

## Transferring and Transforming Design Knowledge

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### Abstract

It has been accepted for some time that knowledge, and in particular tacit knowledge, can be experienced, embodied, represented and embedded in artefacts and by people. This has allowed design, which involves a considerable amount of tacit knowledge, to develop its place in the research community. The usefulness of knowledge can only be realised when it is transferred at which time it can be applied or become the basis for new knowledge creation. The particular properties of design knowledge make it problematic to transfer and this now becomes a major issue for design researchers and practitioners.

This paper will be based in part on literature that deals with the nature of design knowledge, how it is created and disseminated and in particular, the environment required for transfer. It will also draw on several past research projects undertaken by the author which have looked at these issues as they relate to graphic design studios, design students, Nottingham knitting industry and selected design-led companies in the West Midlands.

The paper will propose that the issue that lies at the heart of problems associated with the transfer of design knowledge is that it is situated and transforms as it transfers. Many believe that this applies equally to all knowledge, but is almost inevitable in the case of tacit knowledge. As knowledge is experienced it is added to the particular environment of its receiver and is reconstructed within the prevailing schemata and to suit need.

Management practitioners and researchers have also dealt with the issue of tacit knowledge transfer. Studies of leadership and management practice are based almost entirely on best practice and personal example. It is recognised that a style of management may be experienced, but is not possible to transfer to another person because of the particular background, personality and experiences of different individuals.

The paper will discuss the conditions within organisations and individuals which facilitate transfer. This includes the concept of absorptive qualities and will show that in particular, prior learning is a determinant of what is transferred. Access is highlighted as a key factor and the role of design studios is used as an example of how design knowledge is experienced. The role of the status and diversity of sources is also discussed.

There remains to be considered the idea that the transfer of tacit knowledge as outlined above, may be partial, selective and indeed may communicate knowledge which was unintended by the originator. The paper will show that this process is not

so different from knowledge experienced in written or verbal representations. Finally it will consider the issues involved with the transfer of experienced knowledge in a context of debates about the communication of design knowledge and its transfer between Design School and industry.

## **Aims**

This paper will look at the issues involved with the dissemination of design knowledge focussing on that which is created and transferred experientially. It is set in the context of debates about the relationship between learning and innovation in design and it also seeks to inform strategies for the transfer of design knowledge between individuals and organisations.

Debates around design research have highlighted issues associated with the nature of this knowledge (and in particular in tacit form) and whether it can be experienced, embodied, represented and embedded in artefacts and by people. This paper draws on findings from a range of major research projects which suggest that designers use artefacts and people as a resource to derive knowledge. However, the particular properties of design knowledge make it difficult to transfer and this paper contends that it transforms as it transfers but is not unique in this respect. This process of experiencing and transforming knowledge causes problems when defending the significance of design knowledge in the context of research and knowledge transfer.

The paper therefore has several aims:

- To describe design knowledge (and in particular that which is tacit) as situated and socially created
- To show how the nature of design knowledge requires that it transforms as it transfers.
- To discuss the conditions within organisations and individuals which facilitate effective transfer.
- To draw findings from several major research projects to evidence the above
- In the light of conclusions, further issues will be raised concerning the form of outcomes of design research and the ability of verbal and visual forms to transfer.

## **Method**

This paper will be based in part on literature that deals with the nature of design knowledge, how it is created and disseminated and in particular, the environment required for transfer. The debates raised here are set in the context of improving the creation and dissemination of design knowledge to enhance the performance of individuals and organisations. It therefore draws mainly on literature which has been given recent prominence in the disciplines of sociology and management.

It will also draw on several past research projects undertaken by the author which have looked at a variety of issues around designers and design organisations as learners and the methods they use to derive design knowledge both from the external environment and experientially. Four studies are cited which cover designers as learners in graphic design studios, design schools, the Nottingham knitting industry and selected design-led companies in the West Midlands. The length of this paper does not allow to fully describe the research methods used in each study. However, each project was substantial and has been published in peer reviewed

journals or conferences (references are given). Below there is a brief overview of methods and further detail is provided.

