Lewis M, **Moultrie** J, (2005), The organisational innovation laboratory, Journal of Creativity & Innovation Management, Vol. 14 No. 1, pp 73-83

THE ORGANISATIONAL INNOVATION LABORATORY

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ABSTRACT

Organisational 'innovation laboratories', dedicated facilities for encouraging creative behaviours and supporting innovative projects, have received scant academic attention despite their increasing popularity with a range of different practitioners. This paper develops an initial theoretical explanation of the phenomenon, based upon notions of organisational learning and dynamic capabilities. This framework is then used as the basis for analysing the structure, infrastructure, benefits and dis-benefits of 3 UK-based laboratory facilities (mass service, government department, academic institution). Preliminary conclusions suggest that the 'innovation laboratory' can offer real benefits for organisations: reinforcing corporate commitment to innovation and creativity by providing a physical manifestation of dynamic capability and double-loop learning concepts. Although the physical design of the space is central to its functionality - emphasising dislocation from day-to-day activity, eliminating hierarchy, encouraging participation – direct facilitation remains critical to successful operation. There are also dis-benefits associated with what can be substantial financial investments and there is some evidence that such facilities can have a relatively short useful life-span. Given the limited nature of the empirical base, the paper concludes with some specific suggestions for further work.

1. INTRODUCTION

In the early 1980s, the US Corporation MG Taylor created the first facilities that were recognisable as innovation laboratories. Their Navigation Centres, or NavCentres, were collaborative workspaces designed to encourage organisational communication and learning. They provided flexible and innovative environments equipped with moveable furniture, multiple write on surfaces, a research library, multi-media tools and appropriate ICT for group working. The ambition was to create an environment in which strategies for business growth could be developed in a fun, dynamic, rapid and novel way.

It is in the last decade however that there has been a rapid growth in the number of 'innovation laboratory' applications. Indeed, such facilities have emerged as an increasingly popular managerial response to the various challenges associated with organisational capability development and learning (Smeds 1997, Wycoff and Snead 1999). Consider the Accelerated Solutions Environment (ASE) at Cap Gemini's London Headquarters for instance. This creative workspace is designed to enable "rapid business decision making and the creation of innovative solutions". Workshop sessions can last up to 4 days, and each session follows a three stage process: scan (divergent search for information), focus (convergence towards a solution) and act (selecting, planning and implementing). This generic 'design' process is appropriate for a wide range of business issues, and reflects the diversity of the target audience. The space can be configured for small or large group sizes, up to a maximum of around 100 participants. The flexibility of the workspace is especially important for these large group activities. Strong facilitation remains critical to the delivery of successful results.

Although consultancy firms are amongst the 'lead users' of such facilities, there are also many industrial and public sector laboratories. Indeed, the sheer range of applications engenders confusion over the intent and contribution of any individual innovation laboratory and it is this lack of conceptual clarity, together with the relative paucity of related research that motivates this paper. As a recent phenomenon, there has been little attempt to understand the underpinning concepts and overall benefits of these facilities. Thus, this paper has the following three objectives:

1. to raise academic interest in this emerging phenomenon, and encourage discussion over the relative benefits of such facilities
2. to make an initial attempt explaining the theoretical basis for these facilities
3. to identify opportunities for future research.

A preliminary conceptual framework is developed that draws together relevant literature under two key themes. First, the framework explores the physical nature of the laboratory, including the structural (e.g. architecture, interior design) and infrastructural (e.g. group brainstorming software, interactive displays) content of a 'typical' innovation laboratory. Second, the framework articulates the potential benefits and dis-benefits of an innovation laboratory in terms of dynamic capability and double-loop learning concepts.

These frameworks are then used to structure analysis and discussion of the findings from 3 UK-based, but cross-sectoral case studies: Royal Mail (mass service); Department of Trade and Industry (government department), and; University of East Anglia (academia). Given its preliminary nature, the paper concludes with specific suggestions for further work.

