An Economy of Knowledge: Research, Architectural Practice and Knowledge (in) Translation

ANDREW MAHER
Spatial Information Architecture Lab, Department of Architecture and Design RMIT University Australia

INGER MEWBURN
Department of Architecture, Building and Planning, University of Melbourne, Australia

How does new knowledge 'flow' within an organisation? In this paper we report upon a case study in which ethnography is employed to render visible the 'knowledge transfer' (strategically redefined as 'knowledge translation') occurring between a PhD researcher and the members of the organisation in which he is 'embedded'. In this case the PhD student is located within an architectural firm and an industry context that is not accustomed to housing researchers in its midst. The path of knowledge flow, or rather its translation, is not found to be smooth. Knowledge 'flow' happens only in leaks and trickles through the organisation. We discuss the implications of this case for how ethnographic research in a business context might be communicated to an audience who do not necessarily value scrutiny of this nature.

> "...I was soon struck by what seemed at the time the peculiar disadvantage under which architects labour, never working directly with the object of their thought, always working at it through some intervening medium, almost always the drawing..." Robin Evans (1997, p. 156)

INTRODUCTION

This paper reports on an ethnographic case study of an architecture PhD student who has been working within a professional architectural firm while undertaking his degree. This student is part of a project developed by Prof. Mark Burry at RMIT University with various industry partners and the help of an Australian Research Council (ARC) Linkage grant[1] from the Federal Government of Australia, to 'embed' a number of architecture post graduates in the professional context, both in engineering and architectural firms.

The purpose of the ethnographic research that we present here was to begin to investigate how the 'embedded' PhD students were working within the firms and what sort of knowledge creation was happening as a consequence of their presence. While undertaking this research we became particularly interested in how the students and employees within the firms understand knowledge as something that 'flows'; thus allowing it to be 'transferred' to

1 More information on this particular funding scheme can be found at: www.arc.gov.au/

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others. This 'knowledge flow' was seen by our participants as a way to help to develop new workplace practices and further new knowledge, even when the researcher themselves had left the scene. Through this case study we ask: How might this 'knowledge flow' operate? and What are the implications of this for how research is conducted, and communicated in professional architectural practice?

The Project

The project to 'embed' PhD students in architectural practice[2] , begun in 2005, was in response to prior involvement in practice-based project research at RMIT University's Spatial Information Architecture Laboratory (SIAL). This prior research involved architects and engineers shifting isolated projects from their firms into the academy where experienced researchers tinkered with solutions. Some of the research outcomes from these previous projects – for example on one project the spin-off of an attempt to describe a geometrically complex structure was the development of a way to construct without drawings – suggested a serious gap in understanding innovation and workplace change (Maher, et al. 2003).

We observed that the innovations and insights that arose through these projects, while pertinent to the broader profession, did not result in workplace change when communicated via published work. Academic papers produced in the architecture field are traditionally not widely read or used in professional practice as most new knowledge in the industry is communicated through its preferred working medium: representations such as drawings and photographs (Manley, et al. 2001). In addition, research in architecture is often seen by the profession as unrelated to the *business* of architecture; in fact, the broader construction sector is not a demanding user of research output (Finch 2005). Therefore architecture firms are unlikely to sustain dedicated research and development programmes. However the ready uptake of the research services we provided to industry indicated there was indeed a need for architecture firms to take research more seriously. The intention of the embedded practice project was to reverse the process that we had set up in our prior transactions with industry. Instead of firms bringing projects to us as a research centre, we would place PhD students with the relevant architectural expertise within the firm's workplace, supervise their applied research practice and use government grants available to the academy to help fund them. It was hoped that in this 'embedding' process other issues such as workplace change and knowledge flow within these organisations could be uncovered and investigated.

From the outset we wanted to get the embedded PhD students to use ethnographic techniques to help them to explore issues of workplace change. As the PhD students were all architects, none of them had any professional background in these techniques, so a social science researcher was provided to train and advise them on the potential of ethnographic

[2] The research project is an Australian Research Council Linkage Grant entitled 'Technology Transfer through Embedded Research within Architectural Practice: the creation of an Australian practice-based architectural research and development network'. The chief investigator is Prof. Mark Burry, Andrew Maher is research associate. It runs until March 2008.

investigations to inform research into work practices. These social sciences practices provided (for us) a novel theoretical framework to analyse how the firms, as organisations, might change with the implementation of new methods, techniques and practices introduced by the PhD students.

