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The Development of Responsibility in Product Designers

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Abstract: Investigations of ethics in product design have been limited. This paper offers an insight into designer's perceptions of responsibilities over three levels of expertise; first year design students, graduating design students, and design practitioners. The paper presents the use of some novel methods including triad and card sorting to uncover perceptions of designers responsibilities. The findings give rise to categories of development including knowledge development, ethical development, and role context development. The result is a descriptive model of the development of responsibility in product designers.

Key words: Product design, Responsibility, Ethics, Development.

1. Introduction

This paper describes three studies, involving 75 subjects, which explore development of the ethical concept of responsibility in novice and expert product designers. This subject, though recognized as important, and arguably crucial, to research in design education, has received remarkably little attention in product and industrial design. In the field of engineering design there is a far more coherent body of research on ethics [1-3] where ethical judgement is now considered an essential part of the overall process; as Robinson [4] remarks: 'an engineer's - decision about how to solve a particular problem does not wholly rest on the crystalline clarity that quantification provides, but on ethical considerations'. The research reported in this paper focuses on these 'ethical considerations' in the field of product design, and particularly the wide range of subjects that are covered under the term 'responsibility', and the ways in which designers talk about their responsibilities. Participants at three levels of expertise (first year undergraduate, graduating product designers, and practising product designers) took part in the research which produced a model of ethical development.

The first study [5], which used an innovative questionnaire methodology to interview 50 graduating UK product design students in 2007, categorized a range of issues that fall under the term 'responsibility'. This categorization then fed into two further studies of both practising product designers (12 participants) and first year undergraduate product design students (13 participants). Studies 2 and 3 have incorporated methods of personal construct theory, in particular, repertory grids and card sorting [6-9].

This paper brings together the findings of these three studies by proposing a descriptive model of development that reveals new attitudes and perceptions of design responsibility.

2. Formulating the research question

The literature survey revealed a gap in publications on ethics and product design, and more specifically designers perceptions of design responsibility. A plan was devised to address this. The three levels of expertise were identified to be the focal points for investigation.
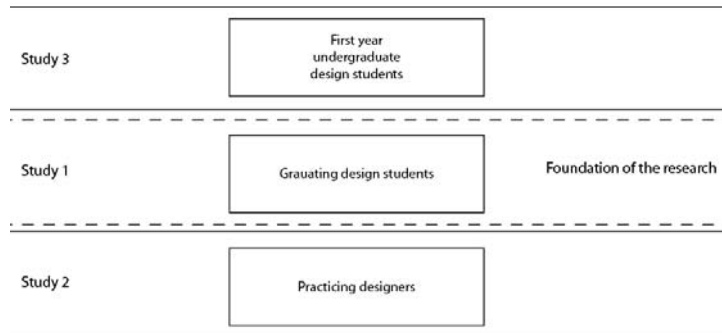

Figure 1: The three levels of expertise that this research investigated.

There were two broad questions driving the research. Firstly, what do designers perceive their responsibilities to be, and secondly, do perceptions of responsibilities change over the three levels of expertise, and how?

Study 1 sought to generate a broad understanding of responsibility within the context of product design. Graduating design students were interviewed at degree shows for two reasons: first, they provided an opportunity to talk to a large number of students in a relatively short period of time and without too much prior arrangement. Secondly, and more importantly, students could be interviewed in front of their own projects, allowing them to reflect specifically on those projects.

Study 1 involved 50 graduating students from 11 UK universities [5]. The student sample was no older than 30 years old. Experience varied; some students were registered on sandwich courses and therefore had 6-12 months experience in an industrial setting, others had none. The results of the semi-structured questionnaire used in Study 1 generated three main issues; (1) The diversity of issues covered by the term 'responsible design', (2) Where students think their responsibility for products ends, and (3) Differences between what students say about their responsibilities in theory, and what they practice in their design work. The two studies that followed were largely grounded in Study 1; keywords and phrases which appeared in the dataset were fed into the method developed for studies 2 and 3.

