

CAPTURING AND RETAINING KNOWLEDGE TO IMPROVE DESIGN GROUP PERFORMANCE

Dr Seymour Roworth-Stokes
Pro Vice-Chancellor
University for the Creative Arts, UK

Abstract

This paper explores the management and organizational context for capturing and retaining knowledge transferred through the design process.

It is widely acknowledged that our ability to successfully organise and transfer design knowledge is dependant upon the context in which it is situated. Cross (1992) has also highlighted the normally unsystematic way designers work and the limited extent to which the knowledge contained within the products they create is made explicit.

Essentially design knowledge transforms as it transfers (Ashton, 2007) and the knowledge-based resources of a design group are socially complex. Successful exploitation of these knowledge assets can secure competitive advantage (Alavi and Leidner, 2001) yet, a systematic literature review of leading design and educational management journals found limited empirical evidence that shed light on the influence of knowledge management on design group development.

The paper addresses this weakness in the literature and suggests that design consultancies utilise cross-disciplinary knowledge to solve problems which could not be resolved by linear disciplinary frameworks (Gibbons et al, 1994). Based on two in-depth case studies with interior design companies implementing new digital asset management systems over a two year period, the paper explores the findings in relation to design practice and policy, alongside implications for the contribution of the Creative Industries to the knowledge economy.

Introduction

The companies under investigation were supported through the Knowledge Transfer Partnership (KTP) scheme in the UK which draws upon academic expertise to improve organizational performance.

These schemes have been running for over 30 years and have helped businesses develop and embed new technologies, products and production processes. There has been considerable growth in KTPs as organizations have sought to exploit university expertise towards strengthening competitiveness, wealth creation, and social and economic performance.

Previous design related KTP research has focused on the long-term impact of strategies to innovate new products and services after a ten year period (Hands, *et al.*, 2004) but the emphasis has often been on economic outcomes rather than design knowledge and its contribution to organizational development.

This research aims to develop a framework to identify the knowledge being captured and retained as designers' progress from one phase of the design process to the next. The intention is to shed light on the complex interaction of phenomena during the creative process which relates to both individual and design team knowledge.

Managing knowledge in the Design Group

It is widely accepted that knowledge is a key market asset for design groups (as described by Roworth-Stokes, 2007 and Harvey *et al.*, 2002). This is evident throughout the design process from research to concept development, from detail design to manufacture – in fact all the stages that underpin new product development. Design groups help their clients exploit design knowledge in a market for design services which is worth £4.8 billion in the UK alone (DCMS, 2001).

Gibbons *et al.* (1994) suggest that the production of knowledge is becoming increasingly focused toward the solution of specific problems through teams at the expense of the individual interests. It is argued that a new production of 'cross-disciplinary' knowledge is emerging – termed Mode 2 – which is distinct from the more traditionally based and linear disciplinary frameworks – Mode 1. Clark (1998) has proposed that this is a characteristic of 'entrepreneurial' organizations and it mirrors the way design groups manage knowledge for organizational advantage. Teams are brought together with multi-disciplinary expertise, with backgrounds in psychology, engineering and management to solve client problems.

Robertson and Hammersley (2000) found that consultancies wanted knowledge workers to develop their own knowledge – by sharing their own expertise and learning from others – in

order to satisfy client demands and to be part of what was termed the 'cultural fit' of the organisation.

'Thus project team working was not hindered by consultants jealously guarding their personal knowledge and expertise...Valuable organisational knowledge and skills were thus retained within the firm over time...Expert consultants were selected on the basis of their cultural fit... Cultural fit implied a willingness and ability to share knowledge and...which allowed them to work with others from different specialisms and further develop and enhance their own intellectual capital.'

(Robertson and Hammersley, 2000, p.251)

Yet whilst there is a burgeoning literature on the contribution of the Creative Industries to the economy, there is a dearth of empirical research which has specifically focused on the ability of design groups to capture and retain knowledge within the design process. This paper will explain the practical interventions which address this gap in organisational performance and will then go on to explore the implications for policy and practice.