The methods used in each of the empirical studies has taken a similar form and has involved selecting particular organisations to study which reflect the balance of size and type in the population. The only exception being the Nottingham knitting industry where the whole population was invited to participate. Data collection has been by in-depth interview with a range of participants involved in design in the organisation. Social network analysis methods have been used to research design students and the Nottingham knitting industry. This involves describing the networks of influence and communication that exist between actors within a defined community. In the former case this was used to illuminate the use of studios as social learning spaces in design schools and graphic design organisations.

In all the studies cited here, participants have been questioned about their sources for learning and innovation and preferred modes of learning. This latter element of the study has been informed by longitudinal data collected by the author about the learning styles of designers obtained from testing both MA Design and MA Design Management students on entry into courses over a ten year period using a standard Learning Styles Inventory questionnaire (Honey and Mumford 1986).

## **Context**

It is not intended here to debate the content of design knowledge, but to ground this paper in its appropriate context, it is necessary to declare some assumptions about designers and knowledge.

My starting assumption is that designers use knowledge in the routine application of their working lives and to continue to be effective in their practice, they need to seek out new ideas and methods. This knowledge which can include materials and technology, processes and explicit information also crucially includes a tacit component which encompasses experience, values and intuition (Bertola and Teixeira 2002). Knowledge exists on two levels; firstly that which is known to be true based on past experience as a designer and as an individual in society. Secondly, there is knowledge that has to be sought in order to solve particular challenges and to enable innovation. Together these can be described as the knowing how, what and why which allows designers to judge that their solutions and actions are at least optimal in a particular situation if not universally true. I would therefore identify this as design knowledge.

The above assumption raises several issues that are currently the subject of debate. Those things designers know to be true will of course be different dependant on the background and experience of individuals and what is new knowledge will also vary according to individual circumstances. This paper attempts to throw light on these particular issues and firstly, will show through existing literature how situated and socially constructed knowledge is not unique to design and is accepted in other research paradigms. The first part of this section deals therefore with understandings in the discipline of management. It will then lead into a discussion about the nature of design knowledge and learning.

The link between knowledge richness and innovation has long been highlighted in business and management texts (Drucker 1994). In business paradigms, there is an emphasis placed on the internal and external environment as fertile places to collect 'facts' which in turn allow the organisation to know. An organisation which does not

interact with the external world is less likely to have access to new information and ideas. However, management researchers have accepted for some time that knowledge can be created by the individual – informed by internal and external sources of information – in relation to tacit components of effective management like for instance, leadership. Furthermore, the shift from universal theory management to contingency models accepts that factors like context, culture, personal experience and personality impact upon what we know to be right. Leadership research is now almost entirely inhabited by ‘theories’ based on best practice with the expectation that the practitioner will use this knowledge to inform their own behaviour rather than attempting to replicate unless under the controlled conditions which obviously do not prevail in natural social situations. Indeed, non-replicability of resources is something that businesses crave to enable them to fend off competitors and it is now recognised that design is one such resource. The role of situated knowledge in management theory and other sociology based disciplines, is not now challenged. Social constructivism is a well established paradigm that explains the creation and nature of knowledge in social contexts which has a whole panoply of methods and precedence that are well accepted in the field (Burr 1995, Berger and Luckmann, 1975). Of course, this view of knowledge has given rise to the same kind of debates amongst management researchers (itself a relatively new field) and practitioners as in the visual arts – for instance, what are the implications when there is a focus on new knowledge, universal truths and how we use knowledge in teaching and practice?

The creation of knowledge by the individual is one which has also received attention in the field of management learning and it is known that certain learning styles – both individual and organisational – are more likely to facilitate this process. Designers appear to have the appropriate kinds of learning preferences which allow them to access knowledge, and in particular tacit knowledge, from their own experiences and those of others. Depending on your viewpoint, this is either a convenient coincidence or the result of strictly applied learning and teaching methods throughout visual artist education (in the UK at least) where success can only be achieved if the student submits to the method. Designer’s action/reflection tendencies require them to experience often in areas of newness or risk and then assess outcomes before drawing conclusions (Ashton 1995; Schon 1987). The experience can be either their own or achieved vicariously through proximity to significant other actors, by which I mean person-to-person and artefact-to-person contact (Ashton 2001, Ashton and Johnstone 2003).