3. Method

For Studies 2 and 3, a method was developed that was more subtle, and yet more revealing. The aim of this method was to get participants to talk more openly and naturally about design, particularly how responsibility played a role in their day-to-day thought process and operations; the result of this was a card sorting exercise. This was combined with psychological methods that have been used to explore how people construct the world around them; Personal Construct Theory and Repertory Grids [6]. The repertory grid proved to be a long process and pilot studies indicated that the time it required meant that it would not be feasible to use in interviews. Therefore Kelly's method was implemented at its most basic level; triads – also referred to in Knowledge

Elicitation as the 'three card trick'. Kelly's work involved developing word cards and they were used in the triad task to develop constructs about the people in a person's life. This research in contrast developed 'image' cards for the triad method. One reason for using visual imagery was because designers are very visual, but visuals also offer the benefit of being used internationally. The image cards had to meet some basic criteria, they had to; (1) be ambiguous – As explained by Downing [9], in her work with imagery; if more than one meaning could be applied to the 'place-image' then flexibility could occur; meaning that one image could 'function in several complex associations.', (2) where possible use little or no text in the image cards, and (3) provide a balanced representation of the issues that were raised in Study 1.

Keywords and phrases from Study 1 were represented on the cards either in the form of text, or images. A set of 40 cards was developed for the triad and card sorting task; the card pack contained 18 word cards, 18 image cards (these cards were used in the triads), and 4 blank cards – to allow participants to add topics or issues they felt were missing. All cards measured 14cm x 9cm and were presented in both landscape and portrait formats.

Combinations of triad and card sorting methods were developed, tested, and evolved to create the method used in this research.

3.1 Task presented to participants

Each subject was presented with a task which involved 'two sorts' of the cards. Sort 1 was the triad sort; during this sort the participants were presented with a set of three cards termed a 'triad'. The cards used in this sort were picture cards; they were randomly grouped during the design of the task and each participant received the same three cards for each of the six sets that were presented to them (6 sets x 3 image cards – the 18 image cards are later reintroduced in sort 2). The participants had to take the set of cards (triad) and decide in what way two of those cards were alike, and yet different from the third. Once a relationship between two cards was established the participant was asked to define a group name (*construct*) then define a contrast to that group name (*contrast*).

Table 1: Developing constructs and contrasts – A sample of triad set 1. This table shows the construct and contrast assigned by participant 6 in Study 3. Numbers in *italics* indicate the two cards which were grouped.

Card Triad Set 1	Construct	Contrast
20 *30* *35*	Design for lifestyle	Design for purpose

Sort 2 involved a three-step process;
(i) The participants were given the 18 word cards. They then divided the word cards into three separate groups; 'not my responsibility', 'maybe my responsibility', or 'definitely my responsibility' as a designer. This was to get the participants to identify their perceptions of their responsibilities, to make clear classifications (therefore getting them off the fence), and to generate justifications of choices. During this step participants were encouraged to use the blank cards provided to record any of their design responsibilities they felt were missing.
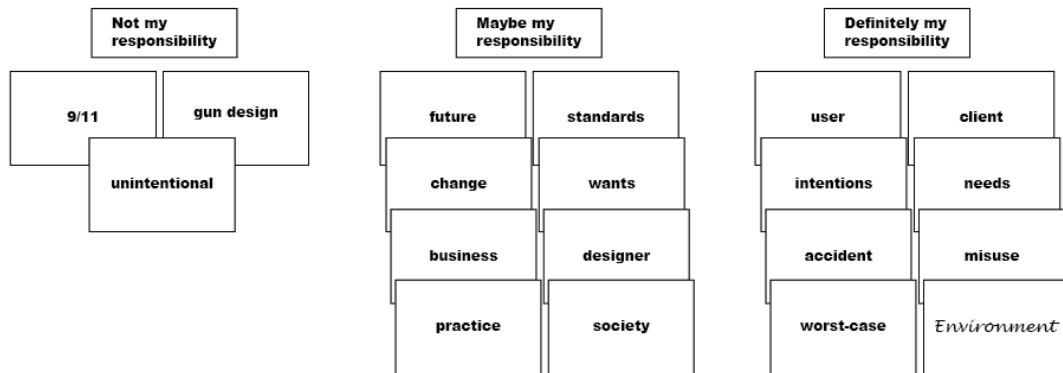
Figure 2: Sort 2 – step (i) The 18 word cards as grouped by participant 11 in Study 2 (The *italics* card was generated using one of the available blank cards from the card set).