2. CONCEPTUAL BACKGROUND

The Shorter Oxford English dictionary defines a laboratory as "a room or building set aside and equipped for scientific experiments or research (originally and especially in chemistry) for teaching science or for the development or production of chemical or medicinal products". For many people, the image conveyed will be of a physical science laboratory, complete with lab coats, bench spaces, Bunsen burners and specialist equipment. However, this laboratory definition does highlight a number of generic characteristics that may inform the creation of a conceptual framework for innovation laboratories; including the structure and infrastructure of the experimental environment and the benefits / dis-benefits of the facility.

2.1. What is an Innovation Laboratory?

An innovation laboratory comprises specific structural and infrastructural content.

Structure

A laboratory is a physical research setting dedicated to conducting specific types of experiment. For organisational applications, this normally means a separate room or set of rooms designed for spatial re-configuration (e.g. moveable barriers, cubicles and open spaces etc.) and participant observation (Griffin and Kacmar 1991). In addition to this functionality, many innovation laboratories recognise that architecture; décor, layout, lighting etc. also have a crucial influence upon participant behaviour (Holahan 1982, Gardner 2001). For instance, in seeking to encourage group-wide creativity, many facilities eliminate the physical manifestations of traditional behaviour and hierarchy: such as rectangular rooms, tables and chairs oriented from front to back, etc.

Infrastructure

A laboratory is the setting for an experiment: "a research study in which the variance of all or nearly all of the possible influential independent variables not pertinent to the immediate problem of the investigation is kept to a minimum" (Kerlinger 1986). The infrastructure to control and measure variables (Shure and Meeker 1969) in most innovation laboratories comprises both simple devices such as large writing spaces, materials for visualisation (post-it notes, paper, pens, cards), etc. and sophisticated ICT to support group brainstorming (Nunamaker et al. 1988) and distributed group working.

2.2. What contribution does an Innovation Laboratory make?

In many markets, competitive advantage is dependent upon the dynamic efforts a firm makes to improve what it currently does well and how it intends to innovate for the future. Likewise, public sector service providers face intense pressure to become more effective and efficient and this in turn creates drivers for innovation (Osborne and Gaebler 1992; Halachmi and Bouckaert 1994). Given this diverse context, most innovation laboratories represent a pragmatic response to intangible and ambiguous problems such as a need to be more creative or future-orientated and therefore the precise value of an innovation laboratory can be hard to

assess. In an attempt to obtain a balanced assessment of the phenomenon, the preliminary process model argues that an innovation laboratory delivers the following generic benefits and dis-benefits:

Benefits

Dynamic capabilities (i.e. "the organisational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die": Teece *et al.* 1997) are defined in large part by how managers make judgments about the organisation and its future (e.g. Teece and Pisano 1994; 1996). An innovation laboratory provides a set of resources to be dynamically reconfigured dependent on the issue under consideration, thereby enabling an organisation to create and enhance organisational routines by which managers can adapt their resource base (acquiring, shedding, integrating and recombining them) to generate new value-creating strategies (Grant 1996). In other words a key benefit of a laboratory is its contribution to double-loop learning (Argyris and Schon 1978). If single-loop learning is essentially operational learning that does not question underlying values and norms, then double-loop learning comes from the sort of enquiries that question fundamental service or market positions or the underlying culture of the operation. This kind of learning requires an ability to challenge assumptions, seeking to re-frame questions and remain open to all sorts of contextual changes. Organisations need single-loop to create consistency and stability. But, because organisational design is an inaccurate and imperfect process, laboratories – that help to increase the "tangibility of the problems we think about and the trappings we work with" (Weick 1977, p.126) – appear to provide a pragmatic focus for double-loop learning activities intended to prevent the organisation becoming too conservative.

Dis-benefits

Too much double-loop learning can have dysfunctional organisational effects. Constant questioning of norms and values, encouraging dissent from established ways of working or simply spending too much time "thinking instead of doing" can create instability as a consequence of over reactions and over analysis. If a laboratory renders the organisation too sensitive to its environment and at the same time encourages too much introspection, it can become very difficult to distinguish noise from real issues. The organisation could become prone to the exaggeration of small errors and be overly responsive to fads and fashions: indeed a cynical response to such facilities is that they are themselves simply a highly visible and expensive (n.b. therefore associated with significant opportunity costs) managerial fashion statement.

