

The business of research in art and design: Parallels between research centres and small businesses

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The Business of Research: Parallels Between Research Centres and Small Businesses

Abstract

This paper provides a cross-case analysis of four art and design Research Centres operating within UK universities.

It is widely acknowledged that the importance and profile of research has increased significantly in the last two decades for universities. However, a review of leading education and higher education management journals found limited empirical evidence that considered factors which may contribute towards Research Centers management and development.

Findings from autobiographical and semi-structured interviews with researchers, managers and research leaders indicates that they encounter similar issues in trying to establish internal legitimacy within the university alongside the need to gain external support and recognition. In dealing with these challenges, they tend to pass through four broadly identifiable phases: (a) Origination, (b) Establishment, (c) Development, and (d) Consolidation and Sustainability.

Many interesting parallels are evident with the way small businesses strive to establish themselves within competitive market environments. Lessons for research managers and directors are derived to explore this parallel within the context of literature on small business development alongside studies concerning the management of research in universities. The lessons are presented in key areas of responsibility which include Leadership, Business Management, Organizational Development, and External Engagement.

The research suggests Research Centre Directors must demonstrate many intrapreneurial qualities to overcome obstacles in the development of a successful research team and that university departments can make substantial organizational interventions to help them succeed.

Index Terms: arts research; design-oriented research; design management; methodology; design research; research design; organizational development

1. Background

In 1992 art and design become eligible under its own categorisation to enter the national research evaluation process in the United Kingdom (see HEFCE circular 5/92, 1992). The recognition that this area undertook auditable research stemmed partly from the PCFC report, 'Research in the PCFC sector', published in 1990. This report found art and design research was in need of support and funding as it had been excluded from previous rounds (Allison, 1994).

University art and design departments subsequently geared themselves to research (Frayling, 1994) and have increasingly earned a larger proportion of funding. There was a 280% increase in allocation from the 1992 to 1996 RAE and the creation of the Arts and Humanities Research Board and subsequent Council, meant further expansion. Indeed, it is widely acknowledged that the financial pressure on improving research output across the sector has become acute (e.g. Miller and Higson, 1999; Court, 1999).

A literature review identified a limited number of studies exploring aspects of Research Centres in higher education. These have largely focused on classification, training, evaluation and impact rather than management and development.

Sandberg and Gatewood (1991) found that Research Centres reflect a diversity of purpose due to differing ages, affiliations and principal research orientations. The association for Directors of Research Centres in Social Sciences (DORCISS, 1995) carried out a Research Council funded project with 3 centres which highlighted the need for enhanced training and development resources and materials. Harvey, Pettigrew and Ferlie (2002) undertook a multiple case study analysis of four medical-related research groups, using exploratory interviews to investigate factors that support successful research endeavour. Factors associated with high achievement were: strong leadership; finding/motivation and retaining talent; strategies of related diversification; strongly linked theory and practice; and centrally, network connectedness. Lastly, Whiston (1990, 1995) interviewed 16 UK Research Centre Directors and found there was a need to produce a flexible evaluation framework that took into account the centres own role and objectives. In conclusion, Whiston identified 8 areas to explore through evaluation: Publications, Data Bank, Dissemination, Education & Training, Managing/Organizational /Strategic Factors, International Reputation, Policy Effects, and Methodology.

2. Methodology

A summary description of the four art and design Research Centres is provided in table 1 below.

INSERT HERE: Table 1. Case Studies

Eisenhardt's (1989) model of deriving theory from case studies was adopted alongside analysis of documentary evidence. This enabled the history of the Research Centres' development to be investigated for patterns of cause and effect (Miles and Huberman, 1994) and for specific art and design research management or "ways of knowing" (see for example Cross, 2001) to become evident. As described by Plummer (1983) autobiographical interviews were conducted with limited interventions being made by the interviewee to yield as full an account as possible in the respondents' own words. This was followed by semi-structured interviews based on a framework of management factors drawn from the literature. All interviews were taped and fully transcribed using pseudonyms and codifications for all people and places to protect anonymity.