In step (ii) the focus became the pile of cards in the 'definitely my responsibility' category. Participants were asked to select five cards and place them on a scale of 1 to 5. Number 1 on the scale represents the issue that the participant perceives as their most important responsibility as a designer, and cards are placed in the slots down to number 5, which represents lesser importance (not least important – because they have already rejected cards). The participants were then asked to explain their selection and give reasons for the order they have chosen. This was to get the designers to trade-off responsibilities and establish which design responsibilities they valued the most.
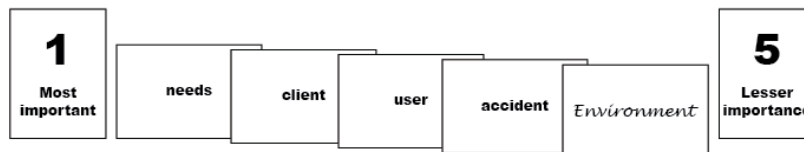

Figure 3: Sort 2 – step (ii) The five responsibilities (word cards) selected and rated by participant 11 in Study 2.

Step (iii) takes the five cards that have been selected in step (ii) and uses them as headings. The image cards were given to the participants and they were asked to group them under the five headings. While doing so, the participants were encouraged to discuss what the card represented for them, and if, or how the representation related to their previous experience or design work.
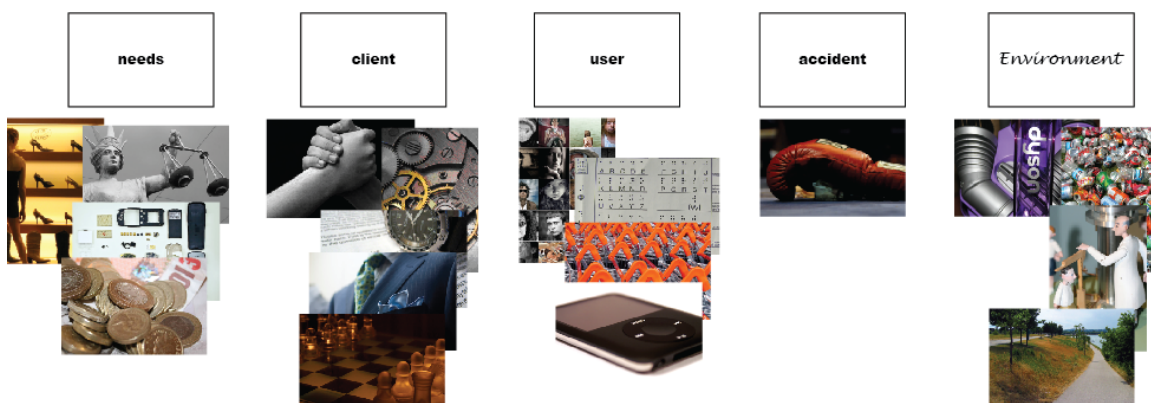

Figure 4: Sort 2 – step (iii) The five responsibilities (word cards) which were used as headings by participant 11 in Study 2; the 18 image cards were then grouped under these, and discussed as the task proceeded.

During sort 2 some semi-structured questions were presented to the participants. The common ones included; 'can you explain that for me?', 'can you give me an example?', and 'can you explain that in relation to your experience?'

The card sorting task was conducted with both practising designers and first year design students. There were 12 practising designers. The interviews were conducted at their place of work. There were 11 designers working in the UK (two educated outside the UK) and one UK educated designer working in Hong Kong. Experience ranged between 1-27 years practising. There were 13 first year undergraduate design students. They were all interviewed at the Hong Kong Polytechnic University. The majority of interviewees were from Hong Kong (8). In addition there were 3 from mainland China, 1 from Vietnam, and 1 from Singapore. Many had taken college diplomas before entering the degree course, but experience of practice was very limited.

