

# An environmental-psychological study of sustainable housing: a transactional approach.

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# **An Environmental-Psychological Study of Sustainable Housing: A Transactional Approach**

**Tony Craig**

A thesis submitted in partial fulfilment of the  
requirements of The Robert Gordon University  
for the degree of Doctor of Philosophy

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*"All good science consists, and all good philosophy consists, of lucky oversimplification"*

(Popper, 1974, p.976)

*"People make society - society makes people"*

(Charon, 1979, p.171)

*"A great deal of what is known is embodied in the environmental structures and setting individuals create"*

(Heft, 2001, p.291)



## Abstract

The main aim of this thesis is to utilise the transactional approach from environmental psychology for the study of sustainable housing. The interdisciplinary field of environmental psychology has recognised for some time the importance of considering human behaviour not only in terms of personal psychological processes, but also in terms of the broader social and physical context in which behaviour occurs.

This need to consider phenomena at different levels of analysis sits comfortably with the transactional-contextual approach described within environmental psychology. However, although the transactional approach is often affirmed by environmental psychologists, many studies do not in fact fully conceptualise human behaviour in the physical and social context. The phenomenon investigated by this thesis is 'sustainable housing'. As such, the phenomenon of 'sustainable housing' is first conceptualized within this thesis using person-in-environment as the unit of analysis, with the main focus being the relationship between individual environmental preferences and sustainable housing design.

The first aim of the thesis was to outline a theoretical framework for conceptualising the person-in-environment relationship with respect to sustainable housing. This was done by building up a conceptual model from the literature in such a way that the 'transactional whole' is elaborated in much more detail than would normally be the case for a closely defined study of environmental attitudes or aesthetic preference. The individual component of the model is built around the theory of planned behaviour (TPB), which is expanded to include environmental perception and preference. The conceptual framework is then explored and developed using case studies which illustrate the importance of considering the individual, the socio-cultural context, and the environmental aspects of sustainable housing together.

The first case study (N=74) looked at the psychological aspects of sustainable water and wastewater management within the domestic context. The findings suggest that greywater and rainwater systems are by and large fairly acceptable as a concept to the general public, although there are several concerns regarding the safety of such systems. There were more concerns raised about the idea of compost toilets, concentrating particularly on issues of odour and hygiene, with many people not believing that such toilets would be hygienic or odour free.

The second case study (N=844) examined the effect of building materials on environmental perception and behavioural intention. The results clearly demonstrate that the material used as cladding for house façades significantly influence people's attitudes and preferences towards particular houses. The findings of this study begin to show a link between environmental preference and behavioural intention. Subjective commentary clearly demonstrates that associative meanings are inferred from cladding materials.

Following on from the second study, the third case study (N=108) examined the change in inferred meaning associated with a change in cladding material. Participants in this study were randomly assigned to one of four experimental conditions. Two factors were varied between the experimental conditions: the exterior façade material (timber or render), and the description ('standard' or 'sustainable'). Attitudes were found to be a significant predictor of behavioural intention for the survey where the house was described as sustainable. Interestingly, there were differences within the 'sustainable description' surveys which were related to the cladding material, with subjective norms being more strongly associated with behavioural intention when render was the cladding material. Therefore, environmental meaning is considered to be a moderating variable in the theory of planned behaviour. When the house was described as 'standard', environmental preference turned out to be a much better predictor of behavioural intention than any of the three TPB components.

The final chapter discusses the major findings from the three case studies in relation to the conceptual model built up from the literature. The empirical data was found to provide considerable validating support for the conceptual model, and two refinements were made to the model following the three case studies. Suggestions are also made concerning ways in which the approach outlined can be taken forward, both within the academic domain of environmental psychology, and also into other areas, such as sustainable housing.

## **Declaration**

The candidate has not, while registered for this Ph.D. submission, been registered for another award at a university during the research programme.

None of the original material in this thesis has been used in any other submission for an academic award. Acknowledgements for assistance received are given under the heading acknowledgements and any excerpts from other work have been acknowledged by its source and author.

Tony Craig

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# Table of Contents

ABSTRACT.....	I
DECLARATION.....	III
SUPERVISION AND FUNDING .....	IV
ACKNOWLEDGEMENTS.....	V
TABLE OF CONTENTS.....	VI
INDEX OF TABLES.....	IX
INDEX OF FIGURES.....	X
<b>1 INTRODUCTION .....</b>	<b>1</b>
1.1 THE OVERALL CONTEXT .....	1
1.2 THE NEED FOR SUSTAINABLE HOUSING .....	3
1.3 THE TRANSACTIONAL APPROACH IN ENVIRONMENTAL PSYCHOLOGY .....	8
1.4 AIMS, RESEARCH QUESTIONS, AND APPROACH .....	18
1.5 OVERVIEW OF THESIS STRUCTURE .....	21
<b>2 A TRANSACTIONAL MODEL OF SUSTAINABLE HOUSING .....</b>	<b>22</b>
2.1 INTRODUCTION .....	22
2.2 HOUSE AND HOME.....	23
2.2.1 <i>The multiple dimensions of home</i> .....	23
2.2.2 <i>The importance of the house in creating home</i> .....	25
2.2.3 <i>Symbolic communications and identity</i> .....	26
2.2.4 <i>The house as a material possession</i> .....	29
2.3 SUSTAINABLE HOUSING DESIGN.....	32
2.3.1 <i>The multidimensional nature of sustainability</i> .....	32
2.3.2 <i>The New Environmental Paradigm</i> .....	34
2.3.3 <i>Psycho-Social aspects of sustainable housing</i> .....	37
2.3.4 <i>The Individual Component of Sustainability</i> .....	39
2.3.5 <i>The Socio-Cultural Component of Sustainability</i> .....	41
2.3.6 <i>The Environmental Component of Sustainability</i> .....	44
2.3.7 <i>Sustainability as a social dilemma</i> .....	45
2.3.8 <i>The importance of perceptions and behaviours</i> .....	47
2.4 PSYCHO-SOCIAL ASPECTS OF THE BUILT ENVIRONMENT .....	48
2.4.1 <i>Perceptions and Preferences</i> .....	48
2.4.2 <i>Environmental Aesthetics and Preferences</i> .....	50
2.4.3 <i>Personal Norms</i> .....	57
2.4.4 <i>The Theory of Planned Behaviour</i> .....	59
2.4.5 <i>The importance of memory and habit</i> .....	64
2.4.6 <i>Building the theories into the conceptual model</i> .....	66
2.4.7 <i>The Inclusion of Time and Society - A Transactional Model</i> .....	69
<b>3 A STUDY OF PSYCHOLOGICAL ASPECTS OF SUSTAINABLE HOUSING: THE CASE OF DOMESTIC WATER AND WASTEWATER MANAGEMENT .....</b>	<b>79</b>
3.1 INTRODUCTION .....	79
3.1.1 <i>Wastewater management: the context</i> .....	79
3.1.2 <i>Sustainable domestic water and wastewater management</i> .....	82
3.1.3 <i>Public participation in water and wastewater planning</i> .....	84
3.1.4 <i>Values, Attitudes, and Behaviour</i> .....	86
3.1.5 <i>Influences on acceptability of sustainable wastewater management</i> .....	87
3.1.6 <i>A study of psychological aspects of sustainable domestic water and wastewater systems</i> .....	89