Methodology

Universities play a significant role in national innovation systems and are regularly cited in economic studies concerned with improving competitiveness through innovation and technology transfer. The term 'knowledge transfer' has recently broadened the concept of engagement between higher education and business in recognition of the need to harness both new and existing technologies that add value to the business and its customers through new products, services and enhanced organisational efficiency.

Building upon data sets already developed by the author in a research study exploring university knowledge transfer (Roworth-Stokes, 2007) two KTP projects were selected in the same sector to explore organisational processes which support knowledge capture, retention and exploitation. The projects both required the implementation of digital asset management systems (including web-design, digital archives and intranet development) within architecture and interior design practices. Academics supervised each project and oversaw the appointment of an Associate responsible for the implementation of the technological infrastructure over a two year period. This allowed for a close investigation of factors associated with knowledge management.

A summary of each case is provided below.

Case	Background	Context and purpose	Outcomes and benefits
A	Services: <ul style="list-style-type: none"> • Interior design • Architecture • Retail branding/ environmental graphics Clients: <ul style="list-style-type: none"> • HMV • Selfridges • City Councils 	Context: <ul style="list-style-type: none"> • 20 staff • Turnover and profit declining Purpose: <ul style="list-style-type: none"> • Intranet facility with office manual • Purchase and implement digital asset management software • Create digital archive of previous client work 	Outcomes: <ul style="list-style-type: none"> • 15 staff • Turnover and profit stabilised • Database driven web-site • Digital Archive • Updated corporate identity, logo and business plan • Competitor analysis/new business database in other sectors Benefits: <ul style="list-style-type: none"> • Staff able to access digital archive of previous 10 years work • Prospective clients search website by client/service etc. • Designers can work remotely through secure Web site • Staff have an IT Service Desk supporting the intranet • Efficiencies in physical (utilisation of space) and human time in accessing client information
B	Services: <ul style="list-style-type: none"> • Interior design • Exhibitions • Architecture • Multimedia and graphic design Clients: <ul style="list-style-type: none"> • The Natural History Museum/ Maritime Museum • Lottery Fund projects 	Context: <ul style="list-style-type: none"> • 13 staff • Turnover and profit decreasing Purpose: <ul style="list-style-type: none"> • Digital archive intranet • Archive database • Improved client presentation and on-line marketing • Efficiencies in project delivery 	Outcomes: <ul style="list-style-type: none"> • 10 staff • Turnover reduced and profit increased • Archive Intranet (Website) • Archive Database Benefits: <ul style="list-style-type: none"> • Digital archive of previous 11 years of client artwork/admin • Prospective clients can get information on intranet • Designers use the Intranet for credential presentations • Efficiencies in physical (utilisation of space) and human time in accessing client information

Table 2. Description of case studies

The inquiry focused upon the interaction of cause and effect relationships during three stages of the project – origination, implementation and development. Building upon Eisenhardt’s approach to deriving theory from case study research (Eisenhardt, 1989), documentary evidence, autobiographical interviews and semi-structured interviews were conducted with a range of staff.

Interviews with both the KTP employee and the Director of the design group were explored in depth, to identify the key events, milestones and the forces at play. A key feature of this approach was to establish as full an account as possible in the respondent’s own words with minimal intervention by the researcher. This technique, as described by Plummer (1983), was employed to give ‘voice’ to each individual view. As Plummer (ibid, p.57) argues: *‘views, truths and conceptions of the real can never be wholly ripped away from the people who experience them’*.

The interview commenced by asking respondents to consider the circumstances which led to the initiation of the project before describing its implementation and outcomes, highlighting any critical incidents or factors along the way. This was followed by a series of structured questions around the themes of leadership, management, organisational development and developments in the design sector.

Careful wording of each question within the interview protocol was critically important to attaining as full and 'open' a response as possible – striking a balance between the need to guide the discussion around topics whilst not wanting to 'phase' respondents with 'management speak' they might not relate to. For example the theme of management sought to clarify perceptions towards resources and communication which led to the question: *'To what extent has the scheme improved the sharing of information and knowledge e.g. client work, contacts etc?'*

All quotations were fully transcribed and pseudonyms and codifications were used for all people and places to provide confidentiality and anonymity.

