A Framework to Maximise Design Knowledge Exchange

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This paper explores the conference theme of design as a catalyst for change through a set of reflections regarding the experience of delivering several major design knowledge exchange projects. Based in a university context, the projects have worked with more than 500 companies over 15 years and total in excess of £6.5million in value. The paper outlines the experiences of developing and delivering the projects. It explores the efficacy of the various delivery vehicles in relation to developing design awareness, knowledge, use and strategic commercial exploitation. Finally, the analysis proposes a framework for optimising the exchange of design knowledge between universities and companies to maximise change through design and the consequent economic growth.

design knowledge; knowledge exchange; adding value through design

1   Introduction

In the United Kingdom, there have been many national and regional initiatives to develop the application of design in small and medium-sized enterprises (SMEs). Design-led manufacturing is seen as a primary means by which SMEs in traditional industries can combat the threat of low cost overseas labour and compete successfully in the global marketplace. Examples include Cox (2005) and European Design Leadership Board (2012).

As a result, universities and others, have been actively encouraged to develop support programmes to improve design and innovation capabilities in SMEs, and have received significant funding through various regional, national and European initiatives.

The following examines four such projects or case studies to investigate how design may be used as a catalyst for change. These were all designed and delivered by Birmingham City University to meet funding, primarily European Regional Development Fund (ERDF) and regional development agency, requirements. It presents some of the major findings from the experience of more than 15 years working with over 500 companies and attracting over £6.5million in funding. As such, it is restricted to a single geographic area, design usage in SMEs, comparatively short interventions and a relatively small sample investigated through from initial engagement to final evaluation.

Rogers (2003) states "If an idea seems new to an individual, it is an innovation". Thus, innovations are not necessarily technological, they may relate to design processes, market research or environmental trends. The term design is also used in a broad sense to mean the development of products or services. This includes areas such as product design; visual communications pertaining to packaging and branding; and monitoring of external trends and competitor activity. The links between design and innovation are explored by others including Hernandez, Cooper, Tether and Murphy (2017), Hobday, Boddington and Grantham (2011), Hobday, Boddington and Grantham (2012), and Tether (2005, 2009). Therefore, for the purposes of this paper, it is accepted that a company that uses design more will become more innovative and, as a result, more competitive.

1.1 Project development and the value of a framework

As stated by Bessant and Venables (2008) while investigating the creation of wealth from knowledge:

> *What are the mental models that underpin our thinking about how innovation works? Do we know who the relevant actors are and what 'good practice' might be in terms of getting them to work together better? Are some innovation systems, whether across a particular sector, in a region or around a major transnational firm – more effective than others – and if so why?*

An aim of this paper, based on the experience of delivering the projects described in more detail below, is to propose a framework to provide guidance to practitioners trying to build similar knowledge exchange and innovation environments. In the funding streams used to support the work, primarily ERDF and regional development agency, businesses becoming more innovative is a desirable outcome. However, there is no detailed guidance on:

- What knowledge/information is needed to help potential beneficiaries to make positive changes to bring about growth?
- What are the best mechanisms to transfer and exchange knowledge? A supplementary question may be: are the methods for transfer different for different types of knowledge, eg technical, IT, and design?
- Are there any company characteristics, capabilities and capacity issues needed to make successful transfer more effective?
- How can the most suitable companies be attracted to any scheme? How should the most appropriate companies be selected?

This paper attempts to address that challenge by developing such a framework by reflecting on real-life experiences as well as combining apposite theories, models and ideas from the literature.

1.2 Design as a catalyst for change

In this work, the focus of project delivery is primarily on improving product (or service) development within client companies and helping them to be more innovative through using design.

To this end, in an attempt to visualise how this may be realised, the delivery team devised a novel tool – the innovation ladder. This is shown in Figure 1. The ladder served several purposes:

- it underpinned the development of a needs analysis and means to provide a baseline prior to businesses being assisted;
- it provided a simple structure by which the improvement of business could be envisaged; and
- the notion of moving a company up the innovation ladder indicated appropriate services that could be provided to companies to improve their innovative capabilities.

