

Towards a predictive model of organisational potential for applying design

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Abstract

Design Knowledge Network (DKN) is based in Birmingham City University (formerly the University of Central England), Birmingham, UK and is part-funded by the European Union Regional Development Fund and the regional development agency, Advantage West Midlands.

DKN has developed a three-stage process for assisting small and medium sized enterprises (SMEs) to become more innovative through the effective use of design in their decision-making process. This comprises: a needs analysis; appropriate assistance totalling five days; and review. The process evolved from a simple model, created by DKN, for measuring and improving the innovation ability of SMEs – the innovation ladder.

Following its work with nearly 70 SMEs and the completion of over 160 five-day assistances, DKN has evaluated the design needs of these companies. A significant finding is that most companies recognise that design process and strategy is a commercial asset, but view marketing and market research as greater priorities.

Further analysis of the data points to a means of categorising organisations in terms of their design knowledge and capacity to benefit from design, particularly in adding value to the commercial offering of products and services. All the SMEs are from high value-added consumer goods sectors, including furniture, jewellery, clothing and giftware, where design is a key competitive factor.

The model presented here can be compared with notions of absorptive capacity (Cohen and Levinthal, 1990, Zahra and George, 2002) and design management maturity (Andrews et al, 2001). In addressing the questions of where design thinking resides in SMEs and how it can be best applied for commercial benefit, examples are given that support some of the notions presented by Carlile (2002).

This classification, while more complex, is much more accurate than the original innovation ladder. Such a predictive model of an organisation's potential for the effective application of design is essential in extending strategic design capability beyond the basic level prevalent in many UK design initiatives over the past 60 years.

Introduction

Properly managed, design and innovation are seen as critical drivers to the competitiveness and survival of UK companies facing global pressure from low cost imports. They are a common strand in European Union, UK government and regional development agency policy (for example, Cox, 2005, DTI, 2005). Furthermore, considerable resources have been allocated to improving design and innovation, particularly in small and medium sized enterprises (SMEs) through various regional, national and European initiatives.

The project described in this paper, Design Knowledge Network (DKN) part-funded by the European Union and the UK West Midlands regional development agency, is one such initiative. Its origins date from 1999 and the Centre for Product Design Information project (CPDI), which was also part-funded by the European Union. CPDI developed a website of product design information that included sections covering materials, processes and design methods as well as a directory of designers. It was intended that SMEs would use the website resource to develop design in their own companies.

However, although well used by the design community as a whole, the site was not as frequently used by the West Midlands manufacturing companies that it was intended to help (Burns et al, 2001, Burns et al 2003).

By 2001, a new programme of funding was accompanied by various strategy documents¹ that, among other factors, advocated: the need for the West Midlands to build a diverse and dynamic business base; the promotion of an innovative culture and the importance of innovation through design; and the need for technology transfer between companies and between companies and higher education institutions.

This regional emphasis on innovation, allied to CPDI's own empirical data, prompted the evolution of a new project that better matched the design development of West Midlands SMEs. A successful bid for European Regional Development Fund (ERDF) and AWM funding, resulted in the foundation of DKN.

¹ The West Midlands Single Programming Document Objective 2 2000 – 2006 (GOWM, 2001), the Regional Innovation Strategy (AWM, 1999b), the West Midlands Economic Strategy (AWM, 1999a), and Agenda for Action (AWM, 2001).

The main aim of the project was to increase innovation in the region's SMEs. This was to be achieved through various means such as: improvements to the product development process; introducing or improving a company's design process; increased understanding and usage of trends; competitor and product knowledge and analysis; researching and/or expanding into new markets; or collaborating with academic institutions or other businesses. Through this increase in innovation, it was envisaged that a company would improve its competitive position as evidenced by new sales or jobs created.

Methodology

The receipt of ERDF funding imposed certain performance measures on projects: outputs – business assists comprising a minimum of 30 hours (five days) of one-to-one assistance following an analysis of the company's needs; and results – new and safeguarded sales and new and safeguarded jobs that result directly from the business assist.