Findings

As recognised by Eisenhardt (1989) and Miles and Huberman (1984) there is a risk that there can become a divide between the actual data obtained and the conclusions derived. The huge amount of qualitative data accumulated can mean a lack of clarity within the filtration procedure and a lack of consistency in the process of condensation.

'Analyzing data is the heart of building theory from case studies, but it is the most difficult and least codified part of the process. Since published studies generally describe research sites and data collection methods, but give little space to discussion of analysis, a huge chasm often separates data from conclusion.'

(Eisenhardt, 1989, p.539)

A process of coding was undertaken to develop 'nodes' by highlighting each element of text that had meaning for the respondent. For example: *'once I had got the commitment of the staff I got going'* was coded as 'trust'. Here, Strauss and Corbin's (1990) well detailed method of building substantive and formal theory from qualitative data was employed, whereby open

coding was used to label discrete events or phenomena, and categories identified to group concepts identified through phenomena pertaining to common themes.

In order to summarise the relationships identified and to make sense of the complex interaction of nodes and themes a visual approach to the display of data was sought. As described by Miles and Huberman (1994) the causal connection diagram was employed and is presented below. This incorporates a chronological 'timeline' on the left hand side of the diagram whilst the 'nodes' on the right signify connections between the incidents, happenings and events identified.

Miles and Huberman (1994, p.227) suggest *'such a chain helps analysts lay out explicitly what may be causing certain phenomena. Although the chain does represent a simplification, that very simplification carries with it the seeds of a fuller explanation'*.

For example, node 3 and 4 refer to the need to recruit a new Associate with the appropriate technical and educational background. This was referred to by those interviewed as 'A LOW PERIOD' due to the need to manage knowledge more effectively throughout the organisation.

In determining the significance of a cause and effect relationship the author draws upon Flanagan's (1954, p.327) definition, in that it *'must occur in a situation where the purpose or the intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects.'*

These broad patterns of causality form the basis for the discussion which follows.