3. RESEARCH METHOD

Due to the exploratory nature of this study, a case study approach was adopted (Eisenhardt 1989). Detailed case analyses of three UK-based innovation laboratories forms the empirical core of the work and the rich data sets generated (Yin 1994) were both appropriate and useful given the relative intangibility of the phenomena under consideration (e.g. capabilities, learning). Specifically, in line with the two conceptual frameworks outlined above, the empirical work sought to investigate (a) the structural and infrastructural content, and (b) the benefits and dis-benefits (in terms of learning and capability development) of these laboratories. Three principal factors influenced the case selection process. First, given the relatively limited

number of potential case sites, a significant challenge was access and as a result, a "cascade" approach was adopted: specifically, the Royal Mail case opened up access to two facilities that had drawn on their experiences (DTI and UEA). Second, the UK-setting and shared DNA of the facilities helped to improve the comparability of the cases. Third, as an exploratory study, this approach provided evidence of different types of application and organisational context: corporate; government (policy), and; university (staff development). Primary data were collected using face-to-face, telephone and e-mail interviews using semi-structured question sets - investigating the sub-elements defined by the conceptual frameworks. The authors conducted a total of 14 interviews with senior managerial and technical staff at each facility. Each interview lasted between 1.5 and 2.5 hours. Some were interviewed on more than one occasion and asked to comment (where appropriate) on other observations and opinions. To further improve the reliability and validity of the results all notes were presented to respondents giving them an opportunity to comment on (but not veto) the interpretation. In addition, tours of the facilities were arranged and a variety of secondary sources, such as project plans, selected internal and external reports, etc. were made available. To discover and examine key themes, data were analyzed using "in-case displays" (Miles and Huberman 1994); with relevant issues coded under "Structure", "Infrastructure", "Benefit" and "Dis-benefit" categories. This technique (together with interview transcripts and interim discussion documents) provided for the gradual building up of an explanation for each case in the light of extant theory (Meredith 1998).

4. THE CASE STUDIES

The case studies were selected from a range of sectors: corporate innovation; governmental policy 'futurology', and; university staff development. Photographs illustrating various elements of these labs are included in Appendix 1.

4.1. Royal Mail, Innovation Laboratory (RMIL)

Royal Mail is the UK's national postal service. It faces challenges in its heavily regulated core markets both from new technologies (e.g. e-mail) and new-entrants able to target the most profitable segments ("we were the world's best at getting second to market!"). In late 1996, the technical research group established a demonstration facility on a corporate training and development site, intended to 'showcase' the opportunities and threats created by new technologies: "…we had been commissioned by lots of different bits of the business to look at specific technology-impact problems like 'tell me more about PDA's' and this meant that we had developed lots of related knowledge….". This original laboratory required two dedicated infrastructure staff (a technician and overall facility manager) with individual sessions facilitated by a range of different people. Following the successful experience of this pilot, a business case (n.b. no formal financial justification was made but a 'strategic' case was made using positive testimonials) was written by one of these facilitators for a more permanent and interesting facility. In addition to visiting other technology 'showcases' this member of staff visited a number of entertainment experiences (e.g. EPCOT) and had discussions with the Disney Imagineers. Opened in October 2000 (after five months design and nine months construction) the new innovation laboratory was designed to deliver different service processes: support sales of technical solutions by providing a "space to think about these technologies"; 'represent' the corporate innovation intent, and;

enable generic problem solving. RMIL sessions normally last a single day (four days maximum) and follow a fairly consistent schedule (i.e. start about 9.30 and finishing about 16.00).