However, individual projects were free to implement the needs analysis and business assist services as they saw fit. To this end, DKN created a tripartite intervention process:

- Stage one: an initial company assessment, ie, the needs analysis.
- Stage two: execution of the most appropriate form(s) of business assistance within the stipulated five-day funded period.
- Stage three: review of the progress and impact of the assistance.

This was available free of charge to eligible companies in the region.²

In order to achieve the required results, such as new sales and jobs, DKN had to be able to substantiate the state of a company before and following assistance. Due to the project's underlying aim of increasing innovation, it seemed appropriate to consider the characteristics of companies at various stages of innovation. Thus the model of an innovation ladder evolved.

Figure 1 provides a schematic of the innovation ladder. Table 1 shows the characteristics of companies at each stage of the ladder. In this context, innovation³ is defined as something that is new to a

² Eligible companies should be located in the Objective 2 regions, employ fewer than 250 people and turnover less than €40m annually.

company. These characteristics have been developed by the project team, based on its experience⁴ and with academic input from staff at Birmingham Institute of Art and Design, Birmingham City University.

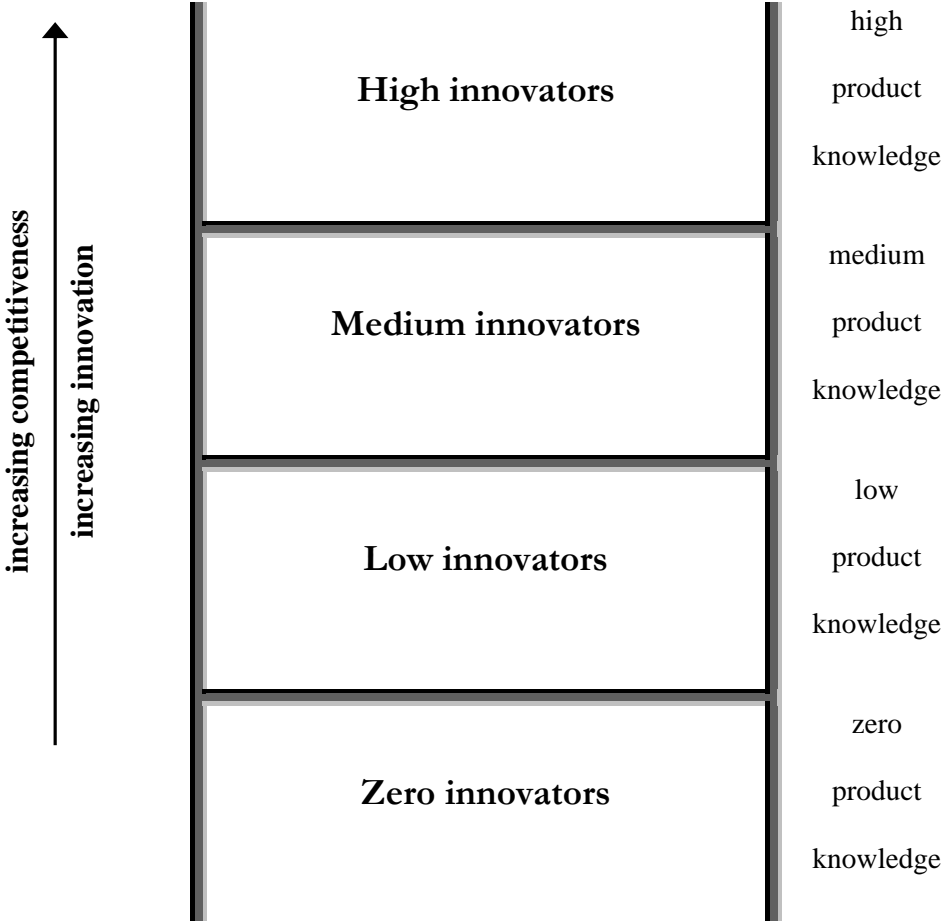


Figure 1: The innovation ladder

³ The Regional Innovation Strategy (AWM, 1999b) states “Many people associate innovation with the introduction of high-tech products, but this is only part of the story. Innovation is also about the development of new skills through education and training; new forms of management, organisation and working practices; new markets and new sources of supply.”