3.2	METHODOLOGY .....	92
3.2.1	<i>Research Setting</i> .....	92
3.2.2	<i>Procedure</i> .....	92
3.2.3	<i>The questionnaire</i> .....	93
3.2.4	<i>The sample</i> .....	94
3.3	RESULTS .....	95
3.3.1	<i>Socio-economic characteristics of sample</i> .....	95
3.3.2	<i>Greywater and Rainwater systems</i> .....	96
3.3.3	<i>Compost Toilets</i> .....	106
3.3.4	<i>Supplementary Questions</i> .....	110
3.4	DISCUSSION .....	113
3.5	CONCLUSIONS .....	115
<b>4</b>	<b>A STUDY OF PERCEPTIONS OF CLADDING MATERIALS.....</b>	<b>118</b>
4.1	INTRODUCTION .....	118
4.1.1	<i>Judging a book by its cover: The external appearance of housing.</i> .....	120
4.2	METHODOLOGICAL DEVELOPMENT .....	126
4.2.1	<i>Preliminary Study One - A Study of attitudes towards various house types</i> .....	126
4.2.2	<i>Preliminary Study Two - Generation of Standardised Images</i> .....	137
4.3	FINAL METHODOLOGY .....	143
4.3.1	<i>Introduction</i> .....	143
4.3.2	<i>The Survey: Overall Design and Variations</i> .....	143
4.3.3	<i>Creating a comparable internet survey</i> .....	146
4.3.4	<i>Procedure</i> .....	155
4.3.5	<i>Details of the sample</i> .....	155
4.4	RESULTS .....	158
4.4.1	<i>Demographic Characteristics</i> .....	158
4.4.2	<i>Overall Preferences</i> .....	158
4.4.3	<i>Results of the Ranking Task</i> .....	167
4.4.4	<i>Detailed results for the most preferred houses</i> .....	173
4.4.5	<i>Qualitative Data</i> .....	175
4.5	DISCUSSION AND CONCLUSIONS .....	180
4.6	METHODOLOGICAL ISSUES ARISING .....	184
<b>5</b>	<b>A STUDY OF HOUSE PURCHASE BEHAVIOUR.....</b>	<b>186</b>
5.1	INTRODUCTION .....	186
5.2	HOUSE PURCHASE BEHAVIOUR .....	188
5.2.1	<i>The meaning of sustainable housing (revisited)</i> .....	191
5.2.2	<i>Integrating environmental preferences within the theory of planned behaviour</i> .....	192
5.2.3	<i>The issue of agency</i> .....	194
5.2.4	<i>Housing preferences, planned behaviour and culture</i> .....	196
5.2.5	<i>Connotative meanings</i> .....	199
5.2.6	<i>Aims of study</i> .....	200
5.3	METHODOLOGICAL DEVELOPMENT .....	201
5.3.1	<i>Method Selection</i> .....	201
5.3.2	<i>Generating the elements of the Theory of Planned Behaviour component</i> .....	203
5.3.3	<i>Results and final elements selected for further use</i> .....	206
5.3.4	<i>Setting the scene</i> .....	210
5.3.5	<i>Measures of connotative meanings</i> .....	212
5.4	METHODOLOGY .....	215
5.4.1	<i>Sample</i> .....	215
5.4.2	<i>The Survey</i> .....	217
5.4.3	<i>Procedure</i> .....	222
5.5	RESULTS .....	223
5.5.1	<i>Demographic and socioeconomic variables</i> .....	223
5.5.2	<i>Individual Item Statistics</i> .....	223
5.5.3	<i>Re-coding the TPB variables</i> .....	223
5.5.4	<i>Predicting behavioural intention using the TPB</i> .....	224
5.5.5	<i>The influence of personal norms</i> .....	229
5.5.6	<i>The place of aesthetic preference</i> .....	231

5.5.7	<i>Connotative meanings and personality judgements</i> .....	233
5.5.8	<i>Beliefs about socio-cultural context</i> .....	237
5.6	DISCUSSION .....	238
5.6.1	<i>Methodological issues arising</i> .....	244
<b>6</b>	<b>OVERALL DISCUSSION AND CONCLUSIONS</b> .....	<b>246</b>
6.1	INTRODUCTION .....	246
6.2	CONTRIBUTIONS OF THE THESIS .....	248
6.2.1	<i>The Theoretical Framework</i> .....	248
6.2.2	<i>Contributions from the Empirical Data</i> .....	250
6.2.3	<i>Methodological Contributions</i> .....	259
6.3	LIMITATIONS OF THE RESEARCH .....	261
6.4	SUGGESTIONS FOR FURTHER RESEARCH .....	264
6.5	CONCLUDING REMARKS .....	267
<b>7</b>	<b>REFERENCES</b> .....	<b>270</b>
<b>8</b>	<b>PUBLICATIONS RESULTING FROM THIS RESEARCH</b> .....	<b>287</b>
8.1	JOURNAL ARTICLES .....	287
8.2	BOOK CHAPTERS/CONFERENCE PROCEEDINGS .....	287
8.3	CONFERENCE PRESENTATIONS .....	287
	<b>APPENDICES</b> .....	<b>289</b>
	APPENDIX 1: WATER AND WASTEWATER STUDY .....	290
	APPENDIX 2: HOUSES PRESENTED IN STUDY OF ATTITUDES TOWARDS VARIOUS HOUSE TYPES .....	297
	APPENDIX 3: SURVEYS FOR STUDY OF CLADDING MATERIALS .....	300
	APPENDIX 4: DETAILED RESULTS OF THE CORRESPONDENCE ANALYSIS FOR THE COMBINED DATA OF THE CLADDING SURVEY .....	343
	APPENDIX 5: SURVEY FOR STUDY OF HOUSE PURCHASE BEHAVIOUR .....	344
	APPENDIX 6: DESCRIPTIVE STATISTICS FOR STUDY OF HOUSE-PURCHASE BEHAVIOUR .....	357