4.2. UK Department of Trade and Industry, Future Focus Laboratory (DTIF)

In 1997/1998, the UK Department of Trade and Industry established a Futures unit in response to the incoming Labour administration's concern "that there was not enough future thinking happening in the Department". More generally there was recognition that policy and strategy could benefit from some form of future-focused thinking process. As part of the response to this intent, the then Director of the Unit (which then became the Future and Innovation Unit and no longer exists), envisaged the creation of what is now known as futurefocus@dti. Based in part on ICL's Future Focus facility (this no longer exists) and influenced by the principles of the Royal Mail, the DTI's central London facility adds the unique element of a series of themed (e.g. governance, community etc.) and dramatised scenarios, addressing five, ten and thirty year horizons. Initially conceived as a collaboration venture between various parts of the DTI and a range of business partners (e.g. Fujitsu, Silicon Graphics etc.) the space is now entirely under DTI control with substantial corporate involvement. The facility opened in 2001 and although specific motivations have evolved, several of the key drivers – such as the need to build consideration of emerging technologies into the way policy was planned and made – remain important. Some workshops are designed to develop action plans, others intended to stimulate thinking or facilitate discussion: "…facilitators only ask that sessions are future-focused". DTIF sessions have never been shorter than 2 hours or longer than two days and never with fewer than six people (fifteen people maximum).

4.3. University of East Anglia, Staff Development Hub (UEAH)

In 2000, the University of East Anglia (UEA) learning and resources centre won a substantial grant from the UK Higher Education Funding Council to support their staff development work. At about the same time, various members of UEA staff (including a team from the staff development group) visited the Royal Mail laboratory. As a result of this coincidence, considerable enthusiasm developed to use the funding to create a facility based on Royal Mail "principles". Having some space available, the lab consortium (a partnership between the library, the staff development group and a local design consultancy) largely avoided the encumbrance of official university bureaucracy. A typical UEAH session "may be half a day ish."

5. DISCUSSION

In this section the boundaries of extant research are explored by discussing the explanatory power of the two conceptual frameworks in the light of the case findings.

5.1. What is an Innovation Laboratory?

Table 1 summarises the structural and infrastructural content of the case studies. All the cases were bespoke, architect designed spaces, sharing features such as unconventional layouts, curved walls, non-hierarchical furniture (e.g. curved triangular tables, comfortable seating), ICT brainstorming support, and an emphasis on technology adoption. Although, given the inter-dependence of their designs, some similarities were

anticipated, the sheer extent of the imitation was surprising – especially given the different organisational and sectoral contexts. There was some divergence at the detailed design level but this was more an indication of geographic constraints and the financial support available rather than a different design philosophy. For instance, the corporate and governmental labs include expensive 'edutainment' components (RMIL 'lift and transport' and DTIF immersive theatre).

INSERT TABLE 1 ABOUT HERE

Structure

Fundamentally, the architecture and design of the physical surroundings set out to influence human behaviour: echoing Bitner's (1992) "servicescape" argument that "physical surroundings [can] facilitate organisational as well as marketing goals". Indeed, the very need for a dedicated and designed space (i.e. not simply hiring conference facilities) is testimony to the perceived importance of a 'dislocation' effect that takes people away from their day to day experiences. RMIL managers argued for instance that there were "fewer conflicts because participants leave traditional animosities (e.g. hierarchy, experience based and functional) at the door". Similarly, UEAH staff wanted the walls of their facility to "instantly communicate 'write on me' and [together with the toys] reinforce the acceptability of play". Their main space is elegantly designed and predominantly painted in a deep blue colour to instil a sense of calm. All of the DTIF doors use sliding mechanisms and are activated by large push buttons in order to suggest high technology and the future. Interestingly, although many studies have confirmed the impact of physical setting on the nature of small group interaction, participation, aggression, etc. (Holahan 1982, Sundstrom and Sundstrom 1986, Sundstrom and Altman 1989) there was no explicit reference in any of the case studies to any underlying principles or theories motivating structural laboratory design choices.

As evidence of this, all of the facilities exhibited surprising degrees of spatial inflexibility. DTIF were left with an "odd-shaped room" after their initial technology partner pulled out and UEAH staff went as far as to stress that their design goals would be different a second time around: the space would contain the same facilities, but there would be "a greater emphasis on flexibility and reconfigurability". Even allowing for the very real constraints of the construction process, this is an extraordinary admission, given the strategic goals of such facilities.

