of support for SMEs new to R&D, which is part-financed by the EU's European Regional Development Fund (ERDF) and which offers SMEs up to £50,000 in project costs, treats design consultancy as eligible for funding (INI, n.d., b, p. 1). As part of the vouchers and R&D support programmes, Queen's University Belfast offers design services.

There is more. Under INI's Design Service, SMEs considering ambitious design projects and out to embed design across all their operations can use an INI design manager working in a role not dissimilar to that of an non-executive director. For 2-5 days a month for up to two years, the design manager is funded on a 50:50 basis up to a maximum grant of £50,000 (US$82,000) (INI, n.d., c). Separately, Queen's University Belfast has for six years managed and delivered two other INI programmes for SMEs. In the 'mini' design development programme, clients are, for £250 (US$410), paired with designers for up to three days to help them develop concepts to meet their specific design need; in the 'main' programme, the tariff is £500 for up to seven days ($820) (INI, n.d., d and e). Between 2012 and 2015, the target is to have about 40 SMEs enjoy the services of design managers, and to get 72 and 150 to go through the mini and main programmes (INI, 2012, p. 3).

INI's offer of design managers for up to two years shows tenacity. At the same time, the continuity of the Queen's service over six years is striking. In the case of another British HEI, matters go even further.

Founded in 1992, the Design Unit – an institute at De Montfort University, Leicestershire, England – has both designed products for SMEs *and* managed the NPD process with relevant interested parties. The Unit emerged in a region of England bereft of major private suppliers of services in product design. With staff previously experienced in a number of different industries before its inception, the Unit offered not just design for NPD, but a desire to project-manage the whole NPD process up to and beyond market launch. This long-term

view, we believe, is vital to embedding design in SMEs, and perhaps represents one of the merits HEIs have over support schemes organised by state bodies that are not HEIs. *The tenacity and continuity of design support may be something that is easier to sustain for HEIs, which are relatively stable institutions, than it is for state-backed design councils, design centres and design promotion organisations.*

As noted of Britain and the EU, mainstream state bodies charged with giving design support can be subject to the changing whims and capricious budgets of successive governments. Although not entirely immune to such upsets, established HEIs, by contrast, may be more able to stick to an NPD project for an SME for a number of years. The academic research insights derived from such work are likely to make it worthwhile for HEIs; the relatively low turnover of staff that HEIs enjoy is also likely to count in their favour. HEIs' enduring research insights, which are easily accompanied by accumulated wisdom on state funds and how to acquire them, form a pay-off rather special to them, and one that they can put to work with each new project.

In their relations with manufacturer SMEs, HEIs also contrast with design consultancy firms and the slender design studios that can – sometimes – be found inside SMEs. Rightly or not, SMEs frequently view private design consultants as expensive, perhaps temperamental, and unlikely to be patient enough to follow up on any particular project, being always in a quest for another one. On the other hand, an SME's in-house staff are, fairly or unfairly, widely regarded as having limited experienced of different industries. Less quixotic, perhaps, than design consultants, staff designers among SME manufacturers can nevertheless prove more parochial in outlook.

For its first decade, the stability, reliability, experience across varied industries and general market orientation of the Design Unit were enough for it to work directly with private companies – both large ones, and SMEs – in encounters that rarely needed to rely on public funds. However from 2003 to 2014, the Design Unit has also performed NPD projects for SMEs with the help of funds from its local RDA, British central government, and the ERDF. In each case, the Design Unit *drew up proposals for a publicly funded design support scheme*, won consent for that proposal from the relevant public authority, and therefore was able to offer full 'funds guidance' to its SME clients.

In this respect an HEI can again differ from other means of giving design support. Through the Design Unit's direct involvement in their design and their delivery, the processes of applying for, funding and evaluating design supports was made relatively free of those bureaucratic features familiar, as we have seen, to mainstream state agencies charged with supporting manufacturer SMEs in product design. Moreover the Design Unit not only performed product design itself; it also (1) *brokered, in particular design projects, contacts with other providers of design services*, giving them towards £1m in the past decade, and (2) *closely managed and integrated*, for the majority of its publicly funded NPD projects, *a wider group of sub-contractors, market researchers, specialists in intellectual property and others*.