# Index of Tables

TABLE 1 - EXAMPLES OF OPPORTUNITIES AND CONSTRAINTS REGARDING ECOLOGICALLY SUSTAINABLE BEHAVIOUR .....	38
TABLE 2 – SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FOR THE WASTEWATER STUDY .....	95
TABLE 3 - CROSS TABULATION OF COMBINED ATTITUDE SCORE AND WILLINGNESS TO CONSIDER A COMPOST TOILET .....	107
TABLE 4 – DETAILS OF HOUSE VARIATIONS USED IN THE CLADDING STUDY .....	139
TABLE 5 - BREAKDOWN OF RANDOMISATION OF SURVEY VARIATIONS .....	144
TABLE 6 - STATEMENTS PRESENTED ABOUT EACH HOUSE VARIATION .....	145
TABLE 7 - OTHER QUESTIONS ASKED OF EACH RESPONDENT IN THE CLADDING STUDY.....	145
TABLE 8 - SOLUTION TO RADIO BUTTON PROBLEM .....	153
TABLE 9 - RESPONSE RATES FOR PAPER SURVEY BY AREA .....	156
TABLE 10 - SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FOR THE CLADDING STUDY .....	159
TABLE 11 - EFFECT OF CLADDING MATERIAL ON PREFERENCE.....	164
TABLE 12 - EFFECT OF ROOFING AND HOUSE TYPE ON PREFERENCE .....	164
TABLE 13 - OVERALL MEAN PREFERENCE RANKING OF EACH HOUSE.....	168
TABLE 14 - CORRELATIONS BETWEEN INDIVIDUAL PREFERENCE MEASURES AND BEHAVIOURAL INTENTION FOR HOUSES 15 AND 19 .....	174
TABLE 15 - ATTITUDES TO BE MEASURED IN THE MAIN SURVEY .....	207
TABLE 16 - SUBJECTIVE NORMS TO BE MEASURED IN THE MAIN SURVEY .....	208
TABLE 17 - PERCEIVED BEHAVIOURAL CONTROL ITEMS TO BE MEASURED IN THE MAIN SURVEY .....	209
TABLE 18 - ITEMS USED TO MEASURE ENVIRONMENTAL PREFERENCE .....	210
TABLE 19 - THE HOUSES USED IN THIS STUDY, ALONG WITH THE ASSOCIATED MEASURES OF PREFERENCE FROM CHAPTER 4.....	211
TABLE 20 - SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FOR THE ATTITUDES TOWARDS HOUSE PURCHASE STUDY .....	216
TABLE 21 - MEASURES OF BEHAVIOURAL INTENTION USED IN THE SURVEY .....	219
TABLE 22 - EXPERIMENTAL DESIGN USED (CLADDING X DESCRIPTION).....	221
TABLE 23 - SKEWNESS ANALYSIS FOR ATTITUDE SCORE WITH AND WITHOUT ATTITUDE 3 .....	224
TABLE 24 - CORRELATIONS OF TPB COMPONENTS FOR ALL FOUR SURVEYS.....	225
TABLE 25 - CORRELATIONS FOR TPB COMPONENTS FOR COMBINED SURVEYS (SPLIT BY DESCRIPTION) .....	226
TABLE 26 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE FOR THE 'STANDARD DESCRIPTION' SURVEYS.....	228
TABLE 27 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE FOR THE 'SUSTAINABLE DESCRIPTION' SURVEYS. ....	229
TABLE 28 - CORRELATIONS OF AR, AC AND PN FOR ALL FOUR SURVEYS .....	230
TABLE 29 - MULTIPLE REGRESSION RESULTS FOR AC AND AR WITH PN AS DEPENDENT VARIABLE ....	230
TABLE 30 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE, INCLUDING 'PREFERENCE' AS AN IV FOR THE 'SUSTAINABLE DESCRIPTION' SURVEYS. ....	232
TABLE 31 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE, INCLUDING 'PREFERENCE' AS AN IV FOR THE 'STANDARD DESCRIPTION' SURVEYS. ....	232
TABLE 32 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE, INCLUDING 'INFERRED PERSONALITY' AS AN IV FOR THE 'SUSTAINABLE DESCRIPTION' SURVEYS. ....	236
TABLE 33 - MULTIPLE REGRESSION ANALYSIS WITH BEHAVIOURAL INTENTION AS THE DEPENDENT VARIABLE, INCLUDING 'PREFERENCE' AS AN IV FOR THE 'STANDARD DESCRIPTION' SURVEYS. ....	236