Infrastructure

Although difficult to portray as a formal experimental intervention, all cases featured a range of high and low-tech infrastructural devices intended to encourage 'innovativeness'. For instance, all used frivolous props, with UEAH in particular arguing that there was evidence of the effectiveness of toys ("people fiddle and giggle…laughter and fun is important"), playthings (children's guitar, glove puppets, knex, etc) and magazines (for cutting and sticking images etc). In stressing the significance of such props, interviewees were echoing Weick's (1977) call for a "junk-laden" laboratory to "invite activities involving novel combinations, which in turn … encourage hypothesis generation and discovery." (p.126). Equally all the labs have lots of writing space on walls, etc. and employed essentially similar ICT infrastructure ('Group Systems' brainstorming software, networked laptops, large screen data projection, etc.). In terms of perceptions, the technology is an important

symbol of the 'new' cutting edge. The functionality of the brainstorming software in particular - shared parallel data input, anonymity, a full record of the discussion session, options to categorise and group ideas, voting and sorting of ideas – was highlighted as important by several interviewees: "IT is important and probably what makes this kind of space different to other rooms". This appears to support the literature arguing that such systems make decision processes more productive (i.e. more ideas) and inclusive, while increasing participant satisfaction (Gallupe *et al.* 1992). More problematically, the feature-rich laboratory infrastructure sometimes meant that the basic function of specific spaces had to remain fairly constant (e.g. breakout room or plenary space). There were some cases (e.g. RMIL AV capability) where infrastructure helped improve spatial flexibility whereas the most expensive (i.e. multi-media rich) infrastructural components (e.g. the RMIL entrance show and the DTIF immersive theatre) represented the most inflexible features in their facilities.
At the same time, despite the expensive physical facilities, most interviewees stressed the importance of human facilitation in enabling the laboratory to work effectively. In contrast, all the RMIL facilitators were volunteers who received no additional payments: expressing a variety of motivations from "CV building, to taking an opportunity to be exposed to problems/issues across the whole of the business, meet external clients etc." Their training is essentially an explanation of the 'kit' rather than any particular processes or facilitator skills. The DTIF facilitators plan and run all events and are also part of the management 'team', providing input and support to marketing and development and customer relationships. Interestingly this aspect of the infrastructure is one key area of divergence between the designs. The RMIL target audience (i.e. its potential demand) for example, was determined by an informal 'return on effort' calculation and because the lab staff 'choose' to invest five or six days in setting up for a single day session, only a certain scale of problems justify the expenditure and therefore it tends to be used by budget holders and middle/senior managers. Conversely, the UEAH facility adopts a much more flexible and low-key approach to using their facility and therefore, although the initial target for the lab for was 25 sessions, over 40 have now been run (including repeat business) with more than 50% utilisation.

5.2. What contribution does an Innovation Laboratory make?

The conceptual framework articulated the potential contribution of an innovation laboratory in terms of learning and capability. Across the cases it rapidly became clear that it was necessary to consider organisational learning at two levels of analysis. First, the 'experiments' conducted in the innovation laboratory are obviously intended to promote learning for the individual/group/project using the facility – interestingly, most interviewees argued that the process was more significant than specific outcomes. Second, the design and the implementation of the laboratories can be viewed as learning initiatives in their own right.

Benefits

Laboratory experimentation has a long tradition in the social sciences (Weick 1965, 1977, Rijsman 1969, Haney *et al*. 1973, Roth 1988, etc.) but the approach has also been subject to serious criticisms: researchers interested in practical managerial issues have been particularly concerned with overly simplistic and artificial settings (Argyris 1975) and the corresponding lack of external validity for any findings (Gordon *et al*. 1986). Although there was limited evidence of theoretical or methodological models underpinning individual