Thus, through the ladder, design was seen as a catalyst for change by improving economic performance of beneficiaries – it is not (in this work) seen as a catalyst for wider societal change.
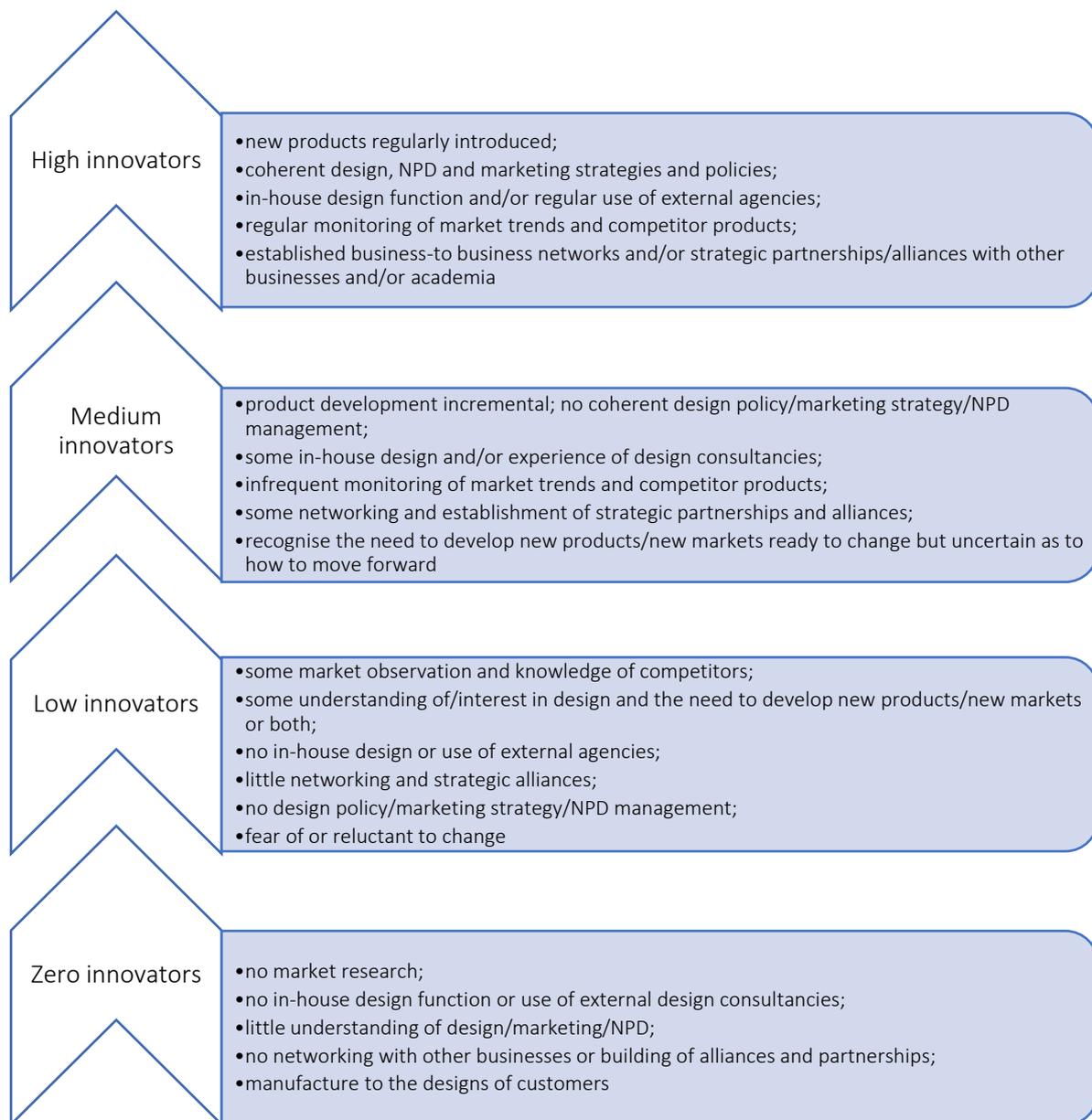
High innovators
- new products regularly introduced;
- coherent design, NPD and marketing strategies and policies;
- in-house design function and/or regular use of external agencies;
- regular monitoring of market trends and competitor products;
- established business-to business networks and/or strategic partnerships/alliances with other businesses and/or academia

Medium innovators
- product development incremental; no coherent design policy/marketing strategy/NPD management;
- some in-house design and/or experience of design consultancies;
- infrequent monitoring of market trends and competitor products;
- some networking and establishment of strategic partnerships and alliances;
- recognise the need to develop new products/new markets ready to change but uncertain as to how to move forward