The PhD students in this project all have professional architecture degrees; in that regard they are all 'insiders' to the processes and acculturation of their respective firms. With reference to Suchman (1995), we understood that the PhD students could make no claims to neutrality in their investigations. But this was seen as an opportunity rather than a problem because the intention was always that the research they undertook operated on two levels: both making things (such as software tools and representations) relevant to practice, and observing and investigating the specific workplace practice as a way to inform this making.

As an end result of this 'embedding' process we hope that the resulting PhD theses, the things they made and the case study research that we present in the second half of this paper, will act as ways to mobilize the research findings into the building industry as a whole. These PhD students are a test case for a different kind of professional doctorate than the 'reflection on individual practice' model that currently exists. The shift from an emphasis on the individual's own design practice, to reflection on the workplace as a whole, suggests a research practice that is perhaps more suited to the 'production' orientation of this industry.

Architecture and Engineering firms

In this section we will provide some information about the characteristics of Architectural practice in Australia in order to provide some background to the following case study. Architecture and engineering firms contribute 5% of the gross domestic product of Australia as a nation, amounting to tens of billions of dollars annually. Although there are large operators within the industry, most people are employed in small organisations. The Royal Australian Institute of Architects estimates that 84% of architects work for companies with 4 or less employees (IBISWorld 2007). The building industry is a highly competitive one, in which architects compete with many non professional building services for residential work. At most they perform only 15% of residential work, by value, in the sector. Even in the commercial and industrial sector this rises only to 50% (IBISWorld 2007). As a consequence architectural firms tend to operate on slim profit margins and seek to shift exposure to financial risk, which in turn has an effect on the propensity to undertake research in the sector (Rigby, et al. 2005).

Typically architects generate most of their project income (around 40%) from the production of documents which are used in construction contracts. This work can be described as the transferring of tacit knowledge of the designers into explicit documents which can be understood by other parties who construct the actual building. On larger building projects architects are often not equipped to do all the work 'in house' so teams form and then reform on a per project basis; in fact the sector can be viewed as a network of project-based organisations.

Project-based organisations pose special challenges to researchers; although new knowledge is generated within projects, little is transferred from one project to another or from projects back to the individual sponsoring organisations of the participants (Gann and Salter 2000). Research suggests that information and communication technology systems and organizational structures do not yet exist to enable or assist the transfer of new knowledge gained from projects across the relevant disciplines or through associated industries (Taylor & Levitt 2004). Lawson et al. (2003) found that even when architectural firms work for clients who repeat commissions, lessons learned on these projects are not channeled into similar projects, partly due to organisational contradictions between what the firm *intends* to do, and then what the members of the office *aspire* to and *actually* do on future projects.

THE CASE STUDY

We chose one of the four firms who had agreed to 'embed' a PhD student to conduct this case study because of their declared intention of dedicating the final year of the research project to 'knowledge transfer' between the PhD student and the employees in the firm. For clarity, in our case study the participants are identified as follows. The authors are the *researchers*. We conducted semi-structured interviews with three actors; a *director* of the firm (who is also a *Partner*), an *urban designer* in the firm and the architecture *PhD student* who was embedded within that firm. All our interviews and observations were conducted inside the office where the firm is located. During the PhD student's tenure with the firm he developed a series of software tools for urban design projects. These tools introduced to the firm greater capabilities for scenario testing and analysis using modelling (3D) and change over time through animation (4D). These research outcomes served to critique the predominantly static bird's eye planar views (2D) which are commonly used by planning and planners to communicate with clients and stakeholders [3].