Again, neither state design agencies, nor most design consultants, nor most SME design departments are in a position to play such roles. Because of the parsimony that surrounds their work in design, state bodies rarely place or recommend more than one design consultant on any particular project – and a private design consultant is even less likely to do so. On the other hand, neither of these forces is likely to have the time to manage, in a close-

up and intimate manner, all of the different players that tend to be brought into interaction with each other from the start of a project through to its fruition in the market. That will also tend to be the case on those rare occasions that the leaders of manufacturer SMEs allow their in-house design staff the freedom to manage such players, whether each is to be found inside or outside the company.

Our argument can be put another way. For organisations to acquire knowledge, its communication and transfer, and the reflux between tacit knowledge and the more formal, explicit sort, are vital (Nonaka and Takeuchi, 1995). In large car manufacturers, the member of staff who has responsibility for such work in the domain of design and NPD – the person who creates product concepts, communicates them, sees them prototyped, guards their survival and infuses them into every aspect of a new product's design – was christened, nearly 25 years ago, the 'heavyweight product manager' (Clark and Fujimoto, 1990). However among medium and especially small manufacturers, by contrast with large ones, such individuals will usually be conspicuous by their absence. Among SME manufacturers, the conscientious building of relationships around NPD, which is so critical to the acquisition of existing knowledge and the creation of new knowledge (Ford and Davies, 2012), may well be something that HEIs can perform better than mainstream state bodies, design consultants, or in-house staff. As the authors have written elsewhere:

> '*a commercially experienced higher education institution can play the role of heavyweight product manager*. It can manage and integrate the work of varied players and, in this work, can ensure not just that lines of communication are clear, but that whole new product concepts are developed and adhered to in the face of setbacks that are inevitable. A commercially experienced HEI can have the kind of clout, objectivity and balanced, comprehensive vision that can save time and money in NPD, and that a project manager internal to a client may not be able to muster. At the same time, HEIs have goals that go beyond time and money, a fact that can work to the advantage of clients.' (Ford and Woudhuysen, 2012, p. 609).

Among the 119 publicly funded design and NPD assignments for SMEs that the Design Unit undertook over more than 20 years, it is clear that those in which it took responsibility for project management, communications and integration benefited from that. A project was much more likely to progress to actual manufacture when the Design Unit was able to manage all the main players around it. The figures for enterprises with five staff or less, and for SMEs bigger than this, are as follows:

	With management of the main players around the project	**Without** such management
Total projects **progressed** or progressing to manufacture, enterprises with five staff or fewer	24	7
Total projects **not** progressed or progressing to manufacture, enterprises with five staff or fewer	2	11
Total projects **progressed** or progressing to manufacture, SMEs bigger than five staff	33	6
Total projects **not** progressed or progressing to manufacture, SMEs bigger than five staff	6	30

When the Design Unit could manage the main players around projects, about nine in every 10 progressed to completion. But when the Unit could not perform such a role, only one in four projects progressed.

There is an interesting wrinkle here, too. Intuitively, it might seem obvious that firms with five or fewer employees would benefit from management of the networks around NPD projects more than larger, more powerful SMEs would. Yet as the figures show, it is actually those SMEs which have more than five staff that have benefited most from management. Here we can draw an important lesson. It is not just the tenacity and continuity of design support that augurs well for its success among SMEs; *SMEs themselves* need to have tenacity and continuity for NPD projects to come to fruition. In this respect, then, publicly funded product design for manufacturing *start-ups* may well be a bad idea.