# Index of Figures

FIGURE 1 - HOUSING AS PART OF THE GLOBAL ECOSYSTEM (FROM MARSH, 1997) .....	4
FIGURE 2 - DIAGRAM SHOWING THE THREE COMPONENTS OF SUSTAINABILITY .....	5
FIGURE 3 - DIAGRAM SHOWING CANTER'S (1977) VISUAL METAPHOR OF 'PLACES' .....	6
FIGURE 4 - VISUAL METAPHOR FOR THE STUDY OF THE RELATIONSHIP BETWEEN PEOPLE AND THEIR SOCIO-PHYSICAL ENVIRONMENT. ....	7
FIGURE 5 - THE PERSON-IN-ENVIRONMENT UNIT OF ANALYSIS .....	9
FIGURE 6 - SCHEMATIZATION OF THE RELATIONS BETWEEN THE THREE CLASSES OF DETERMINANTS IN TRIADIC RECIPROCAL CAUSATION. (FROM BANDURA, 1986, P.24) .....	10
FIGURE 7 - CHANGING STATUS OF ENVIRONMENT AND BEHAVIOUR (TAKEN FROM BANDURA, 1986, P.27) .....	11
FIGURE 8 - COMBINING WAPNER'S (1995) ASPECTS OF THE 'PERSON-IN-ENVIRONMENT' WITH BANDURA'S (1986) CONCEPT OF 'TRIADIC RECIPROCALITY' .....	14
FIGURE 9 - THE THREE COMPONENTS OF SUSTAINABLE DEVELOPMENT .....	33
FIGURE 10 - MODEL OF AESTHETIC RESPONSE TO BUILDINGS (FROM NASAR, 1994, P.381) .....	52
FIGURE 11 - CONCEPTUAL MODEL OF THE PERCEPTUAL ASPECT OF SUSTAINABLE DESIGN (FROM SUGIYAMA, 2001, P.4) .....	53
FIGURE 12 - RAPOPORT'S 'DISMANTLING' OF CULTURE AND RELATING ITS EXPRESSIONS TO THE BUILT ENVIRONMENT.....	56
FIGURE 13 - SCHWARTZ'S NORM ACTIVATION THEORY.....	58
FIGURE 14 - STERN'S VALUE-BELIEF-NORM MODEL .....	59
FIGURE 15 - THE THEORY OF PLANNED BEHAVIOUR (FROM AJZEN, 1991, P.182) .....	60
FIGURE 16 - FAZIO'S (1990, P.84) MODEL OF THE ATTITUDE-BEHAVIOUR PROCESS.....	65
FIGURE 17 - CONCEPTUAL MODEL WITH EXPANDED 'INDIVIDUAL' COMPONENT.....	68
FIGURE 18 - CONTEXT, AS CONCEPTUALISED BY CLITHEROE (1998, P.106).....	70
FIGURE 19 - CONCEPTUAL MODEL WITH EXPANDED 'SOCIO-CULTURAL CONTEXT' COMPONENT .....	73
FIGURE 20 - GRAPHIC REPRESENTATION OF BRONFENBRENNER'S (1979) NESTED INTERCONNECTED SYSTEMS OF HUMAN DEVELOPMENT.....	74
FIGURE 21 - CONCEPTUAL MODEL WITH CASE STUDY 1 FOCI HIGHLIGHTED.....	80
FIGURE 22 - DESCRIPTIVE STATISTICS FOR ATTITUDES TOWARD SUSTAINABLE WATER MANAGEMENT ..	97
FIGURE 23 - FREQUENCY DISTRIBUTION FOR COMBINED SCALE OF ATTITUDES TOWARDS SUSTAINABLE WATER MANAGEMENT .....	99
FIGURE 24 - AGE OF RESPONDENTS BY COMBINED ATTITUDE SCORE (LOW, MEDIUM, HIGH) .....	100
FIGURE 25 - WOULD YOU BE WILLING TO PAY TO HAVE A WATER RECYCLING SYSTEM INSTALLED...? .	103
FIGURE 26 - HOW MUCH WOULD YOU BE WILLING TO PAY TO HAVE A WATER RECYCLING SYSTEM INSTALLED?.....	105
FIGURE 27 - WHO DO YOU THINK SHOULD PAY FOR INSTALLING SYSTEMS LIKE THIS?.....	106
FIGURE 28 - CONCEPTUAL MODEL WITH CASE STUDY 2 FOCI HIGHLIGHTED.....	119
FIGURE 29 - GRAPH PLOTTING RATINGS OF PLEASANTNESS (1 = PLEASANT, 7 = UNPLEASANT) AGAINST CONSIDER BUYING (1 = WOULD DEFINITELY CONSIDER, 5 = DEFINITELY NOT) .....	133
FIGURE 30 - GRAPH PLOTTING RATINGS OF PLEASANTNESS (1 = PLEASANT, 7 = UNPLEASANT) AGAINST TRADITION (1 = TRADITIONAL, 7 = MODERN).....	134
FIGURE 31 - GRAPH PLOTTING RATINGS OF PLEASANTNESS (1 = PLEASANT, 7 = UNPLEASANT) AGAINST DURABLE (1 = DURABLE, 7 = NON-DURABLE).....	134
FIGURE 32 - GRAPH PLOTTING RATINGS OF TRADITION (1 = TRADITIONAL, 7 = MODERN) AGAINST DURABLE (1 = DURABLE, 5 = NON-DURABLE).....	135
FIGURE 33 - HOUSE DESIGNS USED IN THE CLADDING STUDY .....	137
FIGURE 34 - BACKGROUND PHOTOGRAPHS USED IN CLADDING STUDY .....	138
FIGURE 35 - LINING UP THE CAD MODEL WITH THE PHOTOGRAPH .....	140
FIGURE 36 - FINAL RENDERED IMAGE IN PHOTOGRAPHIC BACKGROUND .....	141
FIGURE 37 - SCREENSHOT OF INTERNET SURVEY WITH 'PERCENT COMPLETE' BAR SHOWING AT THE BOTTOM.....	152
FIGURE 38 - RADIO BUTTON STATES .....	153
FIGURE 39 - EFFECT OF CLADDING MATERIAL ON PERCEPTIONS OF TRADITION AND DURABILITY .....	160
FIGURE 40 - EFFECT OF CLADDING MATERIAL ON PERCEPTIONS OF PLEASANTNESS AND PURCHASE CONSIDERATION .....	161

FIGURE 41 - EFFECT OF CLADDING MATERIAL ON PERCEPTIONS OF UNUSUAL AND BORING AND MATERIALS COMPLEMENT ..... 162

FIGURE 42 - EFFECT OF CLADDING MATERIAL ON UNAPPEALING, MODERN, AND SALEABILITY..... 162

FIGURE 43 - FREQUENCY DISTRIBUTION OF PREFERENCE SCORES ..... 163

FIGURE 44 - ANOVA PLOT FOR PREFERENCE X CLADDING X HOUSE TYPE FOR SLATE ROOF ..... 165

FIGURE 45 - ANOVA PLOT FOR PREFERENCE X CLADDING X HOUSE TYPE FOR STEEL ROOF ..... 166

FIGURE 46 - MEAN PREFERENCE RANKING BY CLADDING ..... 169

FIGURE 47 - MEAN PREFERENCE RANKING BY ROOFING..... 169

FIGURE 48 - MEAN PREFERENCE RANKING BY HOUSE TYPE ..... 170

FIGURE 49 - RESULTS OF CORRESPONDENCE ANALYSIS FOR COMBINED SURVEY RESULTS..... 172

FIGURE 50 - CONCEPTUAL MODEL WITH CASE STUDY 3 FOCI HIGHLIGHTED..... 187

FIGURE 51 - CORRELATIONS BETWEEN INFERRED PERSONALITY CHARACTERISTICS, ATTITUDES, AND SUBJECTIVE NORMS FOR SURVEY 1 ..... 234