innovation laboratories, benefits can be evaluated by considering how they deal with some of these academic criticisms. For instance, whereas traditional research laboratory subjects were undergraduate students (the process was therefore derided as 'sophomore science'), participants in the four case studies were all practitioners engaged with real problem-sets. The RMIL staff specifically emphasised their desire "to be problem-led rather than prescriptive" and all the facilities were able to articulate basic categories of relevant problem (i.e. problem types that appear to generate benefits) for their space. RMIL argued that product/service development; internal and external relationship management and; strategic planning worked particularly effectively in the lab because they all require dislocation, team building, communication, creativity, and creative problem solving. DTIF "deal with a very wide variation in groups/backgrounds/objectives" and do not specify "what we expect participants to take away from sessions, or how they use the facility. We only ask that sessions are future-focused." They identified different types of event: scenario building; focus groups; consultation workshops; team building; project scoping and planning exercises (e.g. stakeholder analysis, risk assessment, evaluation, identifying skills and expertise needed). One experienced UEAH facilitator commented that "I have been in staff development for many years, and the Hub really makes you feel that you get genuinely closer to helping people find solutions, more so than other methods." Stated more formally, the type of problem typically under investigation in an innovation laboratory (e.g. new service development) creates "high fidelity between the laboratory and the field" (Ilgen in Griffin and Kacmar 1991, p.303). Other perceived liabilities can also be reconceived as assets: from the architecture and design deliberately reinforcing the artificiality of the setting, to embracing the fact that "participants are apprehensive about being evaluated but so are ambitious employees. Participants in laboratory groups seldom know one another intimately, but the same is true in organisations where … temporary problem solving units are the rule." (Weick 1977, p.124). Equally, academic experiments are often dismissed for being too short (often within class times) whereas DTIF and UEAH sessions typically last two days and RMIL sessions can last up to four days.

Dis-benefits

Given that all interviewees were either managers with responsibility for, or staff working within, a laboratory there was little explicit reflection (even after prompting) upon the downsides of a laboratory. Despite this limitation of the research, several potentially negative themes can still be inferred from the case material. In particular, with respect to the avowed innovation/learning/capability development intent, most expected mechanisms to close the learning loop were missing. Whilst there was some evidence in some of the cases of capturing session outputs - for example, the UEAH software collates brainstorm data and any drawings, sketches and writing on the wall are photographed and combined into a group report – there were limited examples of empirical and conceptual reflection by the laboratory 'controllers' or managers. Indeed there was even variance in the extent to which the controllers recognised the importance of 'process' control: RMIL experience suggests that groups use as much of the space as possible but only undertake 4 activities per day and UEAH were trying to codify the most successful/appropriate techniques (e.g. drawing a timeline of historical state and desired future state) for inclusion in a facilitators guide. Across all the cases, formal evaluation was surprisingly ad-hoc: "I'm not aware that any kind of evaluation was built into the original [DTIF]

project plan." Although individual DTIF sessions are very carefully planned and closely facilitated, there is very little specification of "what we expect participants to take away from sessions, or how they use the facility….. It's hard to evaluate what we do, at least in quantitative terms, since an identifiable piece of policy … would always be the work of the people who made it, regardless of where they were when it was plotted". Likewise, RMIL deploy electronic feedback forms and a corporate follow-up questionnaire is despatched after all projects (i.e. not specifically designed for the iLab) but no real use is made of this data (except that most facilitators like to score 8+ /10). The reliance upon 'happy sheets' as feedback also suggests potential disadvantages with overly supportive, 'feel-good' processes that build consensus and are seen as a positive outcome for the laboratory, even though this may be the inappropriate outcome for the participant organisation. Extending this concern, UEAH staff claimed that it was difficult to describe a typical session ("it is an 'experience' and the overall shape of a session will depend on the goals of the organiser") and anyway argued that the explicit goal was often different from the implicit goal. This ambiguity of purpose raises interesting questions of the ethics of such interventions – another widespread critique of traditional academic experiments (Argyris 1975).

Although the case studies were not longitudinal, there is evidence to suggest that how the organisation manages its laboratory is particularly significant with respect to any discussion of dynamic capabilities. For example, the long-term viability of a facility appears to be influenced as much by its operating context as by its effectiveness in encouraging organisational learning. For instance, the RMIL facility recently changed focus due to efficiency-led reorganisation within the Royal Mail. The lab initially enabled the technology research group to explore opportunities for new technology within the business. Although an emphasis on creativity and innovation remains, the facility now falls under the auspices of the Human Resources department with a greater emphasis on supporting staff and business development. Unlike a management consultancy (e.g. CapGemini), where laboratory investment can be more directly related to fee-generation, client satisfaction and marketing benefits, further management changes at a the Royal Mail (a mass-service provider under intense cost-pressure) could easily lead to the closure of its innovation laboratory. Similarly, the public funding of DTIF and UEAH renders both laboratories (but DTIF in particular with its high cost central London location) vulnerable to political (small p and large P) changes: almost regardless of the benefits they seem to deliver. In this respect, the innovation and creativity manifest in these facilities can actively work against them if organisational 'fashion' shifts. Perhaps reflecting the underlying insecurity felt by laboratory personnel, most interviewees argued that "the facility remaining open is a good indication of its success".