⁴ Includes product and industrial design, product and project management, business analysis and strategy.

Zero innovators	Low innovators
<ul style="list-style-type: none"> • no marketing 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. 	<ul style="list-style-type: none"> • some market observation; • some knowledge of competitors; • some understanding of/interest in design; • no in-house design or use of external agencies; • beginning to recognise the need to develop new products/new markets or both; • little networking and strategic alliances; • no design policy/marketing strategy/NPD management; • fear of or reluctant to change.
Medium innovators	High innovators
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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

Table 1: innovator characteristics

Stage 1: needs analysis

This initial analysis measures the company's existing level of innovativeness against DKN's

innovation ladder and determines the most appropriate intervention to implement. It takes the form of a semi-structured interview and includes exploration of:

- Company background
- Product (s)
- Issues
- SWOT

- Market knowledge; strategy and plan
- Competitor knowledge; strategy and plan
- Design knowledge; strategy and plan
- Other information

The company's responses are recorded and used to identify the company's objectives, priorities, strengths, weaknesses and knowledge gaps. If DKN is able to provide constructive assistance, a proposal form is completed. This explains the background to the intervention, the work to be undertaken and its likely benefits.

Stage 2: business assist

To rectify issues arising from the analysis and to help companies progress on the innovation ladder, the project developed services relating to design, marketing and research.

Initial research and SWOT: this report comprises an exploration of the relevant industry and the company in particular and can include: identification of relevant market trends, competitors and other information together with recommendations for future activities and priorities.

Market research: research of trends such as lifestyle, market size and structure and characteristics of a market with specific interest to company.

Market planning: this consists of various planning and strategic activities, for example:

- examination of the company's existing marketing strategy and recommendations for improvement, taking account of the external factors that influence the company's environment;
- a comprehensive report documents all aspects of marketing communications and may include: understanding of budget and company objectives; advice on branding, including trademarks, logos and packaging; an outline of promotional tactics; and an action plan of future activities.

Competitor analysis: investigates a company's key competitors, both direct and indirect; their products/services, materials and/or technologies, pricing, promotional tactics and routes to market; recommendations as to competitive strategy and future activities.

Product analysis: this determines a company's most highly valued products and/or identification of characteristics to add perceived value. It may include: market research to understand product trends and materials; customer or user interviews; competitor research; recommendations to add value to products or to rationalise or augment a product range.

Prospect search: a report identifies possible prospects for future sales activity and may include the characteristics of existing key customers; and a list of potential prospects and methods for contacting them.

Design audit: a company's design process is mapped against that of BS7000 as a means of advising on improvements. This may: identify company needs and current practice regarding design; establish the strengths and weaknesses of the process and areas for improvement;

Design process and management: a report details methods for managing design and may include the development of a new process and associated documentation; and the provision of detailed guidelines for improvements.

Other services: As required, this includes information and advice for example covering suppliers, materials and business processes, not covered in the above.

Stage 3: review

The review stage consists of two phases. The first is initial feedback from the report soon after it has been presented to the company. They are invited to make comments and predict the likely longer term results arising from the work.

Once the company has had sufficient time to apply the findings, another interview is conducted. This compares and contrasts what the company has implemented and achieved with DKN's expectations. The project also, in line with its funding criteria, collects results evidence, ie, data on new and safeguarded jobs and new and safeguarded sales.

In summary: the needs analysis should establish a SME's position on the ladder. The one-to-one business assistance provided by the project should then enable the SME to climb the ladder, thus

increasing its innovative capability and ultimately competitiveness in terms of the new and safeguarded jobs and/or sales, ie, provide results for the project.