Low innovators
- some market observation and knowledge of competitors;
- some understanding of/interest in design and the need to develop new products/new markets or both;
- no in-house design or use of external agencies;
- little networking and strategic alliances;
- no design policy/marketing strategy/NPD management;
- fear of or reluctant to change

Zero innovators
- no market research;
- no in-house design function or use of external design consultancies;
- little understanding of design/marketing/NPD;
- no networking with other businesses or building of alliances and partnerships;
- manufacture to the designs of customers

Figure 1: The innovation ladder

2   Methodology

The case studies are:

- the Centre for Product Design Information, a web-based resource of product design and related information;
- Design Knowledge Network, provision of product development and design related consultancy services;
- Furniture West Midlands, a networking and action group for furniture designers and manufacturers; and
- Interiors and Lifestyle Futures, delivering tailored workshops and building collaborative groups to enable SMEs to exploit high value markets and/or develop high value-added products.

Developed in response to national and regional policies to gain funding, all the projects have had to provide services to local industry. Priorities of the funding streams (AWM, 1999a, AWM, 1999b, AWM, 2001, AWM 2007) include:

- the need for the West Midlands region to build a diverse and dynamic business base;
- the importance of innovation through design;
- the need for companies to collaborate and develop joint ventures;
- promotion of an innovative culture with knowledge transfer between companies and between companies and higher education institutions; and
- a focus on clusters and cluster development.

The funding, primarily ERDF and the regional development agency, invariably carries several constraints, including:

- Projects are normally tasked to achieve business assists or interventions. These involve the provision of a free advisory service to a company for a few days, usually two to five. The business should then implement the advice and make changes which result in measurable benefits such as new and safeguarded sales and new and safeguarded jobs. These results should be directly attributable to the service provided by the project and realised within the project's lifetime if not more quickly.
- Assisted companies should be SMEs, ie, those that employ fewer than 250 people, be in a prescribed geographical location, eg, a specific part of the West Midlands region and within certain industry sectors, eg, interiors and lifestyles.

Within the boundaries of the funding requirements, projects can deliver their own programme of services to meet the output targets of new and safeguarded jobs and/or sales.

The projects are described in more detail by Burns, Ingram and Newport (2001) and Burns, Jefsioutine and Knight (2003), Burns and Ingram (2004), Burns (2007) and Burns and Ingram (2008). Although described as projects the term design support programmes as used by Acklin, Cruickshank and Evans (2013) and Gulari, Melioranski, Er and Fremantle (2017) could also be used. The following describes each case study in more detail.

2.1 Centre for Product Design Information (CPDI): 2000 – 2001, total value £960,000

To meet its objective of assisting SMEs to improve product development and innovation, CPDI created a website of product design information including:

- over 150 materials and 200 manufacturing processes;
- an introduction to legislation relating to product design;
- human factors and ergonomics material;
- design theory covering over 20 design management techniques, tools and processes; and
- a directory of over 150 design-related companies, encompassing design consultancies, designer-makers and materials suppliers in the West Midlands region.

By the end of the project, the site had over 1,000 registered users and a monthly hit rate of 100,000. Business assists, totalling 158, were achieved through West Midlands region companies being registered on the site and or members of the website directory.

A significant lesson learned in delivering CPDI was that the effectiveness and usage of the website was difficult to evaluate. Thus, while this project provided an extensive resource of information, its remoteness meant it did not interact with the intended beneficiaries or provide tailored information to meet user needs.

2.2 Design Knowledge Network (DKN): 2002 – 2008, total value £2.6m

Concurrent with the delivery of the CPDI project, UK government policies both regional and national had recognised and emphasised the development of clusters as a significant instrument in regional development (Trends Business Research, 2001). As a result, Advantage West Midlands, a regional development agency, identified several priority clusters. These included high value-added consumer

products comprising carpets, ceramics, clothing, designer-makers, furniture, glass, jewellery and leathergoods, where adding value through design was seen as significant contributor to companies establishing a competitive advantage.

In response, Birmingham City University developed a successful funding bid to help SMEs in this cluster to become more innovative through improvements to the product development process, increasing market knowledge and planning as well as advancing the use of design to add value. This became the DKN project.