The definition of research and research management within this study has drawn upon the processes described within the original 1992 Research Assessment Exercise guidance which has underpinned all subsequent UK research evaluation processes: "*the invention of ideas, images, performances, and artefacts including design where these lead to new or substantially improved insights*" (HEFCE, 1992, Annex A).

3. Findings

Table 2 presented below highlights the diversity of research being undertaken within these centres. It is noticeable that there is a strong link to practice-based research methodologies, the relationship between technology and mediated approaches to arts practice, and indeed links to industry within the design based areas. This breadth reflects the discussion and debate about art and design research being evident in and through practice (see for example Niedderer and Roworth-Stokes, 2007) and the multidisciplinary focus of design research addressing social, cultural and technological problems and issues.

INSERT HERE: Table 2: Research practices identified

3.1 Analysis

A causal connection diagram (Miles and Huberman, 1994) was used to understand the phenomena surrounding the development of the Research Centres and Figure 1 provides a synthesis of the respondents' evidence. Each node is numbered to provide a cross-referencing mechanism during the empirical discussion in the rest of the paper. For example (14) will refer to the node where the Research Director develops the skills necessary to lead and manage the research team, as the informal research group achieves recognition by the University.

In seeking to achieve growth all the Research Centres appear to go through similar phases of development: Origination, Establishment, Development and Consolidation and Sustainability. These phases form the basis of the discussion that follows.

INSERT HERE: Figure 1: Cross-case analysis of causal connections

3.1.1 Origination

The interview transcripts in the pre-Research Centre phase describe a change of university strategy toward research (1, 2, 3). There is an appointment of an Assistant Dean with specific responsibilities for research in Case C, the Dean in Case A "buys in" a research team; and research teams are developed in-house in Cases B and D. Case A and D suggest the Dean is keen to stimulate and develop research in readiness for a forthcoming Research Assessment Exercise (RAE). As the Research Director in Case A reported the Dean was anxious to "*really work at bringing the research rating up*".

Appropriately qualified staff becomes a priority for senior management (Cases A, B, D) and Research Directors indicate that their own PhD leads naturally to the supervision of others (4, 5, 6). Faculties are therefore keen to recruit research students (7) and the Research Directors are encouraged to take on research leadership roles by the wider university research community (8, 11).

"So we were in a position for the first time to actually supervise...we still needed some assistance and expertise and experience from colleagues in other parts of the University but you know we had a kernel there of enthusiasm and possibility."

(Research Director: Case D)

A research team has already been established in Case A – node 3, however in the other cases (9) research leaders hone their new found skills by developing staff research around them (17) and at the same time, their purpose is reinforced by the acquisition of resources (13). As Katzenbach and Smith (1993) suggest, removing obstacles from the team's path creates tangible evidence to team members of the leader's credentials. During this early period advice is also sought from peers (8) in order to overcome issues that confront the development of the group.

3.1.2 Research Centre Establishment

Once an agenda has been clarified with the Dean (12), the research team grows its capability and capacity for research (10). The cases indicate a period of negotiation for resources to deliver this new remit and responsibility (13).

“we became increasingly aware that the profile of the projects was high or potentially high and we needed to convince the companies that we had an area to work in...the space that we identified and the origination of the Centre itself was regarded as a spin out directly from teaching”

(Research Director: Case B)

Credentials of the emerging Research Centre are further enhanced by the amount of studentships, grants, research contracts and external finances they secure (15). This also places a greater emphasis on dedicated systems and processes required to manage and administrate in accordance with funding agency requirements (16). Reflecting on an EPSRC award the Research Director in Case D reflected: *“if you're involved with a Research Council then they're pretty tight on what you're doing and how you're doing it...So we were really under the microscope”*.

Aside from Case C where the Associate Dean is already in a position of authority to secure formal recognition upon appointment, endorsement by the university as a dedicated Research Centre follows only after improved research performance (outcomes in the RAE) or demand from industry (15). Although this might suggest universities are indifferent to research groups until they have demonstrated they are sustainable, this process seeks both internal and external verification for the research being undertaken which is clearly credible by peer review (17).