4. Data Analysis and Findings; Development across three levels

The method had a number of advantages; (1) it provided an interactive and relaxed procedure for participants to talk about their personal design experience and practice, (2) the cards acted as stimuli providing discussion points for participants, (3) it enabled and generated reflections on practice and in doing so allowed participants to open up about their day-to-day tasks, (4) it got participants to talk about responsibilities, and construct relationships between responsibilities. However, it was not without its drawbacks. The volume of data produced over the two data sets was very large; Study 2 produced approximately 14 hours of audio data, and Study 3 produced approximately 11 hours of audio and video data. The data was very rich in content providing both qualitative and quantitative information. Initially it was difficult to comprehend and organise. A primary categorisation scheme was developed from transcribing the data files in full. Incorporating this scheme into the larger context of the three studies enabled an overall matrix to be developed.
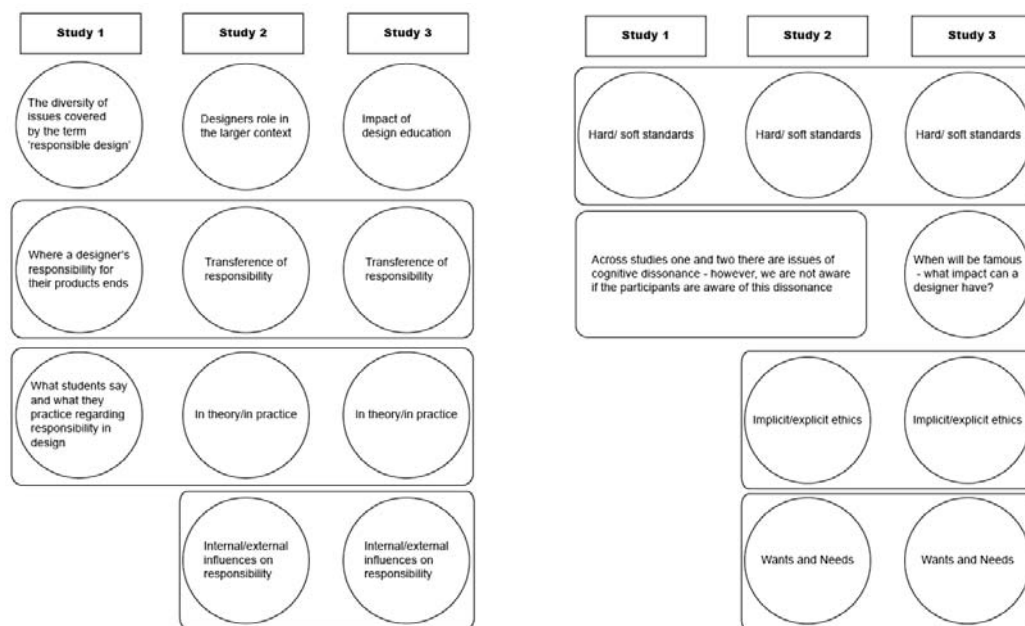

Figure 5: A diagram of issues which emerged from the individual studies. This matrix also highlights connections between issues that were multi-study issues throughout the research.

The data generated a range of interesting issues that offer an insight into perceptions of design responsibilities. However, further analysis of the transcripts began to reveal a story of development. It is this interesting aspect that this paper will now focus on.

4.1 Design Knowledge development – hard and soft responsibilities

The participants talked about responsibilities in two ways; hard and soft. Hard includes standards such as legal frameworks. An example is the standards that a product must meet before going to market. The Study 2 participants provided examples of such legislation; 'WEEE directive', 'Kyoto Agreement', 'REACH directive', and 'IPR'. The Study 1 participants also offered some specific legislation, also naming the 'WEEE directive', 'FMEA', and 'Stress Analysis testing'. The participants in Study 3 (first year designers) expressed an understanding that there are legal frameworks and legislation in place, but they talked in broad terms; 'I know there's a book of standards or the law guide of some kind', and did not provide specific examples. This was probably because they had less experience in industry and therefore their understanding of design in that context was limited. They mainly discussed the issue of standards when prompted by word card 11; 'standards'. The practitioners did not rely on this card as a prompt to raise and discuss the issue.

Practitioners clearly understood there are a number of legal frameworks they must adhere to, but they still appreciated that meeting standards is not always enough; '…something might pass a standard…but knowing users, they'll use it differently and its going to be very dangerous' (then provides the example; the design of a safety gate). This raises interesting questions such as; are hard frameworks enough to guide designers choices? In this case it would appear that the answer is no. Design should involve understanding consequences. And in exploring consequences, design should explore the issue of ethics and responsible decision-making; 'ethics is not an appendage to design but an integral part of it' [10]. What is actually being discussed is the issue of what is 'right' and what the 'responsible' thing to do is in such a situation. Another participant from Study 2 put it nicely when he explained that quality control departments will ensure products pass relevant tests, stating; 'Something may be outside the guidelines and be very dangerous but they find a way to squeeze it through…it would be the designers responsibility to design that out if we felt bad about putting it in…it's purely personal conscience'

Soft standards are those more personal guidelines that designers might adhere to, such as their own ethical frameworks and value systems. Whitbeck [11] discusses a novel design where no industry standards existed. The nature of this design means that designers have to rely on soft standards to guide them. The dataset as a whole indicates that the first year designers have an ideological approach to design and that they are very enthusiastic about selecting the right materials and wanting to design products that provide benefits. The first year designers, and some of the graduating designers have ethical views that they would like to implement, but they struggle to apply them. The practising designers have experience of working on projects on a daily basis and so their knowledge grows and develops. They displayed an understanding of applied responsibilities more clearly than the two other levels. Perhaps design education could do more to increase the understanding of ethics and responsibility in design.

