Observing the act of specification

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The specification of building products is an important but neglected area of design methods research, taking place largely in the detail design phase where important decisions are made with regard to building assembly and its long term durability. In an attempt to investigate this decision-making process a specifier was observed as part of a larger investigation into how designers become aware of products that are new to them—building product innovations. The observation revealed a number of different pressures to change the specification as well as a conservative approach by the specifier, keen to minimise risk.

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At the heart of good architectural design lies the correct selection of materials, components and products that make up a building's assembly; they contribute to the aesthetics and durability of the completed building. In his book *The Roots of Architectural Invention* David Leatherbarrow made the observation that specification is a rarely discussed procedure and one that exposes obscure and indefinite thinking when questioned (p. 143)[1]. An astute observation about a decision-making process which has received little attention from researchers and is rarely discussed by practitioners, presumably because it is difficult to separate the designer's goals from building materials as entities in their own right[2]. By observing a specifier working in an architect's office who was engaged in the act of specifying products that were new to him we are able to look at the complexity of this process.

1 The specification of building products

The number of building products that are potentially available for selection is extensive. Every year new products are introduced by manufacturers in response to competition, new regulations and changes in architectural

1 **Leatherbarrow, D** *The Roots of Architectural Invention* Cambridge University Press, Cambridge (1993)
2 **Patterson, T L** *Frank LLoyd Wright and the Meaning of Materials* Van Nostrand Reinhold, New York (1994)

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fashion. In addition to these 'new' products, there are numerous minor product improvements that are constantly introduced by manufacturers to prolong their product's life on the market. But getting a new idea or product adopted is never easy, as Rogers has pointed out[3], and this is especially true of building where new products and product improvements, like the established products, are dependent upon decision makers in the building industry for their selection. A process generally referred to in the building industry as 'specification' and carried out by 'specifiers'.

Despite the introduction of new procurement methods architects have remained the most influential and important specifier of products in the British building industry[4], described as 'licensed specifiers' with powers similar to those of medical doctors who prescribe drugs[5]. Growing concern over environmental sustainability[6], combined with increased pressure to cut costs and improve efficiency[7,8], has placed additional pressures on specifiers and has started to focus attention on an area of detail design largely ignored by the design methods authors in favour of the more creative conceptual phase. Writing about new materials and methods in 1933 the architect Chermayeff stated that "it is essential to select for a specific purpose within the defined cost, the most adequate material and method; that is to say, that material which best solves the problems of purpose, money and time"[9]. The challenge for the specifier then is to ensure correct specification.

Specification of building products is of great importance to the manufacturers and suppliers who undertake a lot of commercial research into the adoption of their own, and their direct competitors', products. This research is not in the public domain simply because of its commercial sensitivity and helps to explain why published research is rare. The majority of published literature that has investigated the way in which architects make decisions has concentrated on the 'design process' with emphasis on the resulting 'design'[10]. Margaret Mackinder carried out research into the selection of building products by architects in 1980[11]. At the time she noted the lack of research in this field, a situation little changed in twenty years. The small amount of published work has looked at how architects find out about building products[12], and anecdotal reports about the problem of specification substitution[13]. In the 1990s the Barbour Index, a commercial supplier of information to specifiers, published a series of reports. The Barbour Report encompassed the opinions of those involved in large construction projects[4], followed by more focused reports into the influence of contractors[14], and clients[15], concluding with a guide for manufacturers[16]. The work published after Mackinder's seminal work provides some useful data, but none of it attempted to test any of her findings.

3 **Rogers, E M** *Diffusion of Innovations*, 4th edition The Free Press, New York (1995)
4 *The Changing Face of Specification in the UK Construction Industry*, Barbour Index Windsor, UK (1993)
5 **Pawley, M** *Theory and Design in the Second Machine Age* Basil Blackwell, Oxford (1990)
6 **Edwards, B** *Towards Sustainable Architecture* Butterworths Architecture, Oxford (1996)
7 **Latham, M** *Constructing the Team* HMSO, London (1994)
8 **Egan, J** *Rethinking Construction* DETR, London (1998)
9 **Chermayeff, S** 'New materials and new methods', *Journal of the Royal Institute of British Architects* 23 December, (1993) 165–173
10 **Rowe, P G** *Design Thinking* The MIT Press, Cambridge, MA (1987)
11 **Mackinder, M** 'The selection and specification of building materials and components' Research Paper 17, Institute of Advanced Architectural Studies, University of York (1980)
12 **Walton Markham Associates Ltd** 'Communicating and selling to architects' *Architects' Journal* August (1981) 380
13 **Hutchinson, M** 'The need to stick to the specification' *Architects' Journal* 20 October (1993)
14 *Contractors' Influence on Product Decisions*, Barbour Index Windsor, UK (1994)
15 *The Influence of Clients on Product Decision*, Barbour Index Windsor, UK (1995)
16 *Communicating with Construction Customers: A Guide for Building Product Manufacturers*, Barbour Index Windsor, UK (1996)

