FORTUNE FAVOURS ONLY THE PREPARED MIND

Why Sources of Inspiration are Essential for Continuing Creativity

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Intellectual health like physical health depends on a balance between feeding and exercise. But the demands of work often make a healthy balance very hard to maintain. In a detailed study of the knitwear industry and in comparisons with other design fields, we have observed that designers use external sources of ideas for a variety of different purposes throughout the design process. We have also observed that designers’ creative potential is often limited by the failure of managers to understand design, and especially their designers’ need to search for sources of new ideas. Managing design processes to maximise creative output requires both an understanding of the role of sources of ideas in the creative process, and proactive management to support and encourage the renewal of intellectual resources. In this paper we suggest some practical steps for supporting continuing creativity.

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Observations of a variety of creative activities show that they depend on the recognition of similarities and connections, and involve the modification and combination of existing ideas into novel forms to meet new requirements: designs, musical compositions, scientific hypotheses and theories, solutions to problems. Product designers take shapes and motifs from nature or from other artefacts, for example inventing the jug kettle by adapting the shape of a water jug, or employing the idea of a pistol grip for power drills and cameras (see Roy, 1992). Engineers solve problems by recognising analogies and relationships with problems to which they have solutions, and adapting those solutions (see Cross, 1989), for instance basing the design of a machine to produce chocolate coated ice-cream on injection moulding in plastics (the Magnum, made by Unilever). Scientists generate hypotheses and experimental designs by recognising analogies between the structure and behaviour of different systems, as well as by reasoning about how general theories can be applied to specific situations (see Giere, 1988, for a cognitive perspective on science); for example, understanding why animals sometimes behave altruistically using the theory of games originally applied to economics (see Maynard Smith, 1976, 1978, for an introduction).

To generate good ideas of their own, creative thinkers depend on their prior knowledge and their ability to recognise its relevance when they need it, not just on their ability to combine and adapt ideas and distinguish good ideas from bad ones. Hence Pasteur’s famous remark that “in the field of observation, fortune favours only the prepared mind” (quoted in Valery-Radot, 1903). A designer’s fortune is the arrival of design briefs and commissions, which usually have to be met quickly with no time for long searches for ideas, and often in competition with others. Sometimes, especially in crafts like furniture design or tattooing (Glinski, 1997), designs are evolved in initial conversations with customers.

A large part of expertise is recognition of recurring patterns and reuse of solution chunks (see Chi et al, 1988, for studies of expertise in different fields). Schön (1983: Schön & Wiggins, 1992) observe that architects perceptually *appreciate* the characteristics of design elements and combinations; and that a large part of conceptual design in architecture is identifying and constructing appropriate design elements, and exploring combinations. The same is true of knitwear designers (Eckert, 1997b). Successful creative thinkers possess wide knowledge - a large stock of design elements - as well as a wide range of ways to recognise similarities and connections, and ways to combine and adapt ideas.
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But the more designers use standard methods the more they are locked into them; they need to renew their stock of design elements, renew their awareness of the cultural and technical context, to continue to be creative.

The search for new ideas takes different forms in different industries, and is perceived and managed differently; but the need for renewal is the same, so comparisons are instructive. In the clothing industries the use of external sources of ideas is well understood by designers, but nevertheless its importance is grossly underestimated by managers. It is well recognised that scientists and engineers need to work at keeping up with research findings and conceptual innovations in order to produce good ideas of their own. But commercial pressures and corporate culture often dictate that designers (and other professional thinkers including scientists) always devote their entire energy to current projects - the output side of the equation. Although some organisations are aware of the need to provide for the intellectual development of their creative minds, too many treat designers as though they were a disposable short term resource. In the absence of supportive management continuing success depends on a very high degree of self-motivation.

Knitwear: An Inspiration-Driven Industry

How do designers use outside sources of inspiration? The MIND Project (Mechanisms of Inspiration in Novel Design) at the Open University is studying the role of external sources of ideas in the design process. We are focusing on knitwear, a large commercially important design-driven industry that has been neglected by academic design studies. Our observations (Eckert, 1997b) are based primarily on an ethnographic study of the knitwear design process involving structured interviews of designers and knitting machine technicians in over 25 knitwear companies in Britain and Germany, carried out by the first author, supplemented by interviews with engineers, architects, town planners, product designers and fashion designers. The knitwear companies span the full range from market leaders selling their own brands of expensive clothes to suppliers for cheap high street chains.