FIGURE 52 - CORRELATIONS BETWEEN INFERRED PERSONALITY CHARACTERISTICS, ATTITUDES, AND SUBJECTIVE NORMS FOR SURVEY 2 ..... 234

FIGURE 53 - AMENDED CONCEPTUAL MODEL ..... 258

# 1 Introduction

## 1.1 The Overall Context

*“Sustainability (from the Latin, ‘sus tenere’, to uphold) is not simply a condition, as ‘sustainable vernacular architecture’ might suggest; it implies and requires active involvement and support” (Oliver, 2006, p.265)*

In 1987, the World Commission on Environment and Development published the Brundtland Report, *Our Common Future*, in which the definition of sustainable development was cemented as *“development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs”* (UN, 1987). Definitions of sustainability were then to be operationalised within local contexts. Following this, the Earth Summit held in Rio de Janeiro in 1992 agreed on a global programme of agenda-setting by local governments using the principles of sustainable development known as ‘Local Agenda 21’. This involved the creation of strategies for taking required action to tackle the issues inherent in the above definition (i.e. inter-generational equity, intra-generational equity and conservation of natural resource stocks<sup>1</sup>). A decade later in Johannesburg 2002, an implementation framework known as ‘Local Action 21’ was published, based on the operational tasks laid out in the various local government agendas. This implementation framework calls for (amongst other things) *“effective action to create sustainable communities and protect the global common goods”* (ICLEI, 2002). There is an ongoing search for technical solutions to many of the problems raised by the sustainable development agenda, but there is also a widespread recognition that a change in patterns of human behaviour is necessary in order to fully implement the principles of sustainability (Stern, 2000). The focus of this thesis will be on these issues of behaviour change, and how these relate to both the physical and the socio-cultural environment.

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<sup>1</sup> See Marsh, R. (1997) for a discussion of the history of sustainability

It should be noted that the terms 'sustainable housing' and 'sustainable houses' are used synonymously throughout this thesis. Indeed, the material discussed in this thesis is mostly restricted to the design of individual, detached houses, as opposed to terraced/joined housing<sup>2</sup>. It is also recognised that the term 'sustainable housing' is often understood in terms of a much broader process-based definition (i.e. the process of housing people, and how this relates to the various facets of sustainability), as opposed to focussing on the house itself, but for the purposes of this thesis, a product-based (i.e. house-based) definition has been assumed. Moreover, the focus of 'sustainable housing' within this thesis is restricted to the UK (Scottish) context, and it is noted at this point that many of the studies from the literature referred to in the thesis may well not share this geographical context. However, where studies that have not been carried out in the UK are referred to, it has been assumed (unless otherwise noted) that the particular theoretical issues (as opposed to the empirical findings) being discussed are transferable to the UK context.

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<sup>2</sup> The focus on individual, detached housing within this thesis does not imply that there is anything intrinsically more, or less sustainable about this particular form of housing. There are many complex arguments surrounding the issue of sustainability and housing density. Indeed, non-detached housing is often regarded as being more sustainable in terms of resource efficiency, potential for increasing solar gain via housing layout (passive solar), efficiency of land use, including the potential to free up land on development sites for communal facilities such as reedbeds, or communal heating systems. Such issues are obviously however, site dependent, and in some cases, individual detached houses are appropriate in a given layout, or in rural locations.

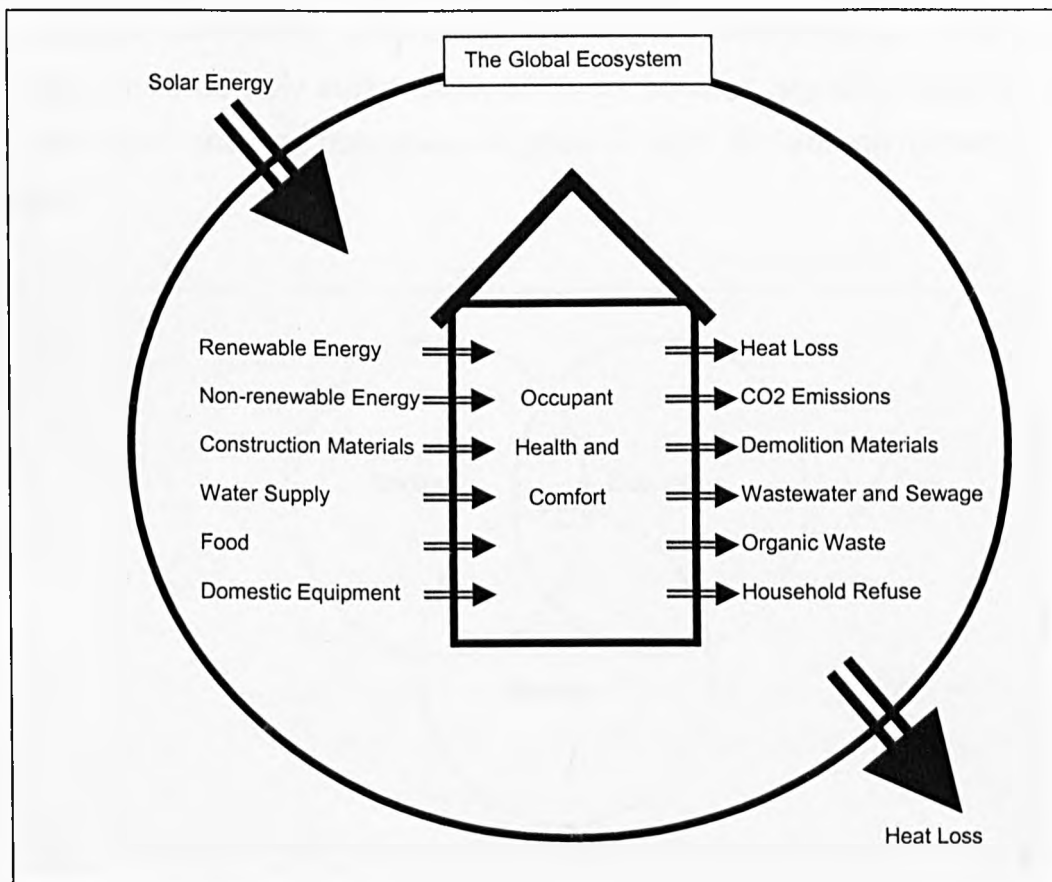
## **1.2 The Need for Sustainable Housing**

The construction industry, including the housebuilding sector, is widely acknowledged as a producer of significant environmental impact (Smith et al., 1997). Reducing these impacts requires both organisational and societal changes. The UK Housing Forum (Housing Forum, 2000) recently published the following six guiding principles to improving sustainability in housebuilding:

- reduce carbon dioxide emissions;
- minimise pollution;
- consider whole life costs;
- use resources to their maximum utility;
- provide for integrated communities;
- consult and engage existing communities.