Combining the lessons learned during CPDI delivery with the focus on cluster development, DKN devised and delivered various one-to-one business services. These included:

- introducing or improving a company's design process;
- increasing understanding and usage of trends;
- competitor and product knowledge and analysis; and
- market research and market planning.

The intervention, totalling five days, usually entailed business research and analysis, presented in the form of a report. The assistance was provided after a thorough needs analysis including design capabilities. This found that no companies had a formal design process or strategy.

The project completed 181 five-day business assists for 70 companies. However, as the project progressed, it became apparent that, although the vast majority of beneficiaries described the intervention as useful, many were not implementing the recommendations as fully as they could.

2.3   Furniture West Midlands (FWM): 2003 – 2009, total value ~£200,000

FWM's creation and development was also a response to the desire to build industry clusters. It aimed to develop a network of furniture manufacturers and designers, following a mapping exercise that had found that the region's industry contributed over 10% of the national total (AWM, 2003).

Following an initial conference to launch the cluster, a group formed to lead the network. It identified three priorities: design; training and marketing. With public sector support, FWM developed a brand identity, website, newsletter and supporting events to build the membership. The group attracted regional and national attention including government, trade and local press and national trade bodies.

A relatively small project in monetary terms, FWM was not contractually obliged to deliver outputs or results. Nevertheless, many positive outcomes were achieved including increased trading between members, recruitment of graduate designers together with student placements and projects; and links into various university, consultancy and advisory programmes.

A highlight was the 'FWM design selection', shown at the international Interiors Show in 2006. Of the 13 companies represented, five developed a new design or prototype specifically for the show.

2.4   Interiors & Lifestyle Futures (ILF): 2009 – 2015, total value £3.6m

ILF was devised in response to the Interiors and Lifestyle cluster plan (AWM, 2008). The plan expanded the high value-added consumer products cluster to include more sectors, such as lighting, floor and wall coverings, travel goods and artworks. It also promoted building communities of companies as well as the development of services to help companies to exploit high value markets and/or develop high value-added products. The plan specifically mentioned design as a means of companies improving products or services to become more competitive and innovative.

The ILF programme consisted of four elements:

- **Discovery** developed for larger companies, where an individual assessment to identify needs and priorities was followed by groups of similar companies exploring opportunities for forming alliances to address key issues.

- **Visioning** aimed to meet the needs of the smaller, creative businesses such as designer-makers. Delivered as a two-day workshop, it helped participants to identify opportunities as well as planning how to get the best from their practice.
- **ILF Venture** supported individuals to establish new design led- businesses through an intensive six-month programme of workshops and mentoring.
- **Knowledge base collaborations** provided intensive support to address a specific business issue.

In total, ILF worked with 300 businesses, primarily through two-day workshops and created over 30 new businesses. It developed new tools and techniques to foster collaborative groups and provided an environment where joint working could flourish. ILF also showcased over 70 companies both through exhibitions and international and national tradeshows, highlighting the design and manufacturing skills of the region's businesses.

The following presents the lessons learned through participant feedback and reflections of the delivery teams.

3   Findings and implications

The above has described four projects that have taken different approaches to improve the innovative capabilities of companies through increasing the awareness and usage of design. The following compares the projects and explores the issues arising from the experiences of delivery.

Each project has taken a different approach to increasing design awareness and usage, the lessons learned in earlier projects being applied in the development and delivery of later projects. They have also had different levels of funding and resources. Unsurprisingly, this resulted in different strengths and weaknesses as shown in Table 1.

In the table, design impact refers to the general increase in awareness and usage of design by the participating companies. The impacts could be small or incremental and do not necessarily result in significant changes at the company level and/or externally.

However, in trying to construct an evidence-based comparison of different projects to assess their relative value in effecting changes in design awareness, usage and management, clear and agreed benchmarks and measures of design are needed.

Design benchmarks might include:

- the existence or size of the in-house design department;
- the number of new products introduced on an annual basis;
- usage of university and other knowledge transfer channels;
- the presence of a written company design process;
- evidence pertaining to the design being integral to business plan and management structure; and
- the number of collaborative relationships.

The ensuing measures would then be increases in the benchmarked values of the above. Measures of design impact are discussed further by Burns and Annable (2011).