Knitwear design combines characteristics of fashion design and engineering. It is a variety of aesthetic design: sales depend on the appearance of the product. But there is a complex and subtle interaction between the appearance of a garment and the technical properties that determine the feasibility and cost of producing knitted fabric. In consequence the design process involves a problematic interaction between the knitwear designers who do the aesthetic design, and the knitting machine technicians who do a lot of detailed design in the course of programming industrial knitting machines to produce feasible affordable garments. The designers produce large numbers of designs, of which many are technically infeasible, and only a few are selected for further development by technicians. Communication difficulties are aggravated by the pressure on designers and technicians to minimise the time between design research and production. Both have to work under intense time pressure, as the time from getting a brief to a hard delivery deadline is often short and the time required to produce a sample garment can be unpredictable (Eckert, 1997b; Eckert & Demaid, 1997, discuss how to alleviate the problem by re-engineering the design process). Thus knitwear design shares many characteristics of engineering design processes, as well as of other aesthetic design processes.
The appearance of a garment needs to fit within the envelope of current fashion, defined by the shared features of contemporary garments as well as by themes and moods. Design research - studying the shape of this envelope - is a vital part of every designer’s job. So in the fashion industry, even more than in other craft-based aesthetic design domains, the vital importance of sources of inspiration is well recognised by designers themselves. This makes the use of sources of design ideas relatively easy to track, though our comparisons with other creative fields indicate that similar processes of recognition, selection, abstraction and adaptation of relevant ideas are universal.

Sources of Inspiration in Knitwear Design

Anything visual can be a source of inspiration for a garment, and knitwear designers combine ideas from different sources as it suits them (see Eckert, 1997a, for a fuller discussion). They are often concerned with projecting the cultural connotations of their sources, but seldom with fidelity or conceptual consistency. The major types of idea sources are:

- **Garments.** Designers attend catwalk shows and visit shops to absorb fashion trends, identify the strong features of a new season, and study how the garments of market leaders and competitors are constructed. Some designers, most famously Vivienne Westwood, also draw ideas from historic designs.

- **Photographs of garments.** Designers study fashion magazines and trend publications to gain an overview of fashion. A photograph does not show technical details, but it communicates the mood of a design and the image of the target wearer.

- **Artefacts and images of artefacts.** Other textiles, designed objects and fine art are often used as sources of inspiration. Designers make extensive use of books of photographs.

- **Natural objects and phenomena and images of them.** Designers take motifs, colour combinations and cultural connotations from nature in the same way as from man-made objects.

Sources of inspiration are used extensively throughout the knitwear design process. Figure 1 shows the most important external inputs. They are used in two fundamentally different ways at different stages in the development of garments for a season: indirectly to create an understanding of the fashion context and directly as a basis for a particular design.

Sources of inspiration are also used for communicating design ideas: As collections are planned and developed, images of objects and natural phenomena are displayed on mood boards to convey colour schemes as well as moods, themes and cultural connotations. When designers talk to each other about new designs they often refer to garments or other sources of inspiration they are all familiar with. Their features serve as a code for communicating the designers’ own ideas. The listener redesigns a garment mentally from the speaker’s description.
Designers need to understand the fashion context: the space of possible garments permitted within the fashion of a season, and the images projected by garments in different
regions of that space. High street fashion is created collectively by all the designers across the world studying the same inspiration materials, as well as the trend predictions produced by a small number of fashion forecasting bureaux. All designers study trend prediction material and catwalk clothes, as well as trade press write-ups about them. They look for recurring strong features and colours in different collections. Each designer interprets these findings for her own company and target market - identifying the region of the space of fashionable designs her company should occupy. Thus designers use sources of inspiration to develop their understanding of the design tasks they have to perform. While researching the fashion context designers already think in terms of concrete designs, which they visualise mentally or sketch. Sometimes these early designs are realised as garments, but often they serve as exemplars of classes of possible garments - mental placeholders for designs that will be created later. This design research process is common to designers throughout the industry; it differs according to the constraints imposed by the design briefs for individual garments.

Figure 2. Fish sweater

Almost all knitwear designs are based on some source of inspiration. Knitted textures, and shape features such as necklines or pockets, are often lifted directly from other garments. While adapting fashionable features can be sharing the common currency of a season, designers are often required to imitate other garments as closely as copyright law will allow. Motifs are often based on artefacts or natural objects, just as the fish motif is adapted from the picture of a herring in figure 3. Colour schemes are often derived from images of works of fine art or natural phenomena.

At the end of the design research process, designers work out a plan for the types of designs that they want to create, either to market as a collection or to present to buyers for retail chains, such as two fair isle sweaters, one sweater with a big intarsia motif, two plain cardigans and so on. For each design they have a rough idea of what they want. For instance, the sweater in figure 2 was based on the idea of an aquatic scene with a variety of different fish. But the objects or images that inspired this design intention may not be available or suitable for direct adaptation into a knitwear design - they may be memories, or
objects conveying a theme or mood rather than a shape or texture. In this case designers search for suitable sources of structural elements or motifs. Once a source is selected it is adapted into a knitting pattern. Figure 3 shows the adaptation of a picture of a herring into a colour pattern motif.

![Herring](image1)

![Knitted Pattern](image2)

**Figure 3. Direct adaptation of a source of inspiration**

The designer evaluates the adapted design. If she does not like it, she might change the adaptation (the grid pattern), or try using another similar source; or possibly give up on the idea for the garment altogether. Once she has settled on a specific design, it needs to be
converted into a set of knitting machine instructions and knitted. Our observations have shown that when problems occur at this stage, designers and technicians try everything to make a particular design work, but the original selection of the source is rarely questioned. Figure 4 shows the sequence of operations through which an idea (reliant on a source of inspiration, or several) is developed into a garment, with the backtracking steps that designers take when they meet problems.