Mackinder found that architects frequently used 'short cuts' based on their own experience in order to save time, reporting a strong preference for certain materials and components they had used previously, drawn from their personal collections of literature; supporting earlier observations of Goodey and Matthew[17] and Wade[18]. One third of Mackinder's sample acknowledged that new materials and methods needed to be monitored but claimed it was office policy to shun the use of anything new unless it was unavoidable, preferring to specify from their palette of favourite products. The implication being that new products were only considered when the familiar products could not solve the specifier's problem.

Mackinder also looked at the extent to which schools of architecture teach the selection of building products and found that they did not; the schools taught 'design' of which, it could be argued, material selection is a very important part. Failure to address such an important part of the design process has been described as a 'major weakness' in architectural education[19,20]. Academic textbooks deal with building technology, standard details and the process of physically writing the specification[21]. None deal with the decision-making process we know as specifying, therefore the young practitioner must learn the art of product selection when in practice, relying to a large extent on the experience of more experienced colleagues. Thus the tendency for specifiers to select products used by their colleagues is strong, reinforcing the tendency to use familiar products. Parallels can be seen in the prescription of medical drugs by medical practitioners where prescribing habits are known to form in early clinical practice and medical schools world-wide are starting to adopt a problem-based approach to learning, so that medical students can develop the skills required to critically evaluate new drugs that come onto the market[22]. To encourage this approach the World Health Organisation has produced a teaching aid, *Guide to Good Prescribing*[23], which is designed to help students develop a method for selecting appropriate drugs and be less susceptible to external influences, such as pressure from drug companies.

2 *The diffusion of innovations*

Mackinder's work and the more recent Barbour Index publications were concerned with the general selection of building products, they did not specifically address how specifiers reacted to building products that were perceived as new to them. To examine how a product is adopted a natural starting point would be to look at marketing literature; in particular that concerned with consumer behaviour[24]. The problem with this body of literature is that it is concerned with products that have recently been launched onto the market. While building designers may consider products that are new to the market, they may also consider products that have been

17 **Goodey, J and Matthew, K** 'Architects and information' Research Paper 1, Institute of Advanced Architectural Studies, University of York, York (1971)
18 **Wade, J W** *Architecture, Problems and Purposes: Architectural Design as a Basic Problem-solving Process* John Wiley and Sons, New York (1977)
19 **Antoniades, A C** *Poetics of Architecture: Theory of Design* Von Nostrand Reinhold, New York (1992)
20 **Crosbie, M J** 'Why can't Jonny size a beam' *Progressive Architecture* Vol June (1995) 92–95
21 **Coxe, P J** *Writing Specifications for Construction* McGraw-Hill, London (1994)
22 **MacLeod, M J** 'Teaching prescribing to medical students' *Medicine* Vol 27 No 3 (1999) 29–30
23 *Guide to Good Prescribing*, World Health Organisation Geneva (1995)
24 **Chisnell, P M** *Consumer Behaviour*, 3rd edition McGraw-Hill, London (1995)

on the market for many years, but which they have only just become aware of because they are faced with an unfamiliar building type or unusual detail. So products new to the market and the established products may equally be perceived as 'new' by the specifier. A more appropriate body of literature is to be found in work on the diffusion of innovations. This body of research is concerned with an individual's reaction to something which is perceived as new, whether it is new to the market or not. It is the newness of the product, rather than the length of time it has been on the market, that sets diffusion literature apart from marketing literature[3].