The need to use such guiding principles in the planning of future housing construction is well established. However, although regulations and best-practice programmes are slowly having an impact, sustainable house construction is still far from the norm, especially in the UK. This is, in part due to the 'minimum permissible standards' culture that seems to pervade the construction industry (Smith et al, 1998), along with the tendency for developers to focus on maximising profits by reducing costs (Roaf, 2004). The situation is improving however, with widespread support for a recent proposal from the WWF-UK that sustainable homes, as measured by the BRE Ecohomes 'Very Good' Standard (BRE, 2003), should become standard practice in the UK by 2012 (WWF-UK, 2002). This rather standardised 'checklist' approach is useful in ensuring that sustainability principles move beyond mere 'agenda setting', towards a more pro-active action oriented approach. Insofar as such means can create change, they can be very successful in achieving their objective (i.e. achieving BRE Ecohomes standard). However, the initial implementation is likely to stem from the 'minimum permissible standards'

culture previously mentioned. The utility of such an approach to change the dominant social paradigm<sup>3</sup> towards sustainability principles (Milbrath, 1994) is at best questionable, as the aim of such methods is to contribute to sustainable development and business success by reducing environmental impact at minimum net cost to the developer (Prior & Bartlett, 1995). In his discussion of an integrated model for sustainable housing, Marsh (1997) provides an illustrative model, where the house is seen as part of the global ecosystem, with energy and resources flowing into the house. These resources impact on the health and comfort of the house's occupants, and a variety of wastes are expelled from the house (see Figure 1).

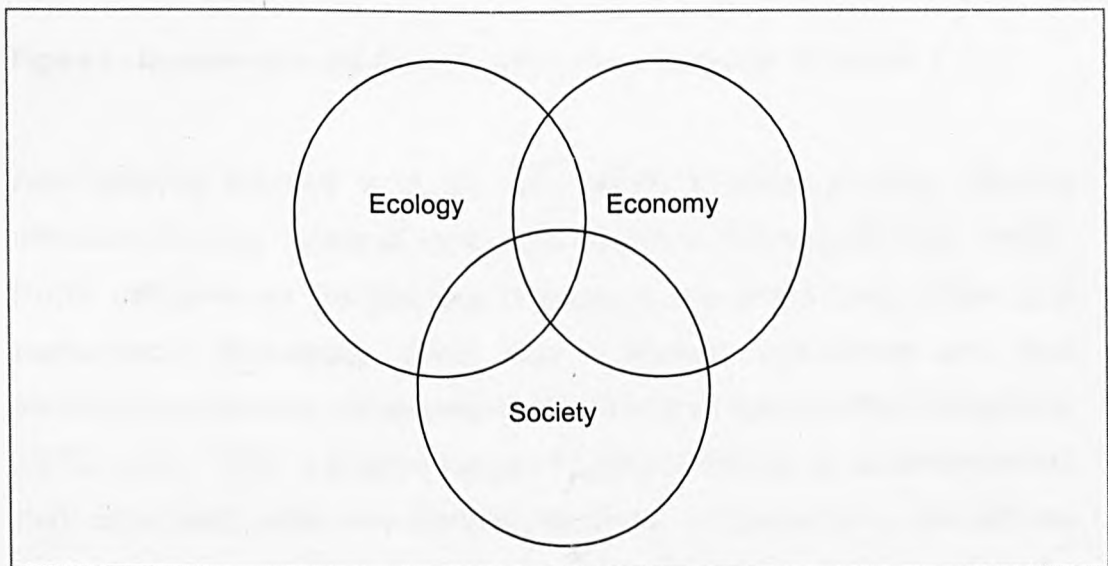


**Figure 1 - Housing as part of the global ecosystem (from Marsh, 1997)**

It has been said that designing landscapes around the principles of sustainability with a strong emphasis on ecological sustainability, can

<sup>3</sup> See section 2.3.2

sometimes lead to landscapes which are “*plagued by dreary utility*” (Mozingo, 1997, p56) especially when social and cultural considerations are not integrated into the design process. Although landscape design and housing design are clearly very different, it is arguable that much of the housing that is currently being built not around sustainability principles, but governed by minimum acceptable standards and market forces might equally be said to be plagued with such “dreary utility”. If social and cultural considerations are to be seriously embedded in the process of designing future housing such that ecological and social values are truly intertwined (Nassauer, 1992), then the house-buying public needs to be engaged, or at least considered in the design and planning processes as partners at every possible stage. Figure 2 shows the most commonly understood domains of sustainability. For an approach to be truly sustainable, all three domains arguably need to be considered, and any outcomes weighed up with all three components in mind.