As with all architects' offices, the building in which this particular firm is located presents the architects within with an opportunity to display their expertise and signal what sort of design firm they are. The entry to the office is located within an open concrete car park situated at the bottom of a renovated red brick warehouse building. The clever juxtaposition between the mundane car park and a stylish entry area, with its luxurious materials and impact lighting, immediately alerts the visitor that this is a firm which takes design seriously. A narrow return staircase leads upstairs; once at the top it can be seen that, although the warehouse has been refitted inside, many original features have been kept. The original roof trusses and wood paneled ceiling artfully display peeling layers of original paint. Derelict lifting machinery has been strategically retained for use as sculptural elements in the ceilings and occasionally the walls. In the reception area there is a large, white, textured desk behind which is a white wall where several large contemporary pieces by famous local artists

[3] In construction 2D (two dimensions) refers to working on a plane – generally using drawings either in plan, section or elevation. Moving to the third dimension (3D) the reference extends to modelling and then the addition of time is usually referred to as 4D or a fourth dimension.

are hung. Through an unusual purple pivot door, the boardroom houses a large collection of degrees from the firm partners, awards the firms has won and presentation boards of recent design work. Sitting at this custom built table, surrounded by these artifacts of education and expertise, made us feel like we were in a place filled with interesting, talented and creative people. We imagine that this is designed to inspire confidence and excitement in the clients about their architect's abilities and the kind of design product they have to sell.

Behind the reception desk, hidden by the demure white wall, the production area of the office is of a markedly different nature to the cool stylish 'public' reception space. Most architects' offices we have been in[4] have a problem with paper clutter and this one is no exception. Storage space is at a premium, all the desk surfaces are covered with books, drawings and files; tellingly there are even some box files stored up in the roof trusses. Once inside the production area it becomes clear that the office spreads through three adjoining warehouses; the open space office is divided by thick walls with small openings. According to our interviewees, the firm's hierarchy echoes the building layout in that it is divided between the disciplines of urban design, architecture and interior design. Each of the disciplines occupies one of the three warehouse spaces and the workers located within each partition report to a different director.

WHO'S THE BOSS? RESEARCH ROLES AND THE ROLE OF RESEARCH

From the outset we hoped to elicit an understanding of how our interviewees (the director, the PhD student and the Urban Designer) participated in research activities within the workplace. When we questioned them about their daily routines and interactions with others the participants would often offer unprompted, useful insights into their own work practice, the work of others, and the broader discipline of architecture.

The director we spoke to was the prime mover of embedding a researcher in the firm; he identified his motivation to be part of this project as stemming from a leadership course he had taken some ten years prior, at Harvard University. He reflected that it

> "didn't matter what area you were, wherever there was a creative part of that business, the best firms were investing in research all the time, and often from outside their own direct area, and that's what interested me about this and what I'd been pushing the firm towards ..."

The director, naturally, is a very busy person; his routine involves working long hours and engaging the networks of consultants and clients through meetings and 'phone calls. The people who work for him have to be self reliant and able to manage their own work. In

[4] Both authors have been practicing architects with about 20 years practice between them.

contrast to this usual relatively 'hands off' managerial style with others, the director placed the PhD student adjacent to his own desk. He gave us two reasons for this: the first was to give research "the right status in the company" and the second was to offer the PhD student a 'birds-eye' view of his and the firm's work routine by putting him in a position to overhear 'phone calls and casual conversations. The director saw this as a way of offering his managing practice knowledge to the PhD candidate: "if he sees what I'm doing and how I'm doing it, maybe that's part of what the role of ... well I thought, you know, this might be naïve on my part, but I saw a role ... that a senior practitioner could transfer to him"

The director emphasized to us that he tried to employ people for their intelligence, believing that skills could always be taught. The introduction of the PhD student from the 'outside' into this firm's 'inside' upset this standard practice and other assumptions normally held about the roles of 'boss' and 'employee'. The student was assigned to the office by the university rather than being selected by a job interview process. The director reflected on this as a potential source of friction, thereby highlighting the tightly controlled nature of the firm's office culture: "We've taken the biggest leap of faith because we haven't known the people that we've taken on... and you could get someone that is just dysfunctional within...just the wrong fit". But it was clear that, from the director's point of view, the intelligence of the PhD student offered a way to integrate him into the office culture.