PATTERNS OF CAUSALITY

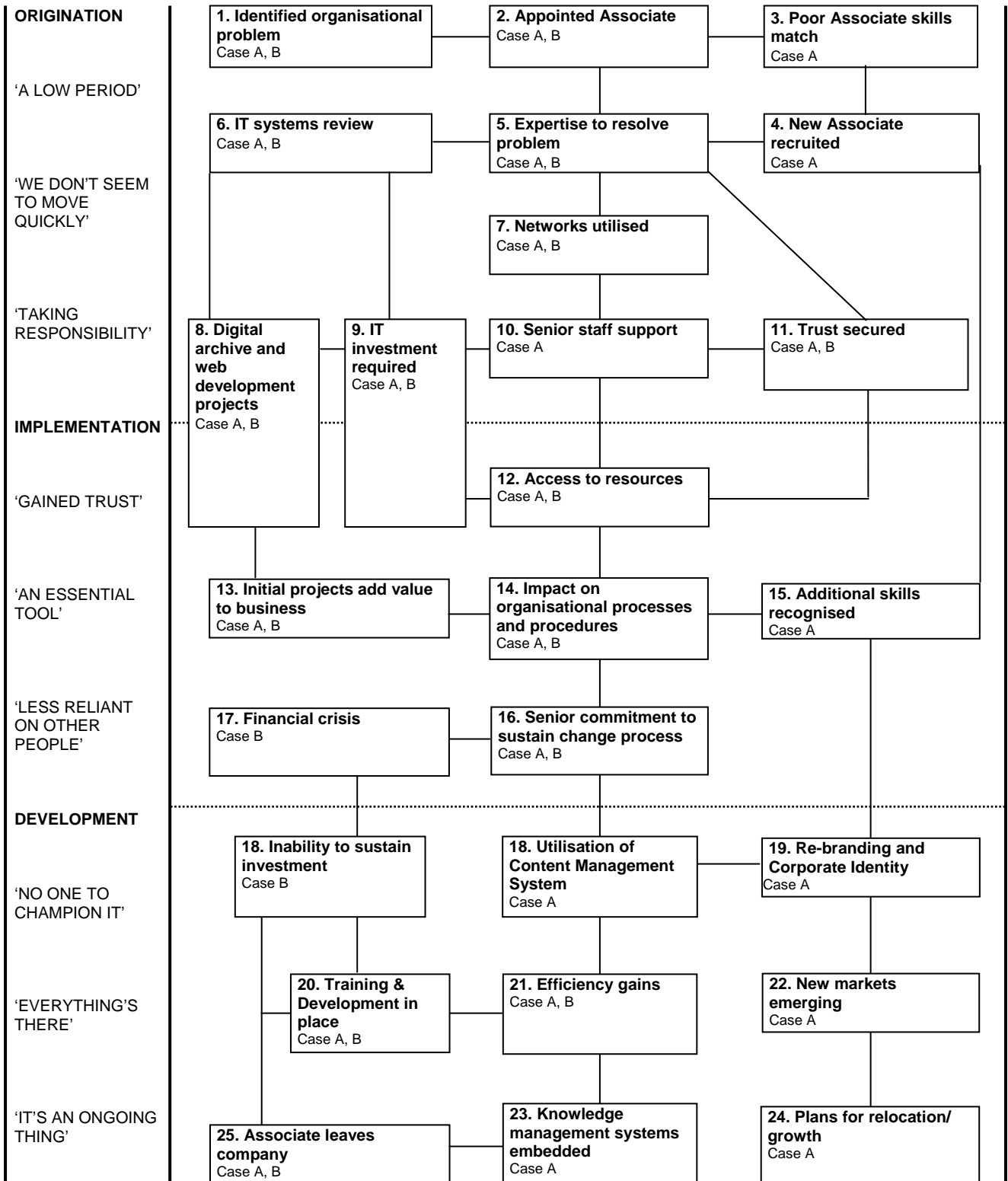


Figure 1. Cross case analysis of causal connections (modified from Roworth-Stokes, 2007)

ORIGINATION

'A LOW PERIOD'

At the point of origination both companies had identified similar organisational problems to improve efficiency (1) and increase competitiveness.

'the company had different digital assets which were difficult to find...over 10 years of data structures which were badly structured throughout the organisation...they were repeating a lot of information and designers couldn't find anything'

(Associate)

The need to improve digital asset management had the potential to improve communication and reduce duplication of client artwork between designers whilst enhancing awareness of design expertise through web based promotion and marketing.

Each associate (2, 3, 4) used their technical and educational background to conduct an audit of the organisations knowledge management systems.

'when I first arrived I was asked to look at the organisation and see what areas needed improvement...but there were various other problems such as the web-site needed upgrading and there wasn't any form of intranet.'

(Associate)

'WE DON'T SEEM TO MOVE QUICKLY'

As the Director of Case A pointed out, *'two years ago we could just about get by'* but the pressure to address this gap in performance had changed with a downturn in business following the millennium boom in regeneration work. A lack of in-house technical competence and expertise in web-design and intranet development had the potential to significantly reduce future success.

'TAKING RESPONSIBILITY'

The Associates, who were recent graduates, used their initiative to improve the level of awareness, trust and commitment towards the knowledge transfer project (7, 10, 11).

'I asked members of my family and friends to seek their advice, it was a challenge and whilst I had learnt the theory it felt like I had been thrown in at the deep end really...but once I had got the commitment of the staff I got going'

(Associate)

IMPLEMENTATION

'GAINED TRUST'

Commitment of resources to delivery the project (8, 9) begins to yield recognition by senior staff of the benefits of the new systems.

'the second year was a discovery, you suddenly understood what was going on, the work that had been put in...so I was as much a student as the Associate in that process'

(Director)

'AN ESSENTIAL TOOL'

Once the primary objectives had been achieved (15), attention turned to the need to fully embed the new technology within the culture of the organisation (13, 14). Concept and detail design work is recorded alongside client data as the design process unfolds. The web-site and the digital management system also facilitate access to files remotely through the internet, creating new working methods for the designers.