4.2 Ethical development

The triad sort delivered both qualitative and quantitative data. It enabled an understanding of how participants view the images and the relationships they construct between particular issues. The same triad sets were presented to all participants in studies 2 and 3; this enabled comparisons to be made across these two levels of expertise (see Figure 6).
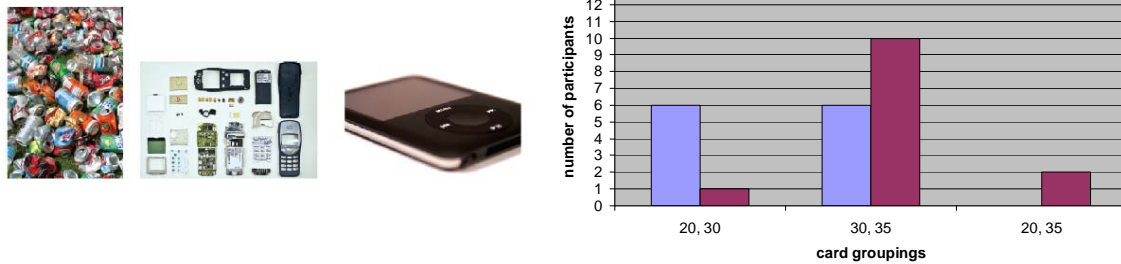
Card Triad Set 1; cards 20, 30, and 35

Figure 6: Triad set 1 – Comparing the three cards (left) that have been grouped by the experienced design practitioners and the first year design students. It is possible to see the different pairings which took place. We speculate that construct and contrast discussions may correspond to development of responsibility.

The data provides solid constructs and contrasts (like those displayed in table 1). However, a more interesting issue appears to be the differences between the way the participants from the two studies verbally assemble their *constructs* and *contrasts*. The practitioners often presented a mass of ideas and these changed as the designer talked. The outcomes tended to be more complex and abstract. Participants often incorporated a lot of information and their reasoning appeared to be convoluted. The first year students tended to think less abstractly. Instead, the cards were taken more literally and words that represented the image on the card were used.

Levels of abstraction was something that was also evidenced in the card sorting task. Card 18 (Gun design) not only represents the idea of abstraction, but also how hypothetical, philosophical and moral imagination can be introduced when discussing design responsibilities. Practitioners generally offer a much more open and hypothetical approach. For example:

'Well my initial reaction is, no, I wouldn't want to be involved in gun design but that's a very easy answer…It may be irresponsible to not carry on designing good weapons or maybe it's more responsible to be brave and say no… If I got given a gun design project it would be my responsibility to do it well'

The quotes from the practising designers tended to be longer and more detailed in their explanations. The first year designers did offer some debate into the fact that 'weapons can be used in different ways [having both] a bad side and a good side'. However the topic never really got beyond the issue of good and bad. The practitioners' answers seemed to weigh the pros and cons of gun design and offered an insight into their ethical reasoning, judgements on responsibilities, and ability to use their moral imaginations.

The graduating students (Study 1) did not participate in this task, but some did offer opinions. Often the graduating students referred to case studies to expand on ethical issues in design. Examples included (1) The design of the Ford Pinto fuel system – the issue of knowing that the consequences could result in death and still

putting the car on the market, (2) The issue of designing guns that are undetected by metal detectors at the airport, (3) To what extent is the engineer/architect responsible for anticipating the sort of terrorist attack seen on the Twin Towers, (4) The design of the Ford Transit and the role they often play in robberies because they can move large amounts of goods, and (5) Dyson – the moral issues of people getting laid off; moving manufacturing to other countries.

The examples presented by the graduating students were often in relation to intentions, actions, and consequences. Although the context is slightly different to the specific example that has been referred to from Studies 2 and 3, there is an indication that ethical development evidences itself through these three levels of expertise.

The data also indicated a relationship between the use of metaphors and the level of expertise. The design practitioners used more metaphors during discussion than the first year or graduating students. The use of metaphors may indicate an emerging ethical development. This requires further investigation and therefore is outside the scope of this paper.

4.3 Role context development

There appeared to be a correlation between the level of experience and the ability to appreciate design in a business context. The experienced designers were less apologetic about the fact that designers are there 'to make money'. Less experienced designers design within different constraints. Often they are designing to the brief of a university assignment, usually with no real client. This can mean that their boundaries may be flexible; one graduating student explained that his design would not use a harmful plastic if it was for a real client, and the market, but 'I needed to make it for the degree show'. It is not that at early stages they are unrealistic. The belief that they can make a difference through their design is important, but some students expressed a worrying notion that to make a change, some level of fame is required. One student even divided design into 'designers' and 'design masters' – explaining that design masters are famous designers; if you are a design master your influence on design responsibilities may be greater.