3.1.3 Research Centre Development

All the Research Directors recognise that acquiring research funding is an inherent part of their job (18) and yet they see their leadership roles not in a hierarchical way but more in the guise of team leader to represent and promote the work of the team and its members to external parties. The views of the Research Director in Case B are typical: *“One of the things I enjoy doing...is envisaging new areas of development...The other skills are leadership on a daily basis and the ability to excite and motivate the staff to achieve their own potential”*.

In Cases B and D the strategic direction of the Research Centre, is entirely congruous with the faculty and the staff (20). The Research Centre acts as mechanism for staff within the faculty to engage with research and the teams work acts to drive forward reflective methodologies in the

subject (26). However, in Cases A and C, as the profile of the Centre grows in accordance with the need to promote itself to external stakeholders, the synergy of research agendas at faculty level are not maintained (21, 22) and tensions arise in the ability to maintain senior management support to consolidate the Centres' development when new Deans are appointed.

The current Research Director in Case C and the former Research Director in Case A feel let down by a change in research strategy at faculty level and seek to retain autonomy and influence (23). Case C suggests that as a result "*we basically operated largely independent of the School.*"

The Research Director in Case A moves to another institution and another Research Director is appointed with a clear remit and mandate to operate as part of the faculty. In contrast, the Research Director in Case C is able to draw upon the importance of the research effort within the university as a whole and is able to re-launch the Centre as a Research Institute (24) which reinforces his authority and control (22, 25).

The *Development* phase highlights the difficulty of managing growth and the importance to manage levels of autonomy and authority. Indeed, the role of the Dean as mentor, evident in the set-up phase (8), and the Research Director as protégé (Allen, Poteet and Burroughs, 1997), no longer retains mutual benefit or status. As the relationships change they could be likened to what Katzenbach and Smith (1993) describe as the team leader and the hierarchical leader roles.

3.1.4 Consolidation and Sustainability

Continued research performance and ability to attract external funding (18) remain key components of the Research Centres' long term sustainability. This is achieved through an extensive network of contacts (27) built up over the Research Centres' development and provides a means of securing both research contracts and representation on national and international research/subject bodies. The Research Director in Case B highlights the benefits of this approach: "*We established at a fairly early stage a good working relationship with the Committee for Medical Design...and we developed some good contacts...So one project has tended to lead to another.*"

The Research Centres in Cases B and C consolidate their role through the development of activities to improve the research culture at faculty level (26) and all have influence over university research policy (28). It is notable that research leaders recognise the difficulties in being able to enrich the student experience through research as a successful research capability does not necessarily lead to a growing research culture. To counteract this, Case B and D become a "hub" for professional development and research support for staff within the faculty and seek to further reflective practice in related disciplines.

4. Similarities between Research Centres and Small Businesses

It is widely recognised that the boundaries between private and public sector management models and practices in universities are becoming increasingly blurred (see for example Henkel and Kogan, 1996, and Cave, Hanney, Henkel and Kogan, 1997). Research Centres are at the very nexus of this divide, maintaining coherent strategies for research, training and consultancy

activities for a diverse range of stakeholders. As Harvey, Pettigrew and Ferlie (2002, p.766) argue, they are “*multi-faceted...reflecting the fragmented and diverse nature of postmodernity*”.

This analysis suggests that the development of art and design Research Centres bears many similarities with the early phases of growth in small enterprises. This mirrors the work of Whiston (1995) who pointed to stages of small business development when evaluating the establishment and performance of ESRC Research Centres from the “taking off” stage, through the “plateau” stage, and lastly, the sustainability or “in decline” stage. Whiston also argued that Research Centres have similarities in the way they manage resource acquisition to other business enterprises as they have a direct trading relationship with customers in deriving revenue streams whereas many public sector organizations are often constrained by controls over the regulation and balance of inputs and outputs.

Hanks, Watson, Jansen, and Chandler (1993) reviewed stage models for small business growth. They conclude that there are typically five stages: start-up, expansion, consolidation, diversification, and in recognition of the complete life-cycle, the decline stage. The text concerning the start-up stage focuses around the inception of the enterprise, when entrepreneurs strive to achieve success in commercial environments to establish their businesses. Yet, processes and procedures are informal and ad hoc. Gibb and Davies (1990) and Perren (1997) point to the impact of the “entrepreneurial personality” during this phase. The expansion stage, reflects the owner manager’s influence on the organization and business skills being deployed through functional planning, control and formal strategic orientation. This period is identified with survival in trading terms and the ability to achieve market credibility through service to clients.