Results

In the last four years, the project has undertaken over 160 assists for nearly 70 companies. Of the 35 companies for which data is available, average turnover per company is £816,000, average number of employees is 12 and the average turnover per employee is £68,000. These figures excluding start-ups⁵, which, as shown in Tables 3 and 4, make up 27% of the total.

The characteristics of 57 of these companies are shown in tables 2, 3 and 4. Table 4 shows that nearly 85% of the companies assisted employ fewer than 10 people and the majority are manufacturers, designers or designer makers. Due to Birmingham City University's links with the jewellery/giftware and furniture markets, these have the highest representation as market sectors.

The needs analysis for each company was conducted with the managing director or business owner. Invariably, the company has acknowledged it needs help, accepts that it cannot compete on price and is ready to take up the offer of free assistance. Companies tend to have few formal procedures, are reactive in their sales activity and only monitor their environment and competitors spasmodically. However, the vast majority value design, but only one company actually had a formal design policy.

A breakdown of the assistance provided is presented in Figure 1. In line with the above outline of needs, the most popular services are those relating to marketing in various forms: research; strategy; planning; and communications. The 29% of reports devoted to initial research and SWOT analysis, reflects the process employed by the project as described above.

Table 5 shows a breakdown of the initial feedback to the business assists, based on a return rate of 74%. That over 90% of assists are useful and virtually 70% innovative, indicates that the needs analysis process is adequately capturing a company's requirements.

The next section analyses these results in the context of the innovation ladder.

⁵ Start-ups are defined as companies that have yet to start trading and or have been trading for less than 18 months.

Market sector	%
Jewellery and giftware	30%
Furniture	19%
Clothing and textiles	12%
Audio/Visual	12%
Medical/healthcare	11%
Architectural/interiors	11%
Other	5%
Total	100%

Table 2: split of companies by market sector

Company type	%
Manufacturer	35%
Designer	12%
Designer maker	12%
Craftsperson	5%
Service	9%
Start-up	27%
Total	100%

Table 3: split of companies by type

Number employees	%
Start-up	27%
Sole trader	28%
2 – 10	30%
11 – 30	10%
31 – 50	3%
over 50	2%
Total	100%