Diffusion theory is based on the distillation of over 4000 independent studies and is concerned with the factors that influence the rate of adoption of ideas or products which are perceived as new by the receiver of the information, the potential adopter: in this case the adopter would be a specifier working in a design office. At the heart of diffusion research is the 'innovation–decision process' which describes five stages through which a potential adopter may pass[3] (see Figure 1), and which have parallels with the specification process. The specifier will pass from first exposure to information about the innovation (knowledge), through a period of gathering more information to consider its characteristics (persuasion), to making a decision to use or reject the innovation (decision), to construction on site (implementation) and the intention to use the product again (confirmation). Before this process starts, however, the specifier must have identified a problem that cannot be resolved from the information contained in the collection of favourite products, hence triggering a search for information and the start of the innovation–decision process.

3 *Methodology*

The challenge was to try and observe this process. Previous research into specifiers' behaviour had relied on asking specifiers what they did[4,11,12,14,15], and/or asking them to record their decisions[11]. Such approaches are valuable, but prone to difficulties. First, professionals tend to portray themselves as they wish to be seen[25], and their account of how they act may not necessarily reflect what they do. Second, is the ability to remember and recount all the steps in the process, something other researchers have found designers to be rather poor at[26]. Third, asking specifier's to record their own behaviour in diaries naturally raises their awareness to specification decisions and may influence their behaviour.

Two approaches were considered, setting up an experiment and direct observation in an architect's office. The first was discounted because it was prone to the same problem as the dairy method. Direct non-intrusive observation of a specifier appeared to be a more natural approach, but one

25 **Ellis, R and Cuff, D** *Architects' People* Oxford University Press, Oxford (1989)
26 **Yeomans, D** 'Monitoring design processes', in **B Evans** (ed) *Changing Design*, John Wiley and Sons, Chichester (1982)

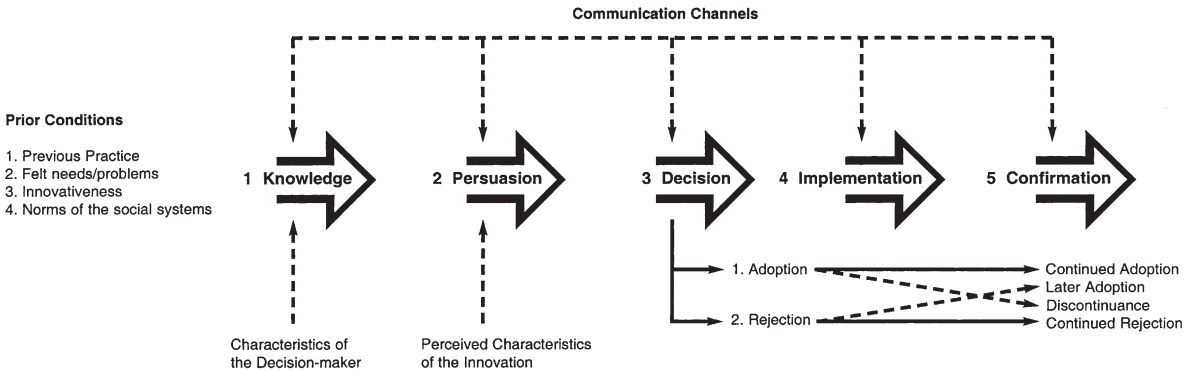

Figure 1 A model of stages in the innovation–decision process (adapted from Rogers 1995, p. 163)

with its own methodological difficulties[27], discussed below. Observation had the potential to identify and illustrate the tasks involved from within the organisation. Consistent with ethnographic research the goal was to interpret the behaviours of the social system being studied[28], an approach adopted successfully by Dana Cuff[29]. Because the author was working in the design office of an established architectural practice the opportunity to observe specifiers in action was available.

The objective was to observe a situation or event that caused a specifier to investigate 'new' products, therefore the specifier(s) would be self selecting and the period of observation determined by the individual and the project life cycle. There was a danger that the critical event may not occur when the observer was present. What was significant, was that the opportunity for observation did not occur for a considerable amount of time because specifiers in the office continued to select products that were familiar to them, thus demonstrating that the adoption of building product innovations is a rare event, supporting the views of Mackinder's sample[11]. Eventually a situation arose that could be observed and recorded for the duration of the process. The specifier observed sat next to the author and had the unusual habit of talking out loud whilst he was working: although this irritated other members of the office, it made for an ideal subject since the thinking process and the decision-making process, usually hidden from an observer, was quite transparent. The observations were recorded by the author in writing in a desk diary, recording both the actions observed and the length of time taken, and then analysed. At the end of the observation process the specifier was told that he had been observed and his consent was obtained both to use the material gathered and to interview him to explore the motives behind his decisions.