If the integration of the PhD student in the office culture was seen as a matter of personal skills and attributes – which were potentially uncontrollable – the integration of research practice was, initially at least, seen as a smooth fit with the firm's routines. It was envisioned that the PhD student's research work and his participation on office projects would have a clear separation, with the research only occurring during the semester (26 weeks of the year split into two blocks of 13). The university holidays would then be set aside for the PhD student to work on office projects. However this framework did not have a chance of being implemented as, just before the project started, the PhD student was involved in a serious car accident. This delayed his start within the office and forced a rethink of how the research would operate. Although the student was house bound for a number of months, this period was regarded by him in retrospect as "a bit of a blessing" because "it set up that relationship (with the director) of I'm not working for you, I'm working on research, in your office, with you". The director, under no illusion as to the PhD student's apprehensiveness and sensitivity to being "used", described this hiatus as a period in which the participants could get to know each other outside the pressures of day to day work, allowing a relationship of mutual trust to develop.

Just as the accident managed to engender a level of trust as working relationships were negotiated, it also slowed down any pressure for the PhD student to engage with the production work of the office. The director explained this change of plans with his partners: "(I said) I don't want to give him any work that he has to do for the practice. But rather be an observer of the projects...the case studies we've got and pull (his research) out of that". This slow integration, and the ability of the director to be flexible in his ideas of how research could be put to work, enabled the student to make personal connections with the

director and the other staff members and, with their help, find his own way into the research projects and the firm's routine.

The informal and unruly nature of the subsequent knowledge work carried out by the PhD student was acknowledged by all the people that we spoke to as one of its most characteristic features. It seemed that the expectations about an orderly progression of research: question – hypothesis – research design – results, needed to be bent into a practice-based shape in order to be put to work. Bits and pieces of new ways to manage software and set up documents were developed and imparted to others in the firm on the spot, responding to locally contingent project factors. This sort of process is not unknown in the world of practice where, as Luis Araujo points out: "... problems are treated in a piecemeal manner and solutions are found in a pragmatic manner, following the path of easily accessible information and knowledge" (Araujo 1998).

The way knowledge and the act of research was constructed by different people within the firm that we interviewed was diverse and at times even contradictory. Through these people's views, which we came to think of as a series of 'lenses', we were able to begin to discern the nature of how the firm, as a group of 30 or so face-to-face workers embedded within much larger networks and organisations, learned and changed. We found that research in the firm was invariably linked, and often uncomfortably so, with its time allocation. Research was a managed risk and understood as an unknown quantity, even when undertaken informally. In the case of this research project, because it was funded through a government grant, the risk was significantly reduced – although not eliminated.

Throughout our interviews, and the time we spent in the office, it became apparent that for our participants the distinction between work, research and leisure was always shifting. Tracking these distinctions and how they were expressed was a revealing exercise which helped us to get at some of the processes of change that were happening in the organisation. At one point in our interview the director used the word 'inject' to describe the act of bringing a researcher into his organisation; by using the metaphor of immunisation he positioned research as a vital way of keeping up with the competition. However as we talked it became apparent that honing a competitive edge was contrasted with the tension of the need to be profitable and continue to keep the business afloat. In relation to the discourse around profit, research was (re)positioned as a luxury commodity. When describing his own research practices the director remarked: "the problem with architectural practice generally is time. That is - you don't have enough of it... where is your research time you know? It's not there unless you go away on holidays like I do". While on holiday practices of work, research and leisure were mixed to the point the act of taking a break from work was described by the director as a 'mini sabbatical'. He told us that while overseas he and the other directors actively seek out new buildings, take pictures and then write reports about them on their return. The distinction between work, research and leisure is collapsed further when this holiday research labour is presented to clients in order to help to maintain the firm's reputation as 'forward thinking'.

THE FLOW OF KNOWLEDGE: 'HEAVINESS' AND 'STICKINESS'

In our interviews, and the casual conversations we had with employees inside and outside of the office, we realized that most participants conceptualized knowledge as a 'flow' that passed from one person to another; usually verbally, but also with the aid of machines like servers and software like email clients. Along with its ability to 'flow', the movement of knowledge between people and was also seen as more or less 'sticky' depending on the circumstance. The constant use of the term 'knowledge transfer' alerted us to this idea. This term seemed to come from the director himself, but was used by everyone we spoke at the firm. From the director's point of view 'knowledge transfer' was important because skills training and further education for staff had had a chequered history; previously the firm had suffered by providing opportunities only to see the recipients "poached" by other firms, or even the academy. Individual, as opposed to organisational knowledge was therefore seen as 'risky': "There's a risk we're taking on anybody in teaching them anything. You've just got to say that you've got the knowledge transfer on the way through". These 'knowledge transfer activities' occurred within formal processes, such as information evenings organised by the PhD student, but the director was confident that the knowledge transfer would also happen in more informal ways through the presence of the student in the firm.