Consolidation is recognition of the influence of business management which is often characterised by the ability to achieve optimum levels of efficiency in production and distribution whilst maximising market opportunity through new product development. This leads to diversification. Gibb and Davies (1990) highlight that this stage highlights the importance of personal objectives and business goals becoming synonymous. The result often leading to the owner manager reconciling the desire to achieve a growth orientation through the recruitment of professional managers combined with a willingness to share ownership, ultimately leading to a loss of direct influence or control over all aspects of the business, in order to see the firm grow (Flamhotz,1986).

Ultimately, Hanks, Watson, Jansen, and Chandler (1993) also recognise that some enterprises fail. The decline stage marks the point when the market opportunity has changed and bureaucracy and centralisation prevail to such an extent that it is no longer possible to innovate.

4.1 Lessons for Research Leaders and Research Centre Directors

Hendriks and Sousa (2013) contend that researching is essentially knowledge work as it is the combination of the organizational context and culture, combined with the motivations and intentions of researchers. To understand the challenges and issues faced by research leaders when establishing Research Centres, the management factors which influence their development were analysed from responses to the semi-structured interviews which sought to explore four broad and overlapping areas of responsibility: Leadership, Business Management, Organizational Development, and External Engagement.

Table 3 provides a cross-case consolidated summary of this analysis along with the nature of the influence, whether positive or negative (identified by the +/-). For example the factor innovator/initiator [F1] was reported to have influenced Leadership eight times by respondents across all cases but the factor outside advice [F8] was only reported in cases C and D. This process of categorization and coding was conducted in accordance with Strauss and Corbin's (1990) method of grounded theory to derive "axial concepts".

INSERT FIGURE HERE (Table 3: Management and Development Factors Identified)

4.1.1 Leadership

The development of intrapreneurial leadership is fundamental to the development of the research group during its establishment. University research managers can establish a creative and enterprising culture, by supporting individuals to achieve credentials and qualifications by working on increasingly important and significant research contracts as well as encouraging staff to progress their careers. Emerging Research Centre Directors in this study demonstrated many entrepreneurial qualities within a public sector operating environment, including the ability to secure and redeploy resources to further their research interests, negotiating investment and formal recognition within the university.

Many of the studies concerning the development of research teams have also considered the role of the research leader in developing a team culture (DORCISS, 1995; Arnold, Rush, Bessant and Hobday, 1998; Tornatzky, Lovelace, Gray, Walters and Geisler, 1999; Harvey, Pettigrew, and Ferlie, 2002). This study found that the Research Director ultimately becomes synonymous with the external profile, reputation and identity of the research team. They also act as a mentor, nurturing talent and project management skills required of principle investigators with advice and guidance when required. In effect, they set the tone for the philosophy and strategic direction of the research team and ultimately carry the accountability for success or failure.

4.1.2 Business Management

As the volume of research contracts grow, and in order to meet the requirements of external funding agencies, the Research Centres establish dedicated financial controls and project management processes and procedures in negotiation with university professional support service departments. This area suggests that the research leader needs to differentiate between leadership and management functions.

Achieving a critical mass of experienced researchers was clearly a priority for a number of the Research Directors. The cases suggest that the ability to capitalise on the knowledge of key personnel requires a balance to be struck between personal fulfillment (through high levels of autonomy and responsibility) and the need for regulation and control at departmental level. 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, would result in the departure of key staff. Shamir, House and Arthur (1993) have also suggested that a key function of leadership is to

create the “social identification” of the research team in order that staff have a sense of purpose and association with other team members.

Martin and Skea (1992) and Bordons, Zulueta, Cabrero, and Barrigon (1995) have considered the effect of research staff numbers on research output. Bordons *et al.* found there was a link between high productivity (publication) and four researchers in a team, which appeared to sub-divide beyond an aggregate size of 5.7. The findings from Case D would resonate with this analysis as a cluster structure had been introduced to take account of increased social interaction and efficiency in smaller groups.