Claudia Acklin's recent doctoral thesis, which is based on eight Swiss SMEs with little or no previous experience in design, is nevertheless relevant here. The thesis argues that, to counter what it calls the 'distrust' SMEs have for design consultants, design knowledge communicated to an SME must be neither too familiar, nor too unfamiliar. The thesis suggests that getting this balance right is key to moving SMEs up from rejecting design after use on one project, on to ad hoc basic use, and finally on to in-house design management as a dynamic capability in its own right (Acklin, 2013, pp. 216, 219, 222, 228). In such a framework, therefore, HEIs, being specially dedicated to the embedding, communication and management of knowledge, may be particularly well suited to spotting different types of design management 'absorbers' among SMEs. In terms of their tenacity and continuity, as well as in terms of their ability to help SMEs get hold of public funds, HEIs are in a strong position not just to bring individual NPD projects all the way to success, but also to push SMEs toward embedding design and its management within their organisations.

Conclusion

We do not wish to exaggerate the role that HEIs might play in supporting design among manufacturing SMEs. Especially with Hong Kong and Queen's University Belfast, and also with India and the Design Unit, HEIs blessed with design support roles and relatively significant support funds to guide SMEs have owed much to a more-or-less substantive industrial policy. Also, HEIs have their ups and downs like any other organisation, and, in their contemporary scramble for cash income, can downplay the research insights they gain from consulting assignments. At the Design Unit, too, both the abolition of its relevant regional development agency, and the growing bureaucratic complexity of the EU's grants apparatus, together make the going with public supports for design tougher than it has been in the past.

Nevertheless, it may well be that, over the coming years, many HEIs turn out more enthusiastic about, resilient with and capable in product design and NPD for SMEs than do governments. The international evidence about design supports gathered and presented here is not an unabashed argument for greater state investment in product design, for such investments have not always been successful. Yet this paper has shown that the state's frequent preference for design promotion, its redefinition of design away from products, and its consequent evasion of expenditure on product design among SMEs in the manufacturing sector is frequent and deep-seated. Our paper has

also shown that, even in Asia and Australasia, the amount of funds which the state has made available for SME product design have never, so far, allowed definitive institutional arrangements for that support to be demonstrated.

Since the financial crisis of 2008, it has become fashionable in the West to argue that it now falls to the state to 're-balance' economies away from banks and toward manufacturing. Indeed in her internationally influential book *The entrepreneurial state*, professor Mariana Mazzucato, of the Science Policy Research Unit, University of Sussex, England, contended that the state lies behind many of America's innovations in electronics, pharmaceuticals, energy and other endeavours in manufacturing and NPD (Mazzucato, 2013). However, though the book had kind words for design, its proposals on how government should support innovation – not least, innovation in SMEs – did not concern that discipline. Its model for success was America's Defence Advanced Research Projects Agency – DARPA. *The entrepreneurial state* argued that, by directing a bottom-up network of agencies performing research and development (R&D), DARPA has massively enabled US technological innovation. In the domain of medicine, the book identified the National Institutes for Health (NIH) as performing a similar function.

For all the power of product design, Western governments, and even those in the East, do almost nothing about it compared with what is done by DARPA (2014 budget: US$2.865bn) and the NIH (US$30bn). The sums of money and the work around state supports for product design, so far, have roused designers, as well as perhaps tens of thousands of SMEs around the world. Yet they have not roused economies.

There are tens of millions of SMEs in manufacturing. Many, no doubt, have no requirement for publicly funded design supports; but one does not need to be an unalloyed fan of industrial policy to notice that the state's supports for design do not amount to one. Whatever else is said about publicly-funded initiatives in design, the budgets at stake and the political prominence of these schemes is very far from the 'mission-oriented', policy-led state investments in technological innovation that, in the opinion of one author, have proved effective 'time after time and across national boundaries (Janeway, 2012, p. 231).

Perhaps HEIs, with their mission to acquire new knowledge, can begin to make state design support for SMEs more directed and more entrepreneurial.

All they may need is to get more successes under their belts.

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