It seemed to us that machines and technologies were actively sought out as a way to mediate the flow of knowledge to achieve particular communicative ends – usually to do with transparency and openness. For instance, email was the way that the PhD student preferred to communicate with the other embedded PhD students who were located in offices around Australia. This was ostensibly because of its ease of use, "it's quicker just to bang out an email", but on closer inspection the preference for email seemed to be more to do with how the communication medium felt more like a conduit where "you can say anything" as opposed to a broadcast medium like the wiki[5], where communication had to be "more polished" or "permanent". Email was also widely used within the office as a means to communicate and tap the collective knowledge of the staff. The urban designer stated "if there's a query that's just sent around the office, people will bounce back and just send a link to wherever that the information can be found." Fragments of this collective knowledge get decanted into email, but on the whole she notes that most knowledge was tacit: "in people's heads".

The ability of knowledge to 'flow' was linked to physical location. The PhD student and the urban designer noted that the firm's densely packed library was used a retreat from the bustle of the production spaces within the firm. The PhD student recounted having many productive conversations there, with the librarian who could offer another perspective on his research. The intimacy of the library as a space offered an opportunity to talk 'off topic'; whereas chatting in the open place office space might potentially interrupt the work of others. The student often chose to structure his research work so that less obviously

[5]A wiki is a collaborative website. The students and participating firms have access to a wiki.

"officey" tasks took place after hours at home. When asked why he preferred to read at home, the student replied:

> "there were a few reasons. Just 'cause it's pretty noisy in here, it's sort of hard to concentrate on reading. But also there's sort of a, I guess it was a little bit political in that whilst everyone else is chugging away on projects, they've got this embedded researcher just kicking back, reading in the corner, smoking a pipe"

This comment also highlighted the ways that different activities were signed as 'work', 'not work' and 'research' when they took place in different contexts.

Talk was an important part of the knowledge transfer as the PhD student told us: "there's knowledge transfer happening from me sitting around gasbagging to people" (a gasbag being a colloquial way of referring to a boring person who talks a great deal about uninteresting topics). At the same time the PhD student's perception was that "gasbagging" would not necessarily be understood by others as a form of knowledge work in action. The urban designer though presented another view:

> "If I have a problem with something, I'll ask him about it and then he'll berate me and tell me why I'm having this problem and how I should be doing it. And then we'll hold an info session for the office. He'll show how [particular tasks] are currently being done [in the office] and then how they could be done [in a more efficient way]. And then that's kind of spread, when people come up to me, not just for urban design, but also architecture, [and query] how I collate my reports and how it's done."

A potential source of 'stickiness' in the knowledge flow was how it was understood to be an *exchange*. Some knowledge flow was relatively even – this seemed to happen when there was a clear alignment of interests, such as when the PhD student mobilised the director's professional network to gain feedback on his research, or when the PhD student taught undergraduate students in the academy using the software tools as they developed:

> "I've continued teaching most of the way through, that's probably where if anything fed back to me, was sort of more in the teaching [because] they're getting more time to try out new things than in the office".

However, sometimes the flow of knowledge was perceived as 'asymmetrical', which seemed to make knowledge harder to 'shift'. It seemed to us that knowledge had some kind of 'weight': the more one had, the harder it was to transfer it. This was most apparent in the case of the PhD student. In the previous quote the Urban Designer demonstrated how she acted as a 'translator', able to leverage some of the PhD student's vast knowledge into workplace change by virtue of her position as a manager and her finely honed negotiation skills; as she commented to us: "I'm quite verbal. If I don't like something I'll complain and people will know about it. I won't berate anyone, I'll just say this is better because...".