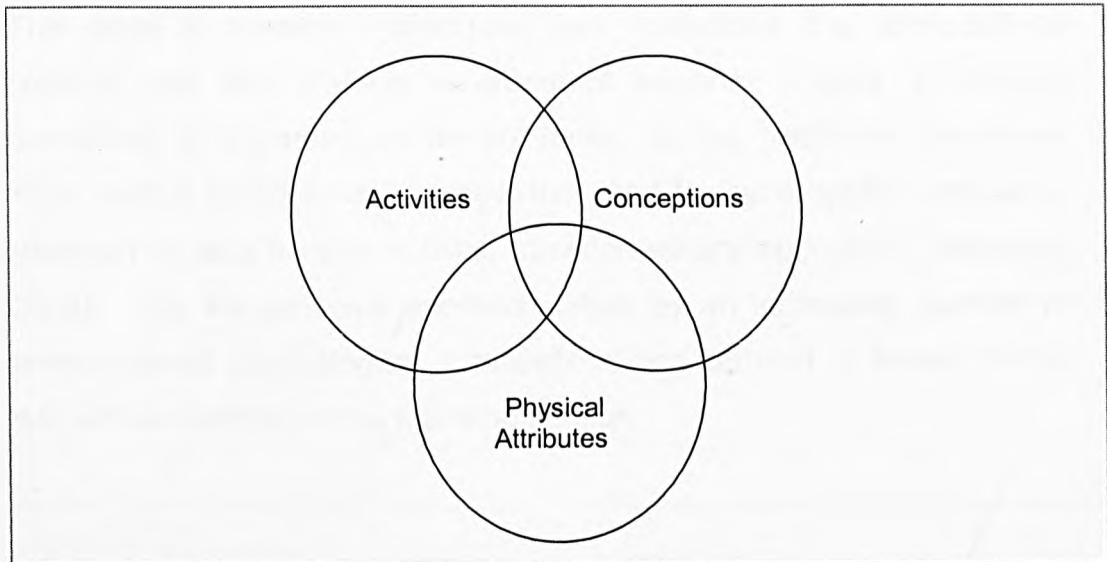


**Figure 2 - Diagram showing the three components of sustainability**

The three-circle Venn diagram depicted in Figure 2 might be seen as a parallel to Canter's (1977) three-circle diagram (see Figure 3) depicting a visual metaphor describing the nature of 'places'. In Canter's metaphor, the three circles are 'activities', 'conceptions', and 'physical attributes',



where places can only be fully understood by considering all three facets together. Insofar as an 'unsustainable' place might be thought to result from a tension between the 'ecology' and 'economy' spheres, so too it might be considered a result of a tension between 'physical attributes' and 'activities'. It all depends on the explanatory or metaphorical framework one begins with.

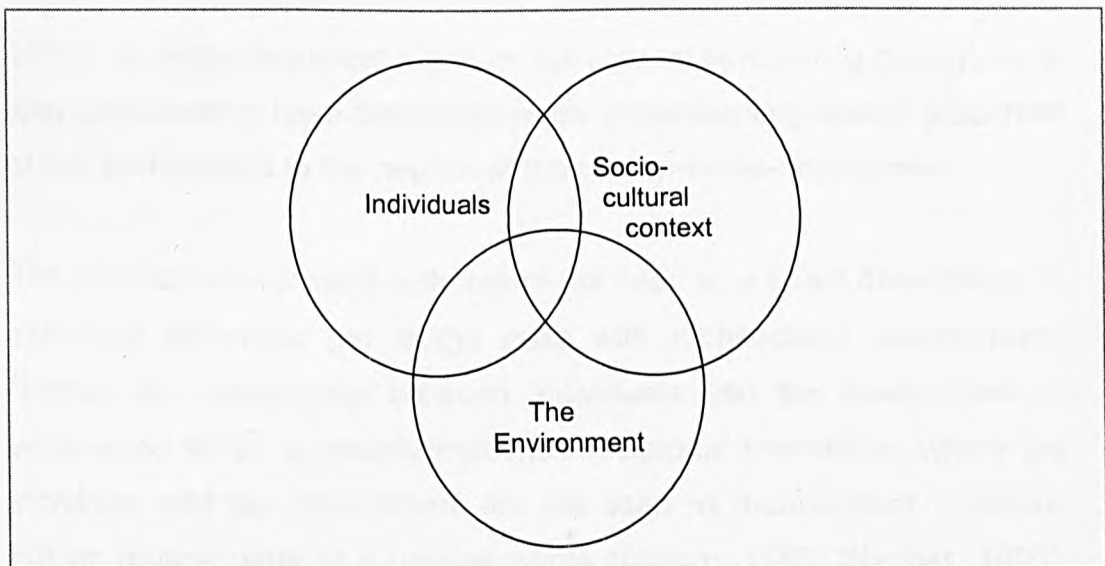


**Figure 3 - Diagram showing Canter's (1977) visual metaphor of 'places'**

Any planning process is by its very nature a social process, feeding ultimately into the "goals of society" (Parker and Penning-Rowsell, 1980). Public influence on the planning process is one of the basic pillars of a participatory democracy, given that in theory, *'individuals and their institutions cannot be considered in isolation from one another'* (Pateman, 1970, p.42). Thus, a diverse range of opinions should be accommodated and considered within any planning decision. In planning for sustainable future housing provision, such participatory measures are implicit in the guiding principles outlined earlier. In addition, however, consideration must also be given to the symbiotic relationship between people and the socio-physical environment they inhabit. Given that sustainability is compromised by the over-consumption of resources and energy, both as individuals and as a society, as Smith et al. (1998) put it: *"it is no accident that [our] materialistic society should have produced a built environment*

*which facilitates consumption and makes a non-materialistic lifestyle difficult*" (p165). The point here is that in itself, simply 'consulting' and 'engaging' communities about physical neighbourhood change does very little to change the dominant social paradigm (See section 2.3.2), as cultural values are both slow to change, and hard to change by direct intervention.

This need to consider individuals, their institutions (i.e. socio-cultural context) and the physical environment together (Figure 4) creates something of a conundrum for academia, as few traditional disciplines have such a broad focus. Hence, the need for such applied real-world research to take a more holistic, transdisciplinary approach (Lawrence, 2004). The transactional approach taken by an increasing number of environmental psychologists is thought to provide such a holistic focus, and will be explored in the following section.