In its provision of one-to-one support, DKN was probably the most successful, with an emphasis on demonstrating to the company how they might repeat the activity in the future being included in the report. The Visioning workshops in ILF included an action plan developed by the participant to maximise the likelihood of implementation post activity. However, none of the projects had enough funding to measure their success at a later date, particularly with respect to how much design had effected real change in the company. All projects were not sustainable in the long term.

Table 1: Comparison of projects by characteristics

Project	Relationship	Number clients	Design impact	Cost	Delivery vehicle	Strengths	Weaknesses
FWM	Many-to-many; network of companies to provide mutual support facilitated by the public sector	~200	Low	£	Support of a collaborative group, showcasing	Forged new links and raised profile of industry as a whole and design in particular	Not sustainable in the longer term – once public funding and resources were removed, the group floundered and is currently inactive
CPDI	One-to-many; provision of web-based information	>1000	Medium	££	Website	Analysis of sector information needs and the development of a usable website	Lack of follow-up of target users to check on assumptions made during development and an understanding of how information could be used by companies to improve or change performance
ILF	Combination of one to few (workshops), one-to-many (website and social media) and one-to one (knowledge base collaborations)	~400	Medium to high	£££	Workshops, support of collaborative groups, showcasing, individual assistance	Raised the regional capability in high-value, design-led and quality manufactured products through national and international showcasing Creation of new businesses Well-funded allowing the delivery of a range of activities to suit various needs	Companies relying on secretariat function and unwilling to put own resources and money into sustaining benefits
DKN	One-to-one; range of bespoke consultancy services	<100	High	££	Bespoke individual reports, eg, competitor analysis, design process, marketing plans	Intensive assistance tailored to individual needs, follow-up of company change some time after assistance provided	Once assistance complete, no further support provided to help implement advice No contact between companies

3.1 Other findings

As well as the comparison of delivery mechanisms and project strengths and weaknesses described above, the experience of delivery of these projects has elicited some more general findings. These are presented in the following.

3.1.1 Clusters and collaborative working

Many of the regional policies emphasised the formation of clusters and the potential benefits arising from companies working together. According to Enright and Ffowcs-Williams (2001), these include:

- increases in the rate of innovation;
- enhanced productivity and improvements in the competitive performance of firms;
- a method by which companies can exchange ideas, knowledge and priorities with the public sector, particularly at the local and regional level, the results of which can be fed back to inform the policy and action plans of the public sector;
- assistance with improving the supply chain and supplier relationships; and
- increased efficiency through collective action.

In the case studies described above both networking and collaborative groups were formed. In the short-term these proved very fruitful, especially with regards to showcasing design and manufacturing skills. However, in the longer term, the groups failed to become self-supporting.

3.1.2 Company differences

Initial feedback, undertaken soon after the assistance, indicated that the projects provided a valuable range of services to its client base. However, follow-up conducted once a company had had a realistic period in which to apply recommendations and achieve improvements, proved less satisfactory. It became apparent that some companies were more successful in implementing recommendations than others.

3.1.3 Design or marketing?

During the earlier projects it was supposed that companies would already know how to do marketing and market research. However, when assessing company needs, it became clear that this was not the case. Therefore, improving design seemed futile if companies lacked the basic techniques to promote or sell the resulting products. Further, in later projects, needs often included understanding routes to market or sales promotion.

Additionally, companies were unaware of their position in the market place, who their competitors were or what external trends could affect their business or should be incorporated into their products and services. Much of this activity is in the area sometimes described as the fuzzy front end, see Koen et al (2002).

These related observations suggest that defining the correct need of a company as well as providing the correct information is key in optimising project performance.

3.1.4 The non-linearity of the design process

During delivery of the projects, it was observed that most SMEs have informal and chaotic business processes. In proposing a linear design process, as per the British Standard BS7000-2:2015 design management guidelines (BSI, 2015), follow-up work found that such models were not implemented by the companies. As described by Annable and Burns (2009), this observation resulted in the creation of a new model that incorporated front-end thinking, tailored for the design process resources and capabilities of SMEs.

3.1.5 Project management

There are many programmes focused on the transfer of specialist knowledge from academia to industry. These are centred on a conviction that, if properly applied, this knowledge will prove advantageous to one or more companies. However, the experience of the case study projects

indicates that a major difficulty of implementing a business or design support project, is the range of areas of expertise and skills needed to deliver a successful programme.