4.1.3 Organizational Development

This area of responsibility requires research leaders to apply tact, to negotiate further resources for development within the university, and political nous, the ability to maintain stakeholder commitment as the profile of the research team grows in accordance with the need to promote itself in new markets. Furthermore, the use of appropriate strategies for recruitment, training and development can maintain a motivated and productive research team. It also indicates the need for continued resource access and investment whilst the demands on administrative tasks such as record keeping and client invoicing multiply, and pressures on the research leaders time increase.

The ability to promote expertise and knowledge becomes increasingly important as the research team aim to establish and build upon an image, profile and reputation for the quality and innovative nature of the work. Most of the cases studied had integrated a number of marketing principles to develop new opportunities from existing research agencies. Such as the recording and promotion of case studies.

The value of the research team’s expertise is capitalized with mechanisms to diversify into new areas of research or product development. For example the research leaders were clearly scanning the horizon for new research themes and presented the teams work at forums for both industry and public sector stakeholders.

4.1.4 External Engagement

This area highlights the importance of networking, particularly by the Research Centre Director, and the advantages that can be derived from thinking within a broader delivery framework of contacts at a regional, national and international level. The cases suggest that new opportunities can be generated in this way. For example prominent positions on research bodies, representative forums, and industry bodies was often cited as the ultimate position of influence – achieving increased profile for the team and greater recognition of its authority and influence in the field to anticipate and to some degree help shape, national and international research policy.

Lastly, the career development of research leaders is enhanced through the use of personal and professional networks. Several of the Research Directors in this study re-located existing research teams, and in Case C and D personal networks provided the research leaders with support in the form of mentors. Harvey, Pettigrew and Ferlie (2002) suggest that “network connectedness” is the glue that holds together the factors implicit in a successful research group.

5. Conclusion

This paper has identified a number of parallels in the phases of development and management of Research Centres with that of small businesses. There are however distinct differences. Hanks, Watson, Jansen, and Chandler (1993) make a link between the “decline” stage when small businesses have formalized to such an extent that they lose the flexibility and adaptability to be agile and responsive to new market opportunities. In contrast the Research Centres studied had managed to retain a sense of innovation and vitality by generating new fields of inquiry in sub-groups as new areas of art and design knowledge emerged. Indeed, it can be argued that universities have developed the ultimate environment to support innovation through the generation of ideas, theories and new knowledge which has evolved over centuries. Even when the vision and mission of the centre appeared to have been at odds with the strategic priorities of a new Dean, the Research Centres in this study were able to maintain their research by operating independent of a faculty or department or even relocate to another university.

With the exception of family businesses, the stakeholder relationship which underpins investment in small enterprises is purely financial with the release of capital in return for equity (Storey, Watson and Wynarczyk, 1989). However, the relationship that the Research Centre has with the host university is much more complex. For example, Research Centres negotiate access to resources and investment which are often made available in-kind, ranging from the appointment or redeployment of staff to equipment and studio space, and they have to promote an external identity whilst not undermining the universities overarching brand.

The notion that universities operate purely on the basis of business logic might also lead to some difficult long term issues and problems for the sector. To what extent would a profit motive deflect universities from their primary social and cultural purpose? Indeed, many UK universities would undermine their charitable status if they failed to manage this balance. There could also be implications for the dual funding support system and vitality of research in the sector as a whole if we were to see the withdrawal of core funding supporting the intellectual infrastructure and pure and developmental research in favour of applied research for industry.

In practice, even with recent developments in the UK concerning student fees, universities have no single clear “bottom line” (Birnbaum 1988), they have several, while business inevitably must respond to the profit measuring stick even if this is not the case over the short term it is over the long term. Therefore, they do not have the pleasure of dealing with one group of stakeholders and this is reflected in the representation at various levels of the organizational structure. Universities must operate in a complex manner and with a high degree of accountability to meet the needs of both clients (to whom they provide goods and/or services) and donors (from whom they receive resources), utilizing all available funding with any surplus being ploughed back into furthering the institutions strategic purpose.