This paper focuses on the receiver/creator of knowledge and learner, and mention has already been made of qualities of individuals that encourage this process. Organisations also have properties that encourage knowledge acquisition. The characteristics of learning organisations map quite neatly onto those likely to be found in innovative organisations and Huber (1998) believes that a learning culture is a pre-requisite for an innovation culture. Both need a capability to scan boundaries and horizons for new information but also have ‘feedback loops’ that allows the organisation to reflect on its actions (Pedlar, Burgoyne, Boydell 1991; Huber 1998). Cohen and Levinthal (1990) suggest that organisations need absorptive qualities – the ability to be able to take in and embed new ideas and knowledge so enabling them to innovate. As Swan et al (1999) say, it is increasingly recognised that the resources required to realise innovation are distributed throughout networks and the ability to access information and knowledge therefore, becomes a main concern of the organisation. Knowledge acquisition becomes a system of exchange where it is an internal commodity and a currency of barter amongst other organisations with which it interacts – it both creates knowledge in the form of ideas, data and artefacts and exchanges with others.

The usefulness of knowledge can only be realised when it is transferred at which time it can be applied or become the basis for new knowledge creation. Definitions of learning emphasise that merely acquiring knowledge and information does not qualify as such, it needs to be internalised and applied to be learning. This brings us to a further problematic aspect of design knowledge that is its tendency to be constructed socially and to transform as it is transferred. The truths and realities that groups agree upon are a way of cementing group cohesion and help us make sense of our complex worlds. This gives rise to situated knowledge – truths that only exist in a particular time and place. Tacit knowledge because it is not codified, is likely to be situated and Giroux and Taylor (2002) believe that tacit knowledge is located not in individual cognition, but actually in specific situations and actions. The transfer of design knowledge can then not be achieved by 'bolting' it onto organisations or individuals. It has to be embedded and in this process it re-situated and reconstructed within the prevailing schemata (Shariq 1999).

In summary, this section has shown how situated knowledge is accepted and even desirable in contexts other design research and, in particular, in the industries where design is valued. Literature which helps us understand processes of transformation and some of the features which enable transfer.

### **Empirical data**

Now we move on to consider empirical data, which have been collected over the last 18 years from a number of studies to illuminate how designers and the communities in which they exist learn. Reviewing these data we can confirm something of the nature of experiential design knowledge and provide evidence of the behaviour of designers as they experience, transfer and use it.

The first major study began with research in design school studios between 1999 and 2001 resulting in data drawn from two courses in each of five UK Design Schools (Ashton 2001). The study used two different data collection methods, firstly observational studies in studios over the course of one project and social network analysis using information derived from fairly standard questionnaires used in this field. The study was the first of its type in this context and was one of the first attempts to provide empirical evidence of how design knowledge is actually created and communicated. Papers based in the study have been published both in design research literature and also specialist social network analysis venues.

This study showed us that design students when faced with a design problem collect information primarily from other existing artefacts and their fellow learners. What is important is that the students do not seek to copy designs but to use them as a kind of short hand route to understanding what established designers know about users, materials, styling and processes. The course learning group was used both to construct knowledge (what is good design? how do designers behave?) and share knowledge. Within the group there were key members who performed particular roles acting as disseminators, gatekeepers and links to other groups. The process of construction was enabled by the proximity of individuals, often in the studio but elsewhere too. The creation of 'truths' and pressure to conform was mainly through visual means, by watching people and looking at others work - this reliance on the visual may be particular to artists and designers. Those students who were mainly absent from the group were less familiar with group norms – they did not know what the group knew and were also not able to influence it.

An interest in the facilitating nature of design studios led to a further study in a commercial context (Ashton and Johnstone 2003). A sample of graphic design agencies which reflected the characteristics of the total population in terms of size of company and geographical location (London and Manchester and elsewhere) was selected. In this case the data collection took the form of in-depth interviews across a range of staff and some studio observation. The aim was to find out if some of the same processes of knowledge creation and transfer found in Design School studios, existed here too. There were similarities in the result of this and the previous University based study. The proximity of individuals both allowed introduced knowledge to be disseminated quickly and for social knowledge to be 'agreed'. An addition to the methods used to collect, use and disseminate knowledge as present in the design students, here there was evidence of inter-organisational learning. This was enabled by the mobility of labour – that is employing new people to introduce new knowledge - and knowledge acquisition via clients and related organisations, including Universities.