'We have a common international language of design...the systems have to be consistent and we are all scribbling away using the same tools...but we can now work together no matter where it is'

(Director)

'LESS RELIANT ON OTHER PEOPLE'

As knowledge assets are captured as part of the creative process there is less reliance on the Associates (16) to manage the process. However Case B highlights the fragility of the design services sector and when the company is affected by an economic downturn (17) staff resource are diverted towards new business development (18).

'involvement in the archive intranet was far greater than in the creation of the archive database, because the archive intranet was a greater priority to the practice in terms of generating new business'

(Supervisor)

DEVELOPMENT

'NO ONE TO CHAMPION IT'

The Associate in Case B completes the training and development of staff and is able to leave 6 months earlier than originally planned (20, 25).

'There has been a lot of internal efficiency, we have a few people leave and new people come in and they have been able to adapt quickly to the new structure'

(Associate)

Case A continues to invest time and resources into the partnership and there is a shared ownership over the knowledge management systems created (23).

'The Office Manager has learnt quite a bit...and her role has changed...she got through to the heart of the matter and set up the electronic document filing systems because she could see what we were trying to get at'

(Director)

'EVERYTHINGS THERE'

Benefits of the new asset management systems become apparent in both companies. The use of the intranet and the digital archives provide a platform to capture and retain creative and non-creative outcomes. Staff are able to use their time more effectively (21) and the Directors stress the importance of these systems in organizational development:

'There is less collective leadership and more autonomy...everyone knows what they are supposed to be doing and people have such access to information'

'In a business sense it makes us much more effective...you are definitely more efficient'

Case A utilises the enhanced understanding of its collective knowledge to revise its mission and purpose (15). The project becomes a catalyst for the company to align its business more closely with architecture, which also becomes a key feature of its brand and new corporate identity (19).

'IT'S AN ONGOING THING'

At the end of the project implementation (25) the emphasis has moved to the sustainability of processes and procedures which capture and retain knowledge. Investment in information management becomes an asset and driver for development rather than a risk to be managed. New market opportunities became evident through larger contracts (22) and the companies realise the potential for growth.

'we are now mature enough to accept bigger jobs...you can do a ten million pound job the same as you can do a hundred million pound job in roughly the same time with a few more staff...we can handle it and we will get a much better and consistent turnover for it.'

(Director)

Analysis

Before we consider the policy implications it is useful to reflect upon the findings of the research within the context of the design process.

There are many models to describe the design process originating from Archer's (1965) seminal work on design methods. More recently research conducted in the UK by the Design Council has proposed a simple double diamond diagram to explain how one might manage design more effectively. The diagram is used below to describe four distinct areas which show the different modes of thinking that designers encounter when they embark upon a new design project.

It should be noted that the purpose of these headings is to allow reflection on the findings, and their underlying cause and effect relationships, to inform design practice rather than a direct comparison with the chronological headings contained within the timeline in Figure 1.

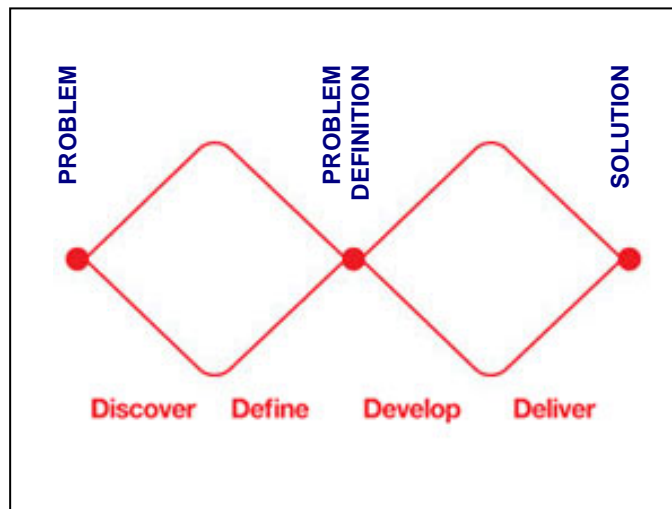


Figure 2: Design Council (2007)

The Design Council model offers an iterative process in which knowledge is captured and retained as designers progress from one phase to the next. The discover phase begins with an initial idea or problem identified from user need or demand before the second phase operationalises the design problem into a managed process. This is followed by the development phase based on the generation of concepts, ideas and potential solutions before the delivery stage when the product or service is tested, agreed, specified and launched in the marketplace.