Academics also direct their loyalty toward their subject discipline as opposed to being professionally or corporately minded. Kerr and Jermier (1978) have suggested that this can significantly limit the effects of managers to initiate new tasks or persuade staff to take on additional responsibilities. This research would support the views of Zaidman (1997) who argues that decisions over research priorities by senior managers, cannot be made without consideration of researchers own beliefs, interests, size and degree of authority. Indeed, the individual focus of

selectivity within research assessment in the United Kingdom has strengthened the ability of staff to negotiate and control their immediate operating environment if they are successful.

In summary, this paper suggests successful Research Centre development requires an operating environment that retains a sense of autonomy and control for both research leaders and their teams. Ultimately research performance depends upon external peer review (Henkel and Kogan, 1996; Court, 1999) but it is clear that research leaders have a significant part to play in motivating and developing research teams that can secure an internationally excellent and world-leading profile through research evaluation. In doing so, research teams establish their own unique identity and social cohesion, as the team leaders seek to create an environment in which research potential can be achieved (Katzenbach and Smith, 1993). Yet, this paper highlights many significant barriers that confront them in trying to achieve this objective, including limited resources, university bureaucracy, hierarchical management styles, lack of research infrastructure and complex regulatory frameworks. To combat these, research leaders demonstrate many intrapreneurial qualities (Palfreyman and Warner, 1996), to re-direct limited resources in the pursuit of an enhanced research profile. For research to flourish, the appropriate use of organizational interventions discussed in this paper may go some way to tip the balance in their favour.

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Table 1. Case Studies

Case	Research Centre activity	University	Formed	Department RAE ratings	Staff
A	Design, Sustainable Design, Design Management, Interaction Design, Computer Aided Design, New Product Development, Industrial Design, Art and Design Pedagogy	Technological university	1990	International excellence (+50%) / National excellence (100%) / International excellence (35%)	Between 5-10
B	Design, Sustainable Design, Design Management, Interaction Design, Computer Aided Design, New Product Development, Industrial Design, Interactive Design	Large former polytechnic	1989	National excellence (2/3rds) / National excellence (100%) / World Leading (5%)	Between 5-10
C	Design, Interactive Design, Fine Art, Electronic Arts, Computer Aided Design, Digital Imaging	Small former polytechnic	1992	National Excellence (2/3rds) / National excellence (1/2) / World Leading (15%)	Between 5-10
D	Design, Interactive Design, Electronic Arts, Art and Design Pedagogy, Visual and Contemporary Arts	Former technological college	1992	National excellence (2/3rds) / National Excellence (2/3rds) / World Leading (5%)	Between 10-15