The realisation that inter-organisational knowledge transfer might be a possibility was the focus of a further study of Nottingham knitting businesses where it emerged as a primary strategy and suggested deficiencies in both knowledge creation and collection in the businesses in this community (Ashton 2005). Twenty one knitting businesses were approached to take part in this study ranging from one person and small businesses, to larger businesses employing 200 plus people as well as regional support agencies set up to develop design capability. Data was captured during in-depth interviews with design responsible managers and this was used to undertake an analysis of the social networks within which the companies sat. This exposed the networks of influence and communication that existed within the community and also links to further external networks and to supporting agencies.

Many participating businesses increased their information resources and exchange partners by building global networks which provided conduits to new knowledge which was quite different from that could be gathered locally. Whilst the graphic design agencies were efficient creators of their own knowledge, there was a deficiency in this ability in the Nottingham situation. Those companies which were more embedded in their local network and had fewer external relationships, had fewer 'products' (artefacts or information) to exchange. At that time the role of the supporting agencies was crucial as a conduit to knowledge. These organisations did not have a remit to forge business to business relations and would have found it hard to develop these spontaneous reciprocal relationships.

The study undertaken in the West Midlands was a highly selective but in-depth study of some of the regions design innovators. The aim was to understand how these organisation derive new knowledge and how this helped to fuel their innovation.

The sample was drawn from design award winners in the region and contained a range of companies both large and small (by number of employees) across industry sectors and regional geographical locations. Senior managements in the seven participating companies were interviewed using a standard questionnaire to allow comparison across the different companies, and they were encouraged to speak freely about any of the questions and issues.

The findings were complex, but for the purposes of this paper, the key factor to report was the importance of competitor products in providing both impetus and knowledge for their own innovation. Looking at competitor products was identified as the most important source of information. Just like the design students in the first study, these businesses needed to look at competitor products to find out what the peer group

knows. Using this knowledge – together it must be said, with a wide range of other information and material resources - they were then able to maintain their innovativeness. The design innovators were also well connected and their knowledge networks had a global reach. Their absorptive qualities together with relevant prior experience and held knowledge enabled them to maintain their design innovativeness.

Key findings which are consistent throughout these studies is show the importance of others (and in particular other designers) and artefacts as resources for new knowledge acquisition and also as a means to transfer knowledge. The value placed on some information rather than all information is often a feature of the influence of the source and that access to a large number of diverse sources and in particular sources beyond the immediate community, increased the knowledge available to the individual and the organisation. They also showed how membership of a community helped to confirm what individuals knew to be right and as has been said to emphasise certain new knowledge above others.

## Conclusions

The review of literature at the start of this paper has explored notions of situated knowledge which allows us to speculate about the transfer and creation of design knowledge. The findings from the empirical studies confirm that designers and design organisations use a variety of actors – people and artefacts - to develop their own knowledge resources and that the effectiveness of this process is dependant on a number of different factors. There are several characteristics of designers and design organisations which make them highly effective experiential learners and susceptible to the social construction of knowledge. Mention has been made of the action/reflection learning preferences of designers. When this is coupled with proximity of in-group others and links to a wide variety of other knowledge sources this becomes a powerful mechanism for knowledge creation and dissemination. The central role of artefacts as holding and communicating knowledge is also highlighted.

There remain some nagging concerns with the idea of situated design knowledge and the experiential construction of knowledge by individuals or organisations. Some may say that this process gives rise to 'pick and mix' knowledge and the communication of knowledge which was unintended by the originator. It also raises questions about the newness of such knowledge. In the context of Research and Knowledge Transfer as purposes of the contemporary University, neither of these characteristics is desirable. It is in the nature of situated knowledge that it may exist only in one context and this is also likely be true of experiential knowledge which is the result of the unique experience of an individual. It is also the case that prior learning plays a part in what the individual or organisation gleans from an experience. A designer studying an artefact will both experience and interrogate it in a different way from a non-designer and derive different meanings and understandings. But this is not of course particular to design knowledge, as it can equally apply to all knowledge relating to our social world and is almost inevitable in the case of tacit knowledge in the context of any discipline. Who could argue that the gleaning of knowledge from written and verbal forms is not also selective and partial and also highly dependant on prior learning? Indeed, it would be difficult to defend a position that held that design knowledge was somehow different from other kinds of knowledge, but it is highly desirable that we find a place for it in our developing topography of knowledge.

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