In contrast the cases studies suggest that prior to the commencement of the digital asset management systems, knowledge appeared to being utilized in an unsystematic manner due to inherent problems with the operational structure and working practices.

The table below summarizes the model against the findings of the research and highlights the influence for each of the factors identified which are explored further in the commentary that follows.

Phase	Activities	Nature of influence
Discover	<ol style="list-style-type: none"> 1. Market research 2. User research 3. Managing information 4. Design research groups 	<ul style="list-style-type: none"> • ‘Mood’ and ‘Theme’ boards can be used in digitized format to express market context and consumer/audience profile • User research combined with visual content can enhance credentials presentations • Client details can be made easily accessible across the design group (even remotely) through customer relationship management systems • Understanding of new trends and market potential can be enhanced and retained even when individuals change within the team
Define	<ol style="list-style-type: none"> 5. Business plan 6. Project development 7. Project management 8. Project sign-off 	<ul style="list-style-type: none"> • Clarity over the knowledge assets of a design group can further organization purpose when seeking to grow the business • Concept develop can be informed by reference to previously archived work • Client access to project management information can support concurrent engineering/manufacturing processes • Enhanced information systems can reduce misunderstandings with clients and hence reduce lead times
Develop	<ol style="list-style-type: none"> 9. Multi-disciplinary working 10. Visual management 11. Development methods 12. Testing 	<ul style="list-style-type: none"> • Open and accessible working practices can facilitate multi-disciplinary approaches to resolve design problems • Digital asset management systems can enhance remote working and efficiencies in preparing client artwork • Integrated IT systems which facilitate CAD/CAM file sharing with clients can improve efficiency • Prototyping and market testing can be used to effectively refine/redesign product proposals
Deliver	<ol style="list-style-type: none"> 13. Final testing, approval and launch 14. Targets, evaluation and feedback loops 	<ul style="list-style-type: none"> • Socially constructed knowledge (understandings, meanings or associations which underpin brand equity) can be retained or exploited for promotional purposes • Data can be used to evaluate the effectiveness of the design process and options or alternative design solutions can be captured to inform future product diversification

Table 2: Influence of interventions on design group knowledge

DISCOVER

The interviews demonstrated the importance of ‘visualizing the brief’ at the commencement of the design process. ‘Mood’ and ‘Theme’ boards are commonly used to communicate and clarify the market context, consumer/audience profile and style or finish being considered between client and design group. The analysis would suggest that the retention of these knowledge assets in digitization format can enhance communication throughout the project, providing clarity and purpose whilst ensuring common understandings or interpretations

between designer and client which had been tacit, are retained even when individuals change within the team.

DEFINE

Case A highlights that clarity over the knowledge assets of a design group can further the strategic positioning of the organization in market terms when aiming to secure growth. In addition, both cases suggest that the efficiency of the design process can be enhanced by concurrent engineering/manufacturing processes whereby the design group integrates its own data with client production systems to reduce lead times.

DEVELOP

Increasingly the two design groups were moving towards open and accessible working practices to facilitate multi-disciplinary approaches to resolve design problems. Specialist knowledge was drawn upon in the co-production of knowledge to resolve complex technical and operational problems. This included input from engineers, technologists, psychologists, sociologists and anthropologists amongst others as required.

Digital asset management systems were able to facilitate access and input to the design process, including remote working, in a cost effective way alongside file sharing for prototype development and market testing to refine/redesign product proposals.

DELIVERY

Case A suggests that the process of implementation of the digital asset management process had an effect on the design groups knowledge and understanding of itself within its sector. The recognition of a specific market proposition and subsequent rebranding exercise are evidence of socially constructed knowledge whereby the group collectiveness shares and operates within a common set of meanings and cultural processes underpinning the brand equity.