As with all ethnographic research the material gathered was a detailed account of a specifier and the influence of his direct surroundings. The specification act was highly interrelated to other activities within the office and the process reported below had to be separated out from other tasks which engaged the specifier during his working day (working on two other projects concurrently, attending meetings, dealing with telephone calls, site visits etc.). The significance of the findings to this particular design office cannot be ignored, however, the observation reported below helps to illustrate the complexity of the decision-making process that occurs during the specification process.

4 *The act of specification*

The specifier had two weeks to produce the working drawings for four, single storey, retail units. Three of the four were to be built with timber

27 Nason, J 'Approaching observation', in **J Symon and C Cassell** (eds) *Qualitative Methods and Analysis in Organisational Research*, Sage Publications, London (1998)

28 Rosen, M 'Coming to terms with the field: understanding and doing organisational ethnography' *Journal of Management Studies* Vol 28 No 1 (1991) 1–24

29 Cuff, D *Architecture: The Story of Practice* The MIT Press, Cambridge, MA (1991)

rafters and concrete interlocking roof tiles, the fourth was to be detailed with a structural metal tray and a profiled steel roof to suit a particular client's requirements. His first detailed the three units with the tiled roof, a task carried out quickly because he was familiar with this form of construction. He had used a very similar roof construction on a previous project and the drawings produced for it were used to gain information for use here, thus reinforcing the tendency to use familiar products, observed in earlier research[11]. When he attempted to detail the metal roof, a form of construction that was unfamiliar to him, he was unable to draw on his previous experience because he had not worked on any similar projects, although other specifiers in the office had. Since his personal collection of literature did not contain any information which could help him he was forced to look for products that may solve his particular need: he was forced to search for information about building products that would be new to him, (consistent with Stage 1 of Rogers' model), i.e. he started a different pattern of behaviour.

4.1 Innovation A

His first action was to ask other specifiers in the office if they had experience of detailing such a roof; so he first sought knowledge from his peers, drawing on the collective experience of the office, an action he later said was taken to 'save time looking in the library'. A colleague suggested a product that the office had used successfully before, Product A, but which was new to the specifier. He spent approximately ten minutes talking to his colleague to gain more information and to establish whether or not the product was suitable for his particular requirements. He was seeking to reduce his level of uncertainty, which is consistent with the persuasion stage of the model (stage 2).

Satisfied with the information gathered, he then sought further information about the product from the office library to enable him to make a decision. Because the trade literature was not comprehensive enough to solve all of his queries he telephoned the manufacturer to request additional literature. The manufacturer offered to send a trade representative, the change agent in Rogers' terms, to the office to assist with any queries: this was declined by the specifier who later said that he did not have sufficient time to see the representative. Information was received by post three days after the request, (during which time the specifier had been working on another project). After reading the information he made a decision to specify Product A and continued with his detail design work. The innovation had been adopted, consistent with stage 3 of the model 'decision', however his decision was subsequently revised.

While detailing the roof he discovered a technical problem which he could

not resolve from the literature so he telephoned the manufacturer's technical department for clarification. During the telephone conversation it became clear that Product A would have to be modified to resolve his particular problem, but the manufacturer did not have a 'standard solution' simply because they had not considered such a possibility arising. This resulted in a state of dissatisfaction on behalf of the specifier, who immediately went to the office library to search out an alternative. He did not use the electronic database or the printed product compendia, he selected entirely from the trade literature on the library shelf, a search pattern the specifier later confirmed to be the quickest way of finding suitable products, further emphasising the time pressures exerted during the detail design stage.