Table 4: split of companies by employee numbers

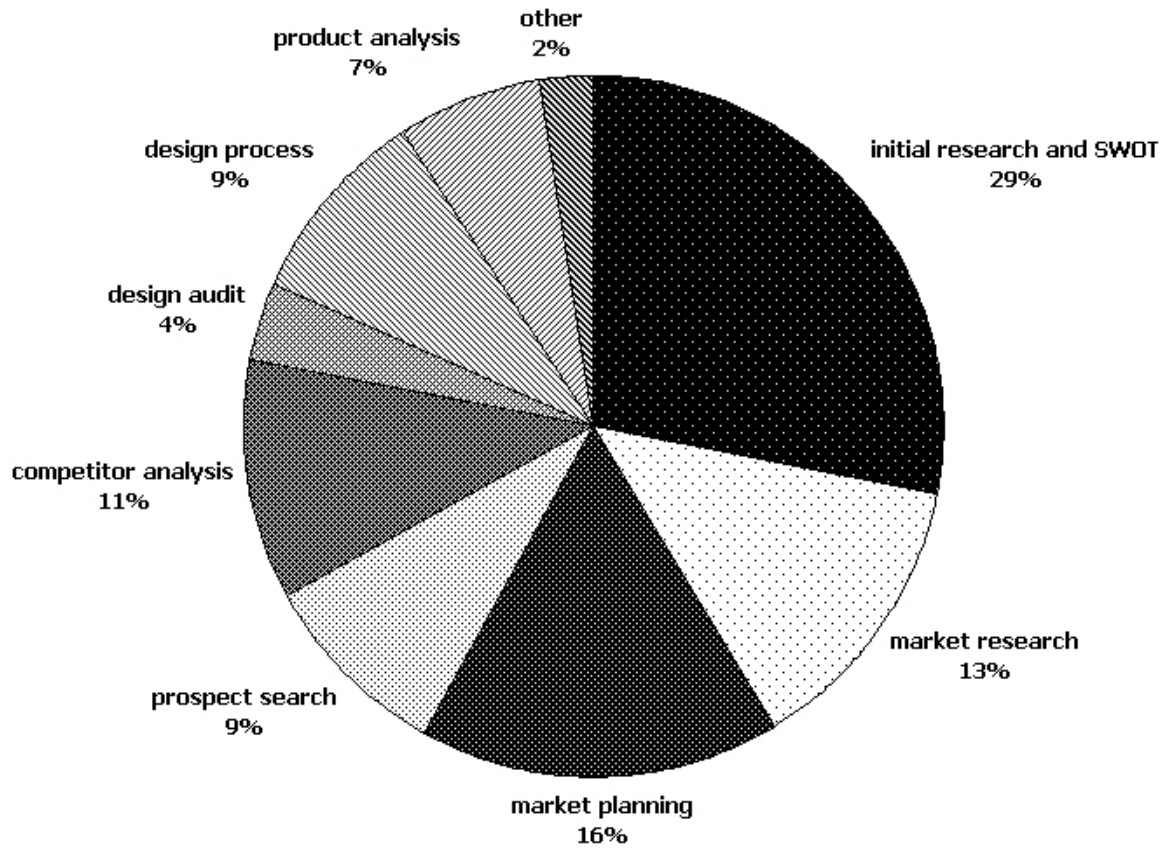


Figure 2: breakdown of business assists

Question	% response
Did the work prove useful? (% responding yes)	91%
Will the work result in new sales?	
Yes	37%
No	3%
Possibly	60%
Will the work result in new jobs?	
Yes	26%
No	9%
Possibly	65%
Was the work innovative? (% responding yes)	69%
Will the work have an environmental impact on your business? (% responding yes)	21%

Table 5: analysis of initial feedback

Analysis

In the early stages of DKN, it was supposed that companies would already know how to do marketing, regularly undertake market research and monitor competitor activity. However, the fact that only one fifth of the assistance required was directly related to design through process improvements or product developments indicates that this was not the case.

In assessing the priority needs of a company, team members felt there was little point undertaking or improving design if companies lacked the basic techniques to promote or sell the resulting products. 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).

By preparing a detailed report, tailored to the specific needs of a company, the project, in effect, acted as an information filter. Reports also described the research methods and sources used so that companies could revisit and update the information in the future.

Additionally, DKN thought that the companies most likely to benefit from assistance would be the low and medium innovators, ie, those ready to change, but not necessarily with the know-how or resources to do it. High innovators were likely to be at a too advanced level for short-term assistance, zero innovators were unlikely to have sufficient resources to put any advice into practice. 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.

There are a number of possible explanations including:

- Real needs were not correctly identified. However, companies had an opportunity to refine their requirements at the proposal stage and to intimate that the work was not useful at the feedback stage.
- The project team comprised mainly people in their early 30s and was based in a university. This may have led to businesses being resistant to advice that they perceived was not from an experienced source or was being provided by an outsider.

- Once the report was completed, there was no time left in the five days of assistance to mentor the business and help it to put the findings into operation. The business manager or owner was left alone to implement DKN's recommendations, subject to time and resource constraints.
- The work may have been undervalued due to its being provided free of charge at the point of delivery.

However, through further research and consideration of some similar projects, it has become apparent that the reasons above do not fully account for the observed behaviour of some companies. The innovation ladder has proved helpful in identifying knowledge needs and gaps, but has not identified if a company will take the information on board and use it. As discussed earlier, the knowledge delivered through the assistance has to be used by the company to effect a move up the innovation ladder and lead to new sales and jobs created, as required by the funders. Thus, the innovation ladder can be used to identify information needs but not development needs.

In response, the authors have outlined a simple typology of companies that are worth helping as presented in Figure 3.