6. CONCLUDING COMMENTS

Before drawing any conclusions from the case material, it is important to highlight some of the work's limitations. This was an exploratory study based upon a small, predominantly UK-based, selection of the total potential sample population. Although the semi-structured question set followed two conceptual frameworks, there was no formal testing of research hypotheses. Equally, combining theoretical and empirical elements means that each could have been more fully explored. Furthermore, in condensing hours of interview notes into a series of observations and quotes, the researchers' interpretation of events is a significant 'reality' filter. Finally, although the cases were selected to explore laboratory characteristics and benefits across a range of

different contexts, the range of organisational types had limited impact on specific laboratory designs. Noting these limitations, four preliminary conclusions can be drawn.

First, the physical form of an innovation laboratory is significantly more than an aesthetic issue. Indeed the cases suggest that it is integral to the functionality of the facility, especially with respect to generating some form of participant dislocation prior to undertaking laboratory activities (i.e. it appears to enable rather than diminish group creativity). Less clear is the extent to which there are specific designs for dislocation and creativity (i.e. curved walls, particular colours) or any need for a full-blown 'Disney-type' experience. More pragmatically, the research suggests it is very important to avoid creating structures (e.g. big curved walls, 150 degree screens) that inadvertently minimise the future flexibility of the space. This emphasis on flexibility is also relevant for the aesthetic design of the space, although all relatively recent creations, some laboratories were already showing signs of becoming dated (attempts to look futuristic date particularly quickly).

Second, the combination of high and low-tech infrastructure is equally important in determining the effectiveness of an innovation laboratory: for example, the extent to which a specific facility is 'junk-laden' appears to reflect the level of creativity expected from a particular session. Although the choice of specific infrastructure should complement the physical design, three generic elements stand out: 'off-the-shelf' ICT tools to support non-hierarchical group brainstorming; multiple writing surfaces and non-hierarchical furniture (e.g. triangular tables). As with the physical layout of the facility however, the research revealed a surprising number of examples where the implementation of the infrastructure had unnecessarily constrained the overall flexibility of the laboratory (e.g. computing network requiring tables to be fixed to the floor). Facilitation remains arguably the most important element of even the most high-tech laboratory and surprisingly this was the area where the research revealed the least well-developed set of heuristics for determining good and bad practice in different applications.

Third, the benefits of an innovation laboratory appear strongly contingent on the specific application and the operating context. Successful applications appear to be those where the laboratory and the 'problem'-setting are closely related, such as team-based new product development or inter-organisational collaborations; the research suggests they work because they are by definition dislocating and creative and predicated on team-building and close, frequent communications. It is less clear whether the presence of an innovation laboratory influences the whole organisation's innovative performance (i.e. assists in the development and deployment of dynamic capabilities) or the role that the laboratory plays in the organisations wider innovation process. Here the operating context seems to be particularly significant. A consultancy firm for instance, is already a creative environment and as such the value of the laboratory is quickly and widely accepted (e.g. CapGemini has now built 16 ASE facilities around the world). In larger corporate and governmental applications however, there is clear evidence that the facilities are valuable for individual projects but this kind of deliverable makes it much harder to justify the ongoing expense, especially against the backdrop of changed managerial priorities and sometimes overt cynicism. Of course, once the physical site has been built there is an argument that this sunk cost helps 'lock the commitment to innovation' into the organisation. Thus, perhaps the most significant benefit of each facility is the degree to which it is a physical reinforcement of the strategic intent of the organisation to be innovative or creative.