Table 2: Research Practices Identified

Area	Methodological approach	Outputs	Issues being address	Case
Sustainable/ Environment Design	<ul style="list-style-type: none"> Practice-based Theory based 	<ul style="list-style-type: none"> Conference papers Journal papers Edited Chapters / Books Case studies Artefacts Industry based Tools/Methods 	<p>How can we promote sustainable product development?</p> <p>How to reduce materials and facilitate re-use, recycling, particularly in electronic goods?</p>	A, B
Interaction Design	<ul style="list-style-type: none"> Practice-based Simulation testing (modelling interaction) Human centred design methodologies Ergonomic and anthropometric data mapping Artificial intelligence 	<ul style="list-style-type: none"> Conference papers Journal papers Edited Chapters / Books Case studies Artefacts SMART material Industry based Tools/Methods, such as electronic devices and automotive systems Computer-aided design tools Medical products 	<p>What are the physical and psychological issues that arise when people interact with products? How can we exploit 3D modelling and new media technologies to create digital products and services?</p>	A, B
Art and Design Pedagogy	<ul style="list-style-type: none"> Teaching and learning methodologies Approaches to computer mediated learning 	<ul style="list-style-type: none"> Case studies Edited Chapters / Books Teaching tools and resources 	<p>What are the learning environments of the future?</p> <p>Are there methodologies specific to art and design and how are they communicated/transferred?</p> <p>How can design research inform practice?</p> <p>How can we develop appropriate learning and assessment methodologies for creative practice?</p>	A, D
Inclusive Design	<ul style="list-style-type: none"> Engineering and manufacturing methods Gerontology 	<ul style="list-style-type: none"> Conference papers Journal papers Case studies Products 	<p>In what ways can design thinking and design methods offer opportunities to resolve complex social, technical and cultural problems?</p> <p>How can design improve quality of life and active ageing e.g. use of SMART materials?</p>	A, B
Design Process	<ul style="list-style-type: none"> Design methods Design and design capability audits Theoretical frameworks for design thinking Computer-based media Information design and technology New product development 	<ul style="list-style-type: none"> Conference Papers Journal papers Edited Chapters / Books Design tools Development of products, processes, systems and experiences Training materials 	<p>Can we develop insights into the dynamics and positioning of the creative process?</p> <p>What is best practice in product design and development and how can this inform practice?</p> <p>Can design develop new products and new markets?</p> <p>How can the creative process be used as an agent for change within society across physical and virtual environments?</p> <p>How can computer systems support distributed design teams?</p>	A, B, C, D
New Media and Electronic / Digital art	<ul style="list-style-type: none"> Cognition Computing Media and video production Human computer interaction Spatial and visual cognition Cultural heritage Contemporary arts practices Cross-cultural analysis 	<ul style="list-style-type: none"> Conference papers Journal papers Edited Chapters / Books Conceptual models Exhibitions Installations Digitisation and digital resources) 	<p>How can electronic / digital art represent new insights into natural systems?</p> <p>Can media/technologies offer new modes of communication and expression?</p> <p>Do digital environments affect and influence our perception of the artefact?</p>	C, D
Visual and Contemporary Arts	<ul style="list-style-type: none"> Arts practice Indigenous cultural practices 	<ul style="list-style-type: none"> Exhibitions (group and solo) Installations Commissions 	<p>How can we explore contemporary issues and popular culture through art?</p> <p>In what ways can visual art practice represent cultural and cross-cultural contexts?</p> <p>What new relationships are being developed to negotiate the relationship between artists, curators and audience?</p>	D