Equally both cases demonstrate that the management information systems offered further advantages in the evaluation of client work whilst the data captured throughout the design process could be used quickly to secure product diversification.

Conclusions

Business management factors are often characterised by strategies, processes and procedures to maximise market opportunity. Gibb and Davies (1990) suggest that this area relates to performance and the ability to operate at maximum efficiency levels.

Intrinsic to this area is the notion that business leaders are able to understand the market in which they operate and quite objectively undertake activities which improve competitive position. Hence, growth can be achieved by using appropriate business management tools such as business plans to set targets and overarching goals for the business. This pseudo-scientific approach to planning is often built upon the business development model identified by Ansoff (1965) by exploring development through market penetration; product development; market development and diversification.

The findings of this research would suggest that the business management of design groups can be enhanced by embedding sound 'knowledge management' in practice. In particular, technology which is geared towards the requirements of designers in capturing visual material and for sponsors to be able to utilise the knowledge derived from it (e.g. Ruggles, 1998; Bassi, 1997). However, Gumbley (1998) and Robertson and Hammersley (2000) have criticised the rather simplistic notion that technology is the means by which knowledge can be effectively produced and distributed due to the need for human and social aspects to be taken into consideration.

This study found that ad hoc management processes and procedures in the design groups combined with a lack of technical infrastructure to capture and retain knowledge reduced the potential to exploit a key market asset during the design process. The fluidity of the creative process and both individual and collaborative contributions towards innovative solutions can result in the retention of knowledge being overlooked. The objective to digitise outcomes led to a strategic change in working practices but this required an adaptive approach to the design process and new working practices. In summary, to translate 'designerly ways of knowing' (Cross, 1982) into tangible knowledge assets requires new 'designerly ways of designing'.

Therefore, technical systems in themselves may only provide a means to facilitate effective knowledge production and dissemination. This research would suggest that a combination of trust in management and the intended purpose for the knowledge, as well as good social interaction (as suggested Robertson and Hammersley, 2000), may be necessary ingredients to its successful implementation.

In addition, the exploitation of knowledge is intrinsically linked to the ability to attract and retain design 'talent' or 'knowledge workers' as often cited in the knowledge management text. When asked to identify the major assets of the design group within the semi-structured interviews, the experienced research staff were invariably cited as the key resource of the organization.

The ability to capitalise on the knowledge of designers throughout the design process requires a balance to be struck between personal fulfillment (through high levels of autonomy and responsibility) and the need for regulation and control. Rotter for example (1966) suggests that 'locus of control' is higher for owner managers than the population average.

In this respect, this research supports the view of Robertson and Hammersley (2000) who found that knowledge workers (in management consultancy firms) are expected to act with a high degree of responsibility and autonomy which, if not forthcoming, may result in the departure of highly valued and talented staff.

From a policy perspective, if the contribution of the Creative Industries to the knowledge economy is to be sustained, leaders in design groups have to engender change in organizational culture towards knowledge management. Equally, universities have a role to play in supporting the design industry in the effective and sensitive implementation of management systems that can realise a positive influence on the growth of the business.

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Biography

Dr Seymour Roworth-Stokes is Pro Vice-Chancellor for Research and Development at the University for the Creative Arts in the United Kingdom and has responsibility for marketing and communications, research, knowledge transfer and cultural strategy. He is an industrial designer with many years experience as a design consultant for clients such as BT and BAA. He has published widely on design, teaching and learning strategies, and on art and design research management. His current research interests include design research methodologies employed with SMEs, creative entrepreneurship and the cultural economy, and managing design research teams. He is leading a major project on behalf of 13 universities in support of the Cultural Olympiad in the lead up to the 2012 Olympics and Paralympics.

Address for correspondence

Dr Seymour Roworth-Stokes, University for the Creative Arts, Falkner Road, Farnham, Surrey, England, GU9 7DS

E-mail: srstokes@ucreative.ac.uk, telephone: 01252 892768.