These include: administrative, planning, communication and organisational skills and foresight; budget management; good interpersonal skills; a basic understanding of economics and the fundamentals of regional development; some semblance of integrity with businesses, ie, an ability to move from the academic environment to a business one seamlessly, adept in the linguistic nuances of each; an understanding of company development and learning; research and analysis skills; and an appreciation of the type of knowledge to be delivered, and the methods most appropriate for its transfer.

Some of this can supplied through buying-in specialist expertise. However, there are often budget restrictions as well as the additional complexities of managing a larger delivery team. Thus, a good project manager needs a wide palette of skills in addition to the specialist knowledge deemed to be of value to industry. It is not within the scope of this paper to explore this further, but it would be valuable, in the future, to investigate the link between the success of projects and the capabilities of their managers.

It was also apparent, through the project experience, that collaborative activity between companies requires the support of independent brokers, such as university staff, and once that support is removed partnerships struggle to survive.

4 Discussion

In moving towards a framework for maximising design knowledge exchange, the above has highlighted several areas that merit further investigation.

Over the 15 or so years covered by these projects, their objectives have moved from improving product development to also developing high-value markets. However, a common rationale is that the usage of design will result in adding value so that companies do not need to compete on price alone. Value may be added through appearance, materials, methods of manufacture, reducing manufacturing costs, improving quality and usability, or a combination of some or all of these factors.

The emphasis of the projects has also changed as lessons learned internally are combined with the external development of policy instruments, such as building collaborative groups, by funding and development agencies. This can be considered to be action research, where reflection on experience informs future practice (Leitch & Day, 2000, Robertson, 2000 and Swann, 2002).

4.1 Differences between companies

Throughout delivery of the projects it has been noted on numerous occasions that given similar recommendations and advice, companies behaved in different ways, eg, some would take it on board, make changes and generate results, others would do nothing.

A possible explanation lies in the notion of absorptive capacity first defined by Cohen and Levinthal (1990) as the capability "of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends". Their work was extended by Zahra and George (2002) who produced a refined definition of absorptive capacity as "a set of organizational routines and strategic processes by which firms acquire, assimilate, transform, and exploit knowledge for the purpose of value creation".

In their review of the literature relating to the role of external expertise to business growth and development, Bessant, Phelps and Adams (2005) state:

> We conclude from the review of the absorptive capacity literature that organisations
> have different capacities to absorb new knowledge and this is dependent on state of

existing knowledge, the nature of what is being transferred, degree of homophily, the extent of ability and motivation and access to external knowledge.

This chimes strongly with the experience of the projects discussed above in that for a company to make changes, it needs to have the capacity and the capability to use that knowledge. Thus, it appears that absorptive capacity provides a method to consider a company's capabilities to determine its ability to assimilate and use new knowledge.

4.2 Defining the knowledge need

Bessant et al (2005), combine the knowledge states derived from the absorptive capacity literature with six tipping points to develop a two-dimensional framework to classify a company's growth states. They suggest that a company can be mapped on to this framework to identify priority areas for assistance. The six tipping points are: operational improvement; people management; obtaining finance; formal systems; strategy; and market entry. The four levels of absorptive capacity or knowledge states are:

- ignorance of key issues;
- awareness of key issues;
- knowledge and understanding of key issues and solutions; and
- implementation of actions to address key issues.

Throughout the review, by Bessant et al (2005), there is no mention of design as being of benefit to growing businesses or its links with innovation. To address this shortcoming, Burns (2009) extends the Bessant et al (2005) model to suggest design tipping points for firms with respect to increasing their use of design. These are given in Table 2 and provide a basis for the design knowledge needed to improve company performance.