CAUSAL CONNECTION DIAGRAM

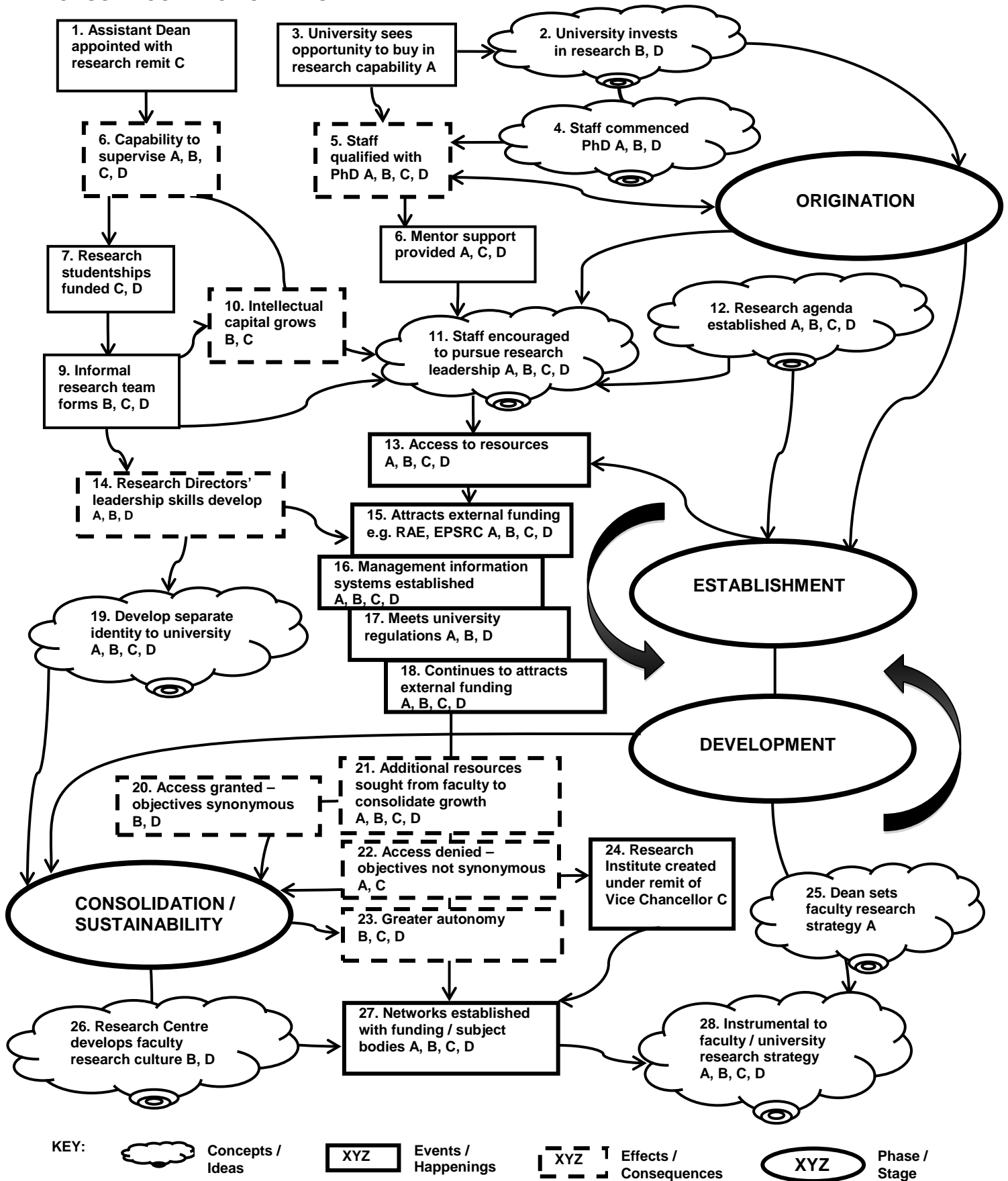


Figure 1. Cross-case analysis of causal connections

Table 3: Management and Development Factors Identified

LEADERSHIP							
INTRAPRENEURSHIP	BUSINESS MANAGEMENT				EXTERNAL ENGAGEMENT		
	STAFF WITH APPROPRIATE QUALIFICATIONS AND CREDENTIALS	EMBEDDING PROCESS AND PROCEDURES	ORGANIZATIONAL DEVELOPMENT		PROMOTING EXPERTISE AND KNOWLEDGE	EXPLOITING MARKET OPPORTUNITY	USE OF NETWORKS
			ACHIEVING CRITICAL MASS	POLITICAL GAMESMANSHIP			
F1+++++/- Innovator/ initiator	F15++++ Attracting/ motivating staff	F33+++/- Regulatory controls	F22+++++/- Resource access	F27+++++/- Partnerships/ dependency	F30++++/- Image and reputation	F36+++++ Ability to publish	F25+++++ Policy influence
F2+++++/- Strategic vision	F17++++ Educational/ technical background	F5+++++ Business plan	F24++++/- Investment stakeholders	F6++++ Synergy with HEI research policy	F32++++ Diversification strategies	F34++++ Demand for expertise	F28+++++ HEI networks
F3+++++/- Desire to succeed	F13++++ Management experience	F7++++/- Time for planning	F14++++/- Training and development	F23+++ Overhead costs	F12++++ Pricing policy	F39++++/- Industrial development	F26+++++ Industrial input
F6+++++/- Synergy with HEI research policy	F16++++ Industry experience	F9++++/- Financial systems/ information	F15+++++ Attracting/ motivating staff	F24+++ Investment stakeholders	F29++++ Marketing plan	F40++++ Public funding strategy	F40+++ Public funding strategy
F4++++/- Risk taker/ uncertainty bearer	F31++ Client handling	F11+++++ Project management	F34++++ Demand for expertise	F2-- Strategic vision	F31+++ Client handling	F38+++ Societal issues	
F22++++ Resource access		F18++++/- Quality control procedures	F35--- Competition for staff	F4+ Risk taker/ uncertainty bearer		F41+++ Location	
F8++ Outside advice		F19+++/- Information sharing				F37++ Economic conditions	
		F20+++++ Communicatio n systems					
		F13+++ Management experience					