4.2 Innovations B, C and D

From his search in the library a further three building product innovations were selected, a task that he only spent ten minutes on. The library contained trade literature from ten manufacturers of similar metal roofing products, seven of which were rejected simply because their technical details in the literature was seen to be of 'poor quality' by the specifier. On returning to his workstation the specifier telephoned all three manufacturers to question them about their products. Product B was discounted because the technical representative was perceived as not knowing his product well enough (described as a 'complete idiot' by the specifier). Product C was rejected because the company would only answer technical queries by sending a trade representative to the office; since the earliest appointment would be too late for the specifier to complete his task to programme the product was rejected. Product D was adopted because the technical representative 'knew his stuff' and had offered some additional practical advice to the specifier which helped him to complete his detailing quickly. In line with office policy the specifier went and spoke to the organisation's technical partner who was responsible for granting approval for the use of any product that was new to the office. Following a short discussion approval was granted and the specifier returned to his desk to resume his detailing of the roof. Product D was referred to by name on the drawings and later in the accompanying written specification. A task he completed within the two-week programme.

4.3 Pressure to change—innovation E

The production information was then sent to the quantity surveyor for production of the bills of quantities and also for a cost check of the design against the original budget. During the three-week period taken to complete this task the quantity surveyor telephoned the specifier to suggest an alternative to that specified in order to save money. The alternative, Product

E, was unknown to the specifier so it constituted a further building product innovation, one introduced to him by a contributor to the design process who was primarily concerned with the cost of the product, not its technical performance. This illustrated the contribution made from outside the architect's office during the specification process, with pressure to change the specified product and also the introduction of a product that was known to the quantity surveyor but not the architectural office.

Product E was immediately rejected by the specifier simply because he had invested a lot of time in solving a particular problem and did not want to go through the process again with a different product and different fixing details. He made no attempt to analyse the information, despite the potential cost savings reported by the quantity surveyor. As a result Product D survived this first attempt at specification substitution and was included in the documentation sent out to competitive tender. Again time pressures appeared to be of paramount importance to the specifier.

4.4 A further innovation

The lowest tenderer was accepted, but the contractor had also submitted a list of products he wished to substitute to save money. Twenty three products had been identified, ranging from the facing bricks and cavity insulation to the ironmongery for the internal doors, plus the steel roofing system, Product D. Thus a further innovation had been introduced, Product F. The client asked the specifier to analyse the cheaper specification. Although the specifier wanted to reject the substituted products immediately, further information had to be sought so that a report could be made to the client. He telephoned the manufacturers and asked a number of questions about delivery and guarantees. The answers raised further issues to be investigated and since he did not have the time to pursue them he rejected all of the substituted products, including Product F, recommending to the client that the cheaper products were of insufficient quality. This whole process, including the writing and faxing of the report to the client for approval, was dealt with in 24 hours. The contractor was appointed the following day with no change to the original contract documents. Product D had survived.

4.5 Adoption

Further attempts to change a number of products, including Product D, were made by the contractor after the project had started on site on a number of occasions during the 30-week programme. This confirmed evidence of specification substitution reported in earlier work[3,13,14], although in the event the specifier refused all requests. First the contractor claimed that the specified product could not be delivered to suit his programme

and proposed Product F again. This was found to be untrue when the specifier checked with the manufacturer who confirmed that the contractor had made no attempt to place an order for Product D (presumably the contractor had hoped that the specifier would accede to his wishes without checking). The request was refused. After the first request had failed the contractor again proposed that Product F be substituted to save money (for whom was never made clear), again this was refused by a specifier keen to see his design decision transferred from drawing board to finished building. Eventually Product D was delivered to site, to programme, and built into the building without any problems being reported from site. Thus, after a number of attempts to change it, it had finally been implemented (stage 4 of the model).

Toward the end of the project the specifier added Product D to his personal collection of literature for use at a future date. It had now become part of his personal inventory of products. This could be seen as evidence of the confirmation stage (stage 5) because the likelihood of the product being used again is high, although not observed in this study.

5 *Talking about the act*

When the specifier was interviewed at the end of the observation period he was asked to recount the actions he went through. Although the specifier was interviewed immediately after the project finished he was unable to recount all of his actions, providing a rather generalised account of events, failing to describe the dead-ends and unable to remember how many attempts were made to change the product, consistent with Yeoman's findings[26]. While this helped to justify the ethnographic approach adopted, it meant that the interview had to be adjusted to gather the specifier's attitudes towards product selection rather than as a tool to expand upon his observed behaviour.