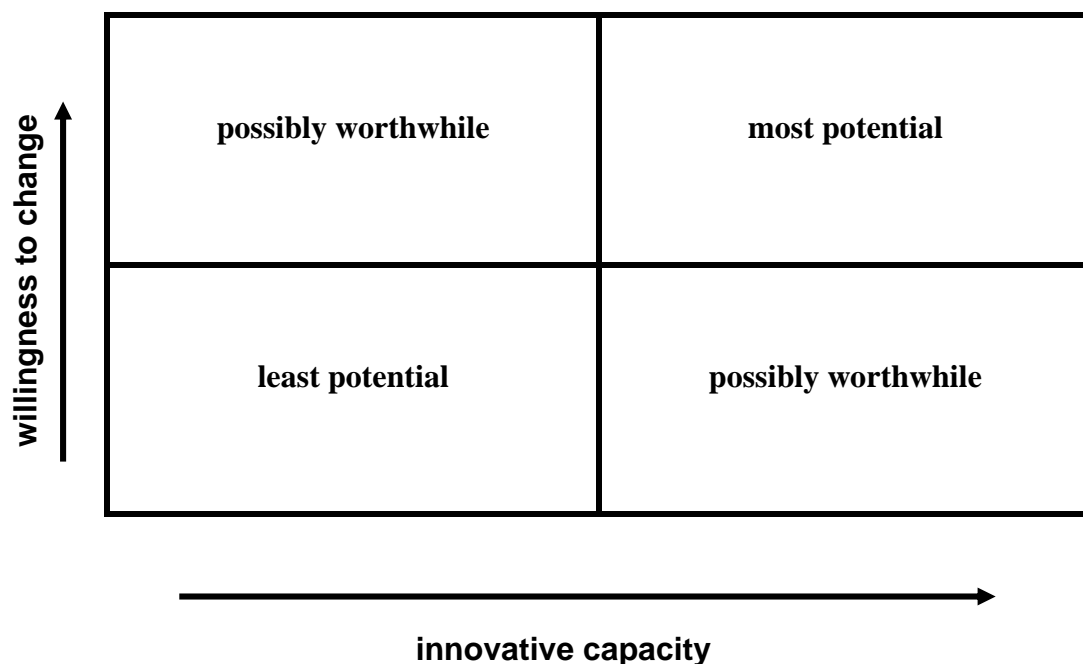


Figure 3: company typology

However, this model also has various shortcomings. First, it only identifies the potential of a company, not its needs. Secondly, the terms ‘willingness to change’ and ‘innovative capacity’ are used to suggest nebulous, possibly unmeasurable, characteristics. In order to try to name and refine the definitions of ‘willingness to change’ and ‘innovative capacity’, a further literature search was undertaken.

Discussion and conclusions

In searching the literature for explanations for the phenomena described above an immediate starting point was the Design Atlas described by Inns (2002). Similar to the innovation ladder, a company is scored against a number of attributes that are considered to indicate design capability. If a company has a low score on any particular attribute, then it is advised to implement the missing policy or process without reference to assessing the company’s capability to assimilate the new system.

Further searching uncovered a number of ideas that explained, at least to some degree, DKN’s observations of company behaviour described above. Of particular relevance were the concepts of absorptive capacity (Cohen and Levinthal, 1990, Zahra and George, 2002).

Cohen and Levinthal (1990) define absorptive capacity as the capability “of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends”. They argue that this attribute is an essential component of a company’s innovative capabilities, which depends on the “firm’s level of prior related knowledge”. “Thus, organizations with higher levels of absorptive capacity will tend to be more proactive, exploiting opportunities present in the environment, independent of current performance” (Cohen and Levinthal, 1990).

Zahra and George (2002) reviewed the notion of absorptive capacity in the context of research into the dynamic capabilities of companies. This 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” (Zahra and George, 2002). They contend that to evolve and develop, absorptive capacity depends on “multiple factors, including a firm’s past experience, knowledge complementarity, and diversity of knowledge sources” (Zahra and George, 2002).