Table 2: Design tipping points

Tipping point	General considerations	Design specific considerations
People management	Delegation of tasks, managing people, establishing functional or geographical teams	Employing designer(s), working with external consultancies
Strategy	Definition of types of work to accept or markets to target, development of brand and market position	Marketing strategy, product/service development strategy, branding and communications strategy
Formal systems	Developing systems to ensure consistency and reduce risks of things going wrong	Design process, product development process, customer feedback database
New market entry (new customers, new areas, new products)	Adapting business model to the new market, scaling-up of business, understanding new customer needs	Customer needs research, market research, competitor research, trends analysis, assessment of different market opportunities, adaptation of product offering
Finance	Obtaining funds to grow and meeting funder requirements	Obtaining funds to grow and meeting funder requirements
Operational improvement	Understanding process capabilities and best practice	Understanding and defining product development; design and marketing processes

4.3 Meeting the knowledge need

How the need may be met obviously depends on what has been identified as the knowledge gap, as well as the availability of resources and specialist expertise. In the experience of the projects, identifying opportunities using tools such as STEEPLE (Social, Technology, Economic, Education/ethics, Politics, Legal, Environmental) analysis, product positioning maps and investigating competitors have all proved fruitful and led to the development of new and improved products.

4.4 Understanding of knowledge exchange

In developing these projects and the mechanisms to transfer the knowledge needed by a company from the University context, project logic models have been found very useful. There has been a move in various funding streams, both structural and research, to request project logic models, for example, see AHRC (2007). As shown in Figure 2, these consist of a number of stages:

Figure 2: The project logic model

where:

- resources are what is needed to achieve the project's aims and objectives
- activities are the things to be done to address the aims and objectives
- outputs are the products that will be delivered by the activities
- outcomes are the changes in knowledge, skills and behaviour that the activities will lead to
- impact is the fundamental changes in service, organisation or community that will result from the activities

Developing such a model does help the consideration of how the project will work. However, little other guidance is supplied about the factors to consider when trying to help companies, and much comes down to the skills, experience and knowledge of the delivery team.

In the work described in this paper, transfer mechanisms have included websites (widely available, relatively low-cost, good for providing long-term support, no ability to offer tailored advice); workshops (restricted availability, medium to high cost, a supportive environment, semi-tailored assistance) and reports (restricted availability, medium to high cost, very tailored advice, little follow-on support). What is best depends on the particular results to be achieved.

5 A framework for maximising design knowledge exchange

Throughout, the projects have been trying to improve companies' capabilities and capacity to grow. With experience, it has become apparent that effective projects depend on both transferring the right knowledge as well as the ability of the beneficiary company to use that knowledge to effect changes and innovation. An aim of this paper is to codify that experience and combine it with findings from the literature to provide a framework to maximise design knowledge exchange.

This is shown in Figure 3 and comprises four stages: measuring the capacity of a company; determining its knowledge needs (or opportunities); defining the knowledge to be supplied and transferring this knowledge.

It is intended that the framework is used linearly and that no stages are neglected. Figure 3 also includes tools and techniques that can be used at each stage.

What is then provided and how depends on what is needed as well as what can be afforded.

6 Other considerations

There are several assumptions implicit in the funding programmes:

- The notion that companies can be improved quickly and easily by the provision of the right services. Successful funding applicants need only to establish a sector's needs, devise appropriate assistance and services to address those needs.

- There is a body of willing companies ready to take advantage and implement the assistance to effect lasting and positive change.
- Beneficiary companies are capable and have the capacity to make changes.
- The link between the service provided by the project to a measurable benefit, such as new sales or jobs is easy to evaluate and articulate.
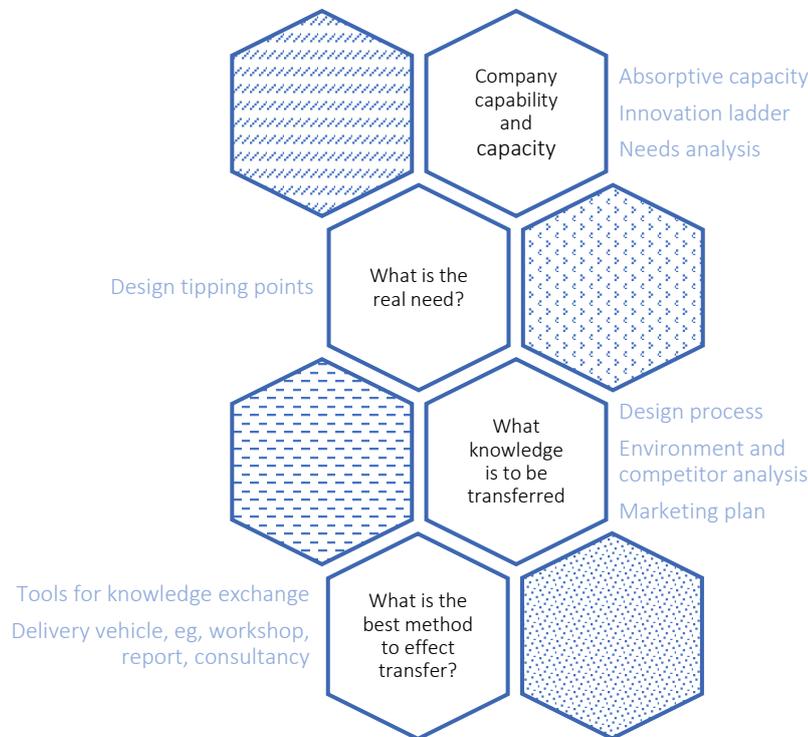