Figure 4. Direct use of a source of inspiration

The adaptation of a source into a design element can be
- “literal”, when the design is kept as close as possible to the original sources;
- an abstraction, when certain features are isolated and highlighted. As knitwear has such a low resolution even the closest designs require some degree of abstraction;
- an association, when the designer comes up with an idea loosely connected to the source, belonging to the same topic or context as the source. For example a designer looking at fish might draw a seahorse from memory.

The adaptation process translates the structural characteristics of the source - size, shape, colour, resolution, texture - modifying them to fit the demands of the medium (in knitwear, a grid of discrete stitches). It usually attempts to preserve emergent aesthetic properties of the source such as colour balance, elegance/cuteness, cultural connotations and so on.

The selection of a source of inspiration is driven by the source. Designers comment that they look at an appropriate source and see it instantly as a knitwear design. Sometimes they come across a source of inspiration and an idea for a garment strikes them; at other times they search through books and past designs until they find a suitable source (for instance figure 3). This search is focused by the available mappings from the designers’ ideas about what garments they want to the ways they know about to search for material. For example, a designer wanting a sweater in an ‘Arabian Nights’ theme might look through a book about Persian carpets. (The fact that Iranians and Afghans aren’t Arabs
wouldn’t worry most knitwear designers.) Very often designers know what emergent aesthetic properties they want to achieve (likely derived from sources of ideas that can’t be directly adapted): these may be perceptual; or abstract, moods like ‘calm, aquatic’ or cultural associations like ‘1920s Jazz Age’. They search for a source of inspiration that has those emergent properties as well as structural properties that permit adaptation into a knitting pattern.

**Practical Lessons for the Knitwear Industry**

Although knitwear designers recognise the critical importance of design research in the design process, it is often not understood by their managers. Understanding the state of current fashion, and searching for ideas and sources of inspiration involves looking at nice objects and art books, going on trips to places like Paris and New York, visiting museums and going on country walks. This is often seen as artis...
Implications for Managing Continuing Creativity

One lesson to be drawn from our study is that effective management of knitwear design requires both an understanding of how creativity works in the industry, and an understanding of how the renewal of creative resources works. Management is visibly worse when managers fail to understand. This lesson is relevant to all creative activities. Design-driven industries differ widely in the demands they make on designers’ funds of knowledge and experience, but the cyclic relationship between learning and creation is strikingly similar in all of them.

The degree to which the importance of sources of inspiration is recognised varies; more in fields where designers need to produce large numbers of designs under time pressure - such as knitwear design - and so need procedures for generating ideas; and more in fields where the constraints of fashion are relatively tight and designers are required to imitate other designers' work - such as fashion design. However architects and civil engineers often acknowledge the sources of design objectives and critical ideas, such as the shape of a rhubarb leaf for the structure of a bridge (the Kingsgate footbridge in Durham, England, designed by Ove Arup; see Walker with Cross, 1983).

Our study of knitwear design has the most direct implications for the management of other types of aesthetic design, such as fashion and textiles design, furniture design, product design and architecture. Designs need to be timely, neither before nor after the time when the culture will accept them. So designing for aesthetic appeal depends on an awareness of the cultural context - what is fashionable, what are the cultural connotations of shapes and motifs - though the sharpness of the boundaries of fashion differs between industries, depending on how often manufacturers update their products and how long customers keep using them. (Clothes and buildings are opposite extremes: architects are influenced by fashion - shared changes in taste - and the stock of ideas they have to draw on, but buildings are built to outlast fashions though they are often designed to convey cultural messages.) Successful innovation as well as subtle expression of mood and image depends on an awareness of innovations in other types of design and a broad understanding of cultural changes.

Technical designers depend on keeping up with developments in their own field, but radical innovation requires breadth of vision: awareness of potential analogies among the products and techniques of other industries.

The fortune that favours designers with prepared minds is design projects to be done quickly to deadlines. To have prepared minds, designers need to do continuous research and collect likely sources of inspiration, to absorb the Zeitgeist and keep up with technical development. This requires vigorous proactive management:

- Invest resources in a library of sources of ideas and information.
- Encourage continuous research, by exploiting designers’ private enthusiasms, and by setting aside time for research and rewarding designers for doing it.
- Balance periods of exclusive product focus with periods of professional development.
- Encourage designers to develop their awareness of technical and cultural developments beyond their own fields.
• Create working arrangements that enable specialists in different fields to meet and talk quickly and easily, to learn from each other.
• Create a working culture in which ideas are freely exchanged between designers.
• Support the development of innovations for future designs, not just current projects.
None of these points should be surprising to engineers or other working designers. But the importance of investing management effort in intellectual renewal is underestimated in all design-driven industries.

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\[\text{1 Knitwear designers are almost all female; male designers are more common in fashion design. For a discussion of sex roles in the knitwear industry see Eckert & Stacey (1994).}\]