Finally, there are also dis-benefits. From the evidence of this research, acknowledging that the facilities were not designed to meet academic research goals, it is interesting to reflect upon the lack of both session-by-session and (most significantly from a strategic perspective) aggregate evaluation. The absence of formal feedback processes appears to undermine the fundamental double-loop learning motivations of the original laboratory investments. As a result there was no evidence of too much double-loop learning but there was a suggestion that the priority of too many sessions had become to make participants feel good – surely an unrealistic expectation if making a true commitment to innovation and change?

Future Work

The preliminary theoretical discussions and empirical findings presented in this paper highlight many areas that warrant further work. However, it is proposed that the following three areas merit particular attention:

1. A more broadly-base survey of the laboratory phenomenon is clearly necessary. This study has revealed many more corporate (e.g. Phillips, BT, Boeing), consultancy (e.g. CSC, IBM, Accenture) and academic (e.g. SimLab, Technogenesis, UltraLab) facilities in Europe and North America and accessing and analysing this broader data set would allow more general conclusions to be drawn. A generic typology of laboratories could then be developed and specific comparison could be drawn between sectors, across countries, etc.
2. Given the nature of the initial data collection, there was limited emphasis placed upon specific experiments within the laboratory spaces. Some form of empirical investigation triangulating between facilitator, participant and observer feedback would offer a much richer insight into the advantages and disadvantages of different types of experiment and the inter-relationship with the different laboratory characteristics (e.g. what difference do curved walls really make?).
3. From a theoretical perspective, future research could also help develop the dynamic capability model. Preliminary evidence suggests that laboratory spaces can potentially enable organisations to reconfigure their resource base to innovatively respond to opportunities in a timely manner. There is scope for understanding these underlying learning routines, whilst also providing concrete examples of these learning routines in practice.

APPENDIX 1: IMAGES OF ORGANISATIONAL LABORATORIES

Image 1: The entrance to the Royal Mail Innovation Lab. Designed to replicate a 'lift' giving the impression of travelling to somewhere special

Image 2: The entrance to DTI Future Focus. Designed to feel futuristic, with calm lighting and sliding doors

Image 3: The Hub at UEA. Curved walls, cool colours and professionalism reinforce core values

Image 4: A typical creative problem solving room with curved write-on walls, IT supported brainstorming and tables for small groups

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Table 1. Structural and Infrastructural Content of Case Studies

Case	*Structure*	*Infrastructure*
RMIL	Separate single-storey building. After a theme park-type entry space (e.g. participants enter a fake lift and star-filled tunnel) combination of three spaces: (1) curved coffee area with palm trees; (2) multiple (semi-flexible) working spaces; (3) exhibition spaces.	(1) Entry space shows single 15 min. (professionally produced) AV show; (2) working spaces supported by group decision support software, data projection, triangular tables, whiteboards, creativity toys, etc; (3) exhibit spaces display various technologies and props. All sessions controlled by in-house facilitators.
DTIF	Located within DTI main building and comprises a futuristic entry space (e.g. sliding doors) leading to: (1) immersive theatre with a 150-degree screen, (2) technology showcase room; (3) work room with curved walls.	(1) immersive theatre equipped with professional projection equipment and technician, (n.b. the filmed scenarios do not exploit the 150-degree screen); (2) range of exhibits from commercial suppliers is used to raise awareness of potential advances, and; (3) a work room has curved walls, white boards, triangular tables, laptops, group working software and data projection. All sessions controlled by in-house facilitators.
UEAH	Part of library building. Three core elements, designed as an integrative concept (predominantly painted deep blue), make up design: (1) curved wall 'laboratory', known as the Hub, used primarily for open-ended problem solving type activities but also used for meetings, presentations, training etc.; (2) a technology showcase space and; (3) a 'drop-in' resource centre, including coffee and reading areas.	(1) Hub supported by group brainstorming software, projection facilities, whiteboards etc.; (2) technology showcase space hosts programme of monthly seminars, exhibits etc. from commercial suppliers and UEA departments to raise awareness of technological (e.g. software) advances, and; (3) 'drop-in' resource centre, houses reference materials (documentary and ICT) relating to staff learning, management, personal and professional development. All sessions controlled by in-house facilitators.