This concept corresponds with the observations made to date by the DKN project. Some companies could be offered knowledge to meet an identified need, but were unable or unwilling to use that information to create value. It now seems likely that they lacked the existing underlying experience needed to exploit the knowledge fully. Furthermore, the companies that least benefited from assistance showed little other interest in external knowledge sources such as competitors or networks of similar companies. To a degree, some characteristics of the ladder are implicit in absorptive capacity, for example, the degree of monitoring of external trends and competitors and the networking activity of the company.

In their review of the literature relating to the role of external expertise to business growth and development, 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 onto this framework to identify priority areas for assistance. The six tipping points comprise: operational improvement; people management; obtaining finance; formal systems; strategy; and market entry. Throughout the review, there is no mention of design as being of benefit to growing businesses or its links with innovation. However, it is possible that a modified version of this framework could begin to address some of the shortcomings of the innovation ladder model and company typology described above. This will form the basis of future work by the authors.

While exploring serial innovation in SMEs, Bruce and Harun (2001) touch on absorptive capacity and use its concepts to propose a model of design capability. Unfortunately, additional investigations have not revealed any work that explored this model further. Again, this may provide a basis for future research.

Exploring absorptive capacity in the context of design and design thinking, inevitably leads to the concepts of design capability and capacity described by Heap et al. (2007). Surprisingly, there appears to be a paucity of research in this area and that which exists focuses on the nature of design knowledge.

The model of design maturity proposed by Andrews et al (2001) consists of eight distinct stages starting from a realisation that design can bring commercial benefits through the ability to manage a design project and eventually reaching the model's pinnacle: the competence to develop strategic design mechanisms. Again, this reflects the stages of acquire; assimilate; transform; and exploit proposed by Zahra and George (2002), raising the possibility that the two may be closely related.

The above has discussed how the design needs of a company may be assessed and started to investigate how companies may be deemed suitable for assistance. Another area not covered by the innovation ladder is that of how design knowledge is transferred across the boundaries present between organisations and business functions. Carlile (2002) uses the notion of objects as a means of transferring knowledge across boundaries. The objects include items such as drawings; CAD files; product parts and schedules and establish "a shared syntax or language for individuals to represent their knowledge", Carlile (2002). It is possible that the means of transferring knowledge through business assistance to a company does not provide a 'shared syntax' and that this reduces its likelihood of success. Again, this is another area for potential research.

Through the study of nearly 70 companies conducted by the DKN project, it has become apparent that innovation and design usage in SMEs cannot be increased through the provision of targeted assistance alone. The capacity or competence of a company also needs to be considered.

To move towards a predictive model of organisational potential for applying design a number of questions need to be answered. For example:

- Is absorptive capacity useful in relation to design capacity?
- Does it provide a terminology or useful indicators to measure and assess design capacity?
- Are design maturity and design capacity different?
- Cohen and Levinthal (1990) purport that R&D capacity links directly to a company being more innovative. Likewise, does improving design capacity make a company innovative?

Exploring these issues is likely to have a significant impact on current policy in the design arena and produce some useful insights into design thinking.

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Kathryn Burns – resumé

Kathryn Burns is project director of Design Knowledge Network based in Birmingham Institute of Art and Design (BIAD), Birmingham City University, (formerly University of Central England), Birmingham, UK. Kathryn has a passion for improving the product development process and securing more investment in the associated R&D resources. She has a BSc (Hons) and MPhil in Chemical Engineering from the University of Leeds and a Master in Business Administration from the University of Bradford.

Prior to joining BIAD in 2000, Kathryn spent over 15 years in industry working chiefly in manufacturing companies ranging from SMEs to multinationals. Her experience encompasses writing software for process control systems, project management, product management and marketing. Additionally, she has been a project management tutor for the MA in Information Technology Management at the University of Sheffield.

Journal articles

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