Although the specifier described himself as creative and always looking out for new products he was aware that his actual behaviour was contrary to this. He claimed that he was 'forced to be conservative' about product selection and detailing because of his, and his organisation's, concerns about building product failure. Products that were new to the office carried a perceived enhancement of risk. His risk management technique relied on the specification of products that he had used previously, or failing that, those used by the office. His collection of literature had been assembled over a long period in the building industry from products that he said were 'known to perform', i.e. he was pretty confident that detailed and implemented correctly these products would not fail. He also said that he tried to stick to products he had used previously because the time pressures

imposed on him by both the design programme and the construction programme rarely allowed him any time to investigate alternatives. This specifier, like others in the office, preferred to specify by brand name (prescriptive specification) rather than by the performance method because it was less time consuming.

6 *Reflection on the act*

Before any conclusions can be drawn it is necessary to comment on the method used. Because the author was responsible for the day to day management of the design office in which this individual worked it is possible that the observer influenced the behaviour observed. However, throughout the observation period the specifier did not seek any clarification of his decision-making process from the author, rather he sought approval from the technical partner in accordance with office policy. There is also the possibility that the observer missed part of the process, however, retrospective analysis of the written evidence produced by the specifier, namely the drawings, written specification and notes in his desk diary, supported the observations.

Ethnographic research produces unique findings which are difficult to generalise from. The action reported above was influenced by the specifier's office environment, time pressures, characteristics of the project and the characteristics of the specifier. Naturally, the question has to be asked as to how representative this behaviour is of other specifiers. When talking about his behaviour his opinions were consistent with Mackinder's sample of architects[11], despite the long time gap between the two pieces of work. His behaviour was also consistent with that of other specifiers reported in associated work[30]. There was no evidence to suggest that the actions recorded were unrepresentative.

This specifier and other specifiers in this office used the prescriptive method of specifying, specifying products by proprietary (brand) name and this observation has identified pressures to change associated with this method of specifying. In organisations where performance specifying is used the final choice of proprietary product rests with the contractor, thus the process and pressures to change will be different to that reported here. Clearly specifiers working in other design offices will do things slightly differently and there is a need for further naturalistic forms of enquiry to compare with the findings reported here.

6.1 *Discussion*

At the time of the observation the specifier was working on three other jobs, all at different stages, and all with demanding programmes, thus the

30 **Emmitt, S** 'The Diffusion of Innovations in the Building Industry', PhD thesis, University of Manchester, Manchester (1997)

potential for investigating manufacturers' claims as to the performance of their products was very limited, serving to reinforce the established products. Again there are parallels with medical research. Studies into repeat prescribing[31] found that medical drugs were prescribed, without further reference to the doctor by the patient (primarily to save time), thus reinforcing the use of a familiar drug. Like the patient's drugs, the products have not been re-assessed, merely applied because they worked successfully before.

One of the issues highlighted through the observation was the impact of other parties to the specification process, a characteristic not present in the studies of repeat drug prescribing or the large body of diffusion of innovations literature. At different stages in the innovation–decision process contributions were made from outside the architect's office by individuals with different priorities to those of the specifier. Pressure to change specifications is something a specifier has to deal with, not just during the design phase but during the assembly process as well. In relation to Rogers' model (Figure 1) there would appear to be a need to add two sub-stages to accommodate the uniqueness of the specification process. Between stages 3 and 4, stage 3a would cover the pressure to change products during the tender stage. Between stages 4 and 5, stage 4a would cover the contractor's attempts to change products.

7 *Conclusion*

The observation reported above helps to illustrate some of the pressures and the complexity of the decision-making process that specifiers pass through. It helped to illustrate communication networks and pressures on the design process that was not evident in earlier research. The findings also suggest that building product selection would appear to be a very personal issue for designers and, as noted above, a difficult process to observe.

Rogers[3] questioned whether it was the need for an innovation, or the awareness of an innovation, which comes first in the innovation–decision process. The research reported here suggests that specifiers actively search out building product innovations only when the need arises, not before. The implication here is that the adoption of 'new' products may face considerable resistance; not just from the specifier, but also from the other contributors to the specification process. By gaining a fuller understanding of the individual's innovation–decision process professional design offices may be in a better position to manage this critical aspect of building design. To do so, however, requires further ethnographic research, both to test the results presented in this paper and to further our understanding of this little analysed aspect of design decision-making.

31 **Harris, C M and Dajda, R** 'The Scale of Repeat Prescribing' *British Journal of General Practice* Vol 46 (1996) 649–653