Also, it was noteworthy that knowledge seemed easier to 'shift', or translate, if it was moved in smaller 'chunks'. This can be seen in the example of the director giving knowledge to the PhD student in the form of a 'broadcast' of his everyday activities that the student could 'tune into' at will. Another example of this piecemeal approach to knowledge transfer was the strange advantage of the 'blindness' of staff to information about software in written form[6] and the PhD student's ability to act as a mobile teaching and learning resource, able to help with a software problem at need. His on the spot instruction enabled others to learn from how he worked rather than what he knew. The urban designer thought the most important thing she learnt from working with the PhD student was an *attitude* towards solving software problems by experimenting and trouble shooting rather than reading manuals – which in turn allowed her to take on the role of 'mobile teaching resource'. We think it was in this way that the PhD student's presence served to interfere in the normal learning processes in the firm and to shift them into a higher gear. To us these various practices signal some of the real value of the way that knowledge is *translated* through daily activities: thinking about knowledge as 'leaking' or 'trickling' might be a more effective metaphor for this process.

Processes of Change and Innovation: uncovering changing workplace practices

Knowledge, as it was transferred did not necessarily remain constant – in effect knowledge became 'translated' when it was moved between one person and another. For example abstract knowledge of the inner workings of a computer program by the PhD student could become a new way of composing documents for a staff member. The urban designer we interviewed offered one of the most surprising insights into how knowledge is translated in this way when she mused about how the PhD student had personally affected her work practices;

> "... most of us are just so inundated with work, we just can't ... we just don't have the time to sort of really learn it properly and, you know, I use some of it. I probably use about, I don't know, 15% ...".

Upon hearing this we immediately began internally pondering whether 15% was a significant figure or not, when the urban designer clarified: "I use the 15% for about 90% of my work." As it happened, it was not the three-dimensional planning tools that the PhD student was engaged in making that she was referring to, but rather the changes to production methods the PhD student had introduced which had resulted in a sharp reduction in the time it took her to make urban planning documents (one of the main 'outputs' of her workflow). Drawing on his general computer knowledge, the PhD student had devised a way for her to collate documents so that drawings within them remained 'live', allowing several people to continue to work on the drawings while the urban planning document was being produced. To us this example signalled how changing work practices

6 This 'blindness' was possibly a result of their intensively visual architectural training.

did not solely rest on having good ideas, *aspirations* or *intentions* but necessitated intervention. And the risks are high when "time's the one … the main constraining factor".

This example also demonstrated that an important factor is who the change agent is. In rapidly developing technological times undergraduate students are often the ones with the freshest knowledge of how to use software, but, as the urban designer told us, in this context (and we suspect in many others) "(changes) probably wouldn't have come in unless we'd had an exceptional student with a lot of guts" to interfere with the work practices of the firm. By contrast the PhD student was empowered to make such changes because he enjoyed a privileged position within the firm and acted with the imprimatur of the director. While the most visible outcomes of this research project were the formally structured research tasks undertaken by the PhD student (existing in the form of tools, projects and as academic papers), underneath this – and perhaps more hidden – are the flows, trickles and currents of change that are going on as a result of the 'interference' by a member of the academy within the practices of this firm. We wonder if it is also happening in the reverse and see this as an exciting area for further research.

Our own location as authors, within an industry where images are the primary currency in the knowledge economy, prompts us to ponder on how this ethnographic research can be best presented. The key difficulty for us has been explaining to other stakeholders exactly how and why ethnography of value. Even the PhD student, despite his participation in the social science training, saw the primary value of ethnography as a "retrospective checking mechanism", rather than a way that research could be furthered and generated (even though we would argue that he needed to be sensitive to the world around in an 'ethnographic way' in order to do the research at all). He was unaware until we told him, and was pleasantly surprised, that his research had had such an effect on the urban designer's work. Perhaps the value of ethnography for him, and others, is in enabling the telling of such stories and the surfacing of voices that might otherwise not be heard. In this paper we show how ethnography can render the flow of knowledge visible – and thereby perhaps, more amenable to manipulation. Earlier we noted that publishing has not been an effective communication of research within the building industry, but on the whole people do love to read stories – especially about themselves. We plan on presenting this paper to a variety of audiences and hope that this will be an effective way to communicate the lessons learnt in this project, particularly those lessons about the potentials of ethnography as research practice within the parallel worlds of architectural practice – the profession and the academy.

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