Figure 3: A framework to maximise design knowledge exchange

However, as discussed by Meagher and Lyall (2013), effective knowledge exchange in a social science context has at least three fundamental challenges:

- *knowledge exchange processes can be subtle and elusive*

- *improvement of knowledge exchange processes calls for attitudinal and behavioural changes at multiple levels*

- *protracted timescales can be required to achieve these changes*

Further, the real changes may be hidden in time through changes in company structure, ownership and personnel. This is further compounded by Tether's (2005) observation that "there is no single body of 'design knowledge' and much design (and innovation) practice is tacit and largely learnt through experience."

Attempting to link changes with programmes delivered a few years before can be extremely problematical. Tether (2005, 2009) also explores the nature of 'hidden design' where companies link their design costs into marketing and/or R&D expenditure. Therefore, the real value of a design activity or change, may not be measured or explicated.

These observations are mirrored in the work described here. Through necessity, this work focuses on knowledge exchange delivery vehicles, company capability and capacity as well as aspects of project management. A better understanding of organisational learning and the role of tacit knowledge, eg, Nonaka (1994), Nonaka and von Krogh (2009), may provide insights into the better

provision of support that is more likely to achieve real change. All the case study projects are relatively low cost with a focus on building design awareness and usage. Embedding design for the longer term may only arise from the more expensive options such as knowledge transfer partnerships or similar schemes. A good understanding of what and how design may result in long-term change is needed here.

Indeed, change may also be seen as impact (REF2014, 2012). As discussed by Hernandez et al (2017), the impact of design is being explored widely in the literature, not least due to the demands of the UK's Research Excellence Framework. The last survey in 2014 included impact case studies where institutions presented the non-academic impact of their research. In the case of the Art and Design Unit of Assessment, only 20% of the case studies related to design implying that there is a long way to go for design to be a real catalyst for change.

7 Conclusions

The above has explored four university-based case study projects that have responded to the priorities of regional policies and delivered services to regional industry. Major findings from the work undertaken over 15 years include:

- The effective transfer of design knowledge depends on the capacity of a company in addition to the identification of the most appropriate support.
- Weaknesses in marketing are a greater priority than design for most SMEs – gaps in marketing ability were having more critical impact than design issues in a company reaching its full potential.
- A company's external environment and competitors are an overlooked source of opportunities for growth. There is a general lack of knowledge regarding how observing a company's external trends (eg, social, technological, environmental and political) can point to opportunities or threats to a company's performance.
- The effective transfer of design knowledge depends on the capacity of a company in addition to the identification of the most appropriate support.

In examining the lessons learned through this experience, as well as investigating the extant literature, the work has presented a framework for maximising the transfer of design knowledge.

However, with a reporting focus on eligible expenditure and outputs achieved, the funding agencies do not encourage or facilitate constructive reflection on the efficacy of delivery methodologies or soft outcomes, such as business change and improvements. Indeed, while the last ten years has seen significant moves towards ensuring that projects are managed properly, virtually no guidance is provided on the factors to consider when trying to help companies, despite a plethora of literature in the knowledge exchange, open innovation, communities of practice and diffusion of innovation arenas.

As a start, this paper presents a new framework combining project logic models, tipping points and knowledge transfer elements to assist in developing projects to increase regional innovation and competitiveness.

However, best practice is not being collated due to a focus on project outcomes, eg, new sales, new jobs, not on the processes involved. Further, while there are no agreed measures of design improvements, it is not easy to compare project methodologies and approaches to delineate unambiguously the lessons learned and spread best practice.

8 References

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