5. Conclusions

The research strategy has been wide-ranging and the data accumulated diverse. Nevertheless, it is possible to identify a broad development of responsibility within the education and practice of the product design community. The semi-structured questionnaire adopted in Study 1 had the benefits of being very flexible and exploratory. This was advantageous at that stage because it revealed responsibility issues that graduating designers regarded as important. This information allowed a foundation to be generated for Studies 2 and 3; these studies were much more focused and sought to probe the issues of responsibility, such as how designers construct relationships between things, how they select and talk about their design responsibilities, which responsibilities they value the most, how they categorise and group particular responsibilities, and how they discuss responsibilities in relation to their own experience.

The triad and card sorting techniques had a number of benefits. They generated a rich body of data which comprised both qualitative and quantitative data; providing both detailed insights into designers thoughts on

design responsibilities and statistical data that could be compared across the two Studies. The amount of data generated from the tasks was substantial; in fact, it may have been too much. However, it provided a relaxed and uncontrived way of talking about design responsibilities and the triads and card sorting meant that the participants had to apply some level of categorisation and in doing that explain their reasoning for the choices made.

The work created some clear insights to the perceptions of design responsibilities by student designers and those practising and it charts a broad developmental process. More than that there were indicators of development of ethical understanding; the ability to think philosophically, hypothetically, and use of moral imagination. There were also indicators that the knowledge and experience gained as the participants move through stages of development correlated with an increased understanding of design in the business context. This is probably because internal and external influences change as students and practitioners move through these stages. The concept of working with stakeholders within a business context is much more concrete for practising designers. The notion of developing business awareness ties in with the broader understanding of the designers role; what they can control, things they can influence and where responsibilities may transfer.

The findings suggest that there are various types of development taking place for these subject groups; the development of knowledge, ethical development, and designers role in varying contexts. These change and evolve over the three levels of expertise. What originally began as an investigation into perceptions of design responsibilities at three different levels of expertise has emerged as the charting of one continuous pathway of broadening responsibilities. The narrow path that first year design students start out on broadens outwards, as they progress through levels of design expertise. Thus the diagram presented at the beginning of this paper (Figure 1) needs to be reshaped and re-presented as Figure 7.
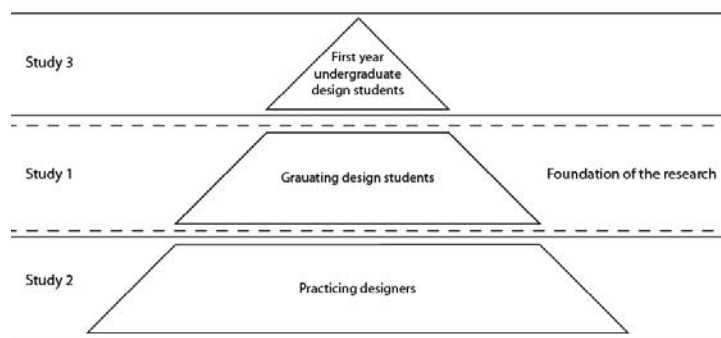

Figure 7: A re-presentation of Figure 1. Here the research discussed in this paper reveals a broadening progression of design responsibilities.

The three levels of expertise selected for this research offer only snapshots of an emerging understanding of design responsibility. However, taken collectively, they reveal a broadening appreciation and application of what responsibility might entail in design practice. The findings suggest that novice designers advance through this model building their understanding of design responsibilities and developing their abilities to discuss and intervene in the ethical and moral issues of design.

Development models such as Kohlberg [12], Krebs and Denton [13], and Dreyfus [14-15] exist, however, this research suggests that simple mapping is probably not possible. Instead a new representation for design

responsibilities is required. With an understanding of these snapshots of perceptions and the construction of the model illustrated in Figure 7, it becomes possible to form an understanding of how the design community in this 21st Century culture might better respond to their design responsibilities. Also, this may enable design education to identify curricular priorities - particularly at undergraduate level. Finally, if this work can be refined so as to define a more detailed conceptual model of the development of responsibility in product designers, it could form a vital bridge between the education and practice that might create new forms of continuing professional development for the profession of design. The work continues towards these ends.

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