**Figure 4 - Visual metaphor for the study of the relationship between people and their socio-physical environment.**

### **1.3 The Transactional Approach in Environmental Psychology**

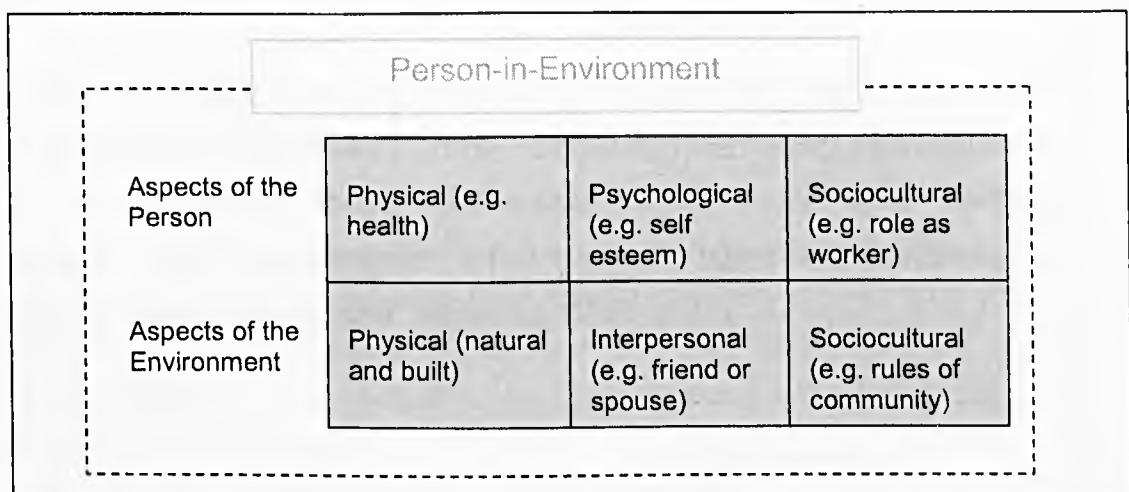
The academic field of environmental psychology differs from other social sciences as the emphasis is on both the physical environment and people as the major units of analysis. Whereas geography as a discipline concentrates predominantly on the physical environment<sup>4</sup> as its unit of analysis, and similarly psychology concentrates predominantly on the individual person, environmental psychology attempts to synthesise the two in a way which is theoretically transactional (Stokols, 1995; Sundstrom et al., 1996). It also tries to provide an inter-relational explanation of the studied phenomenon (Moser, 2000). Although it is arguable that human geography and environmental psychology share the unit of analysis 'person in environment', they differ in their disciplinary starting point. Indeed, it has been argued that until recently psychologists have concentrated their efforts on understanding mental processes to the neglect of the person-environment interaction (Walmsey and Lewis, 1993). A similar argument might be put forward concerning geographers, who until recently have concentrated on understanding spatial properties of the environment to the neglect of the person-in-the-environment.

The physical environment is therefore not seen as a direct determinant of individual behaviour (as is the case with architectural determinism). Rather, the relationship between individuals and the environment is understood to be a socially mediated reciprocal interaction, where the individual and the environment are not seen as independent variables, but as mutual parts of a greater whole (Altman, 1985; Wapner, 1995). Such transactional worldviews "*rely heavily on Aristotle's formal causality, or the description of the pattern and form of a specific event, and give less attention to an efficient causation approach, for example, the search for antecedent-consequent relationships*" (Altman, 1985, p.28). Indeed, such an Aristotelian treatment is "*not the kind of causal view reflected in much 20<sup>th</sup>-century psychological theory*" (Heft, 2001, p.274), but is

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<sup>4</sup> The Oxford English Dictionary® definition of geography is '*the study of the physical features of the earth and of human activity as it relates to these*'.

nevertheless important in offering an account of how 'structure' can be conveyed between 'environment' and 'individuals' (Heft, 2001). Studies using such a transactional approach are expected to take an holistic approach, viewing the relationship between people and environment as a dynamic system (Heft, 2001). They seek to document the main aspects of the phenomenon (Werner et al., 2002) whereby a change in one or more of these aspects is understood to impact on the unified whole (Wapner, 1995). Figure 5 shows the six aspects of the whole person-in-environment unit of analysis (from Wapner, 1995; Wapner and Demik, 2002), which is essentially the heart of the transactional worldview.



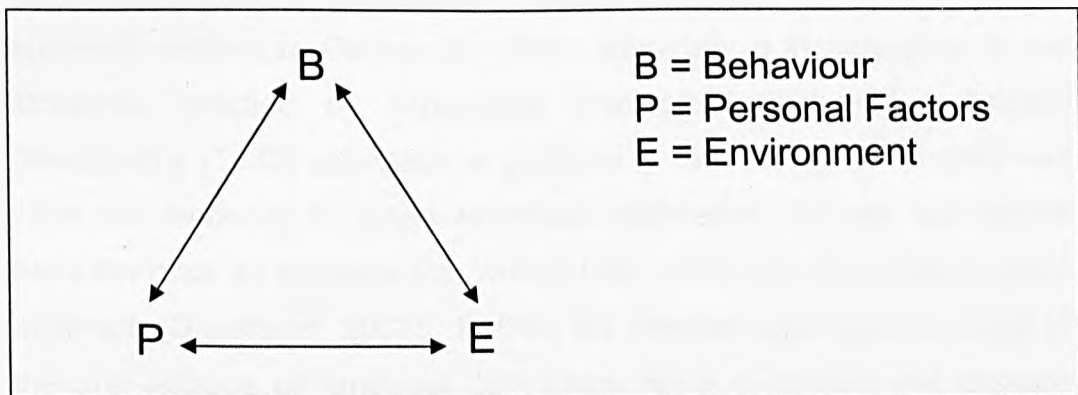
**Figure 5 - The Person-in-Environment Unit of Analysis**

The academic formulation of the transactional worldview can be traced to the transactional school of perception of the 1940's in Princeton University, where the idea that 'perceiver' and 'reality' should be considered as part of the same process was first formulated (Bonnes and Secchiaroli, 1995). This idea is mirrored in Lewinian 'field theory' of the same era, where the physical environment and the social environment are considered as inseparable components of psychological investigation (Bonnes and Secchiaroli, 1995; Marrow, 1969; Heft, 2001). Importantly, these ideas do not in any way rule out the discovery or use of general principles of psychological functioning. Indeed, as Altman (1985) put it:

*“The important point is that transactional approaches begin with an event – a confluence of psychological factors, and temporal features – and try to uncover and/or apply established and new principles to account for the event”*  
(p.28)

An example of such an event which might be explored through this framework is the emergence of a ‘sustainability aesthetic’ within so-called ‘green architecture’, and the various ways this ‘event’ might be understood from a psychological perspective, whilst taking into account both temporal and contextual aspects of the ‘event’.

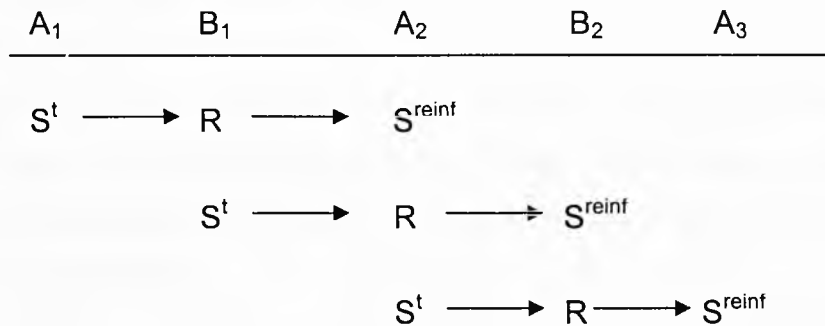
Echoes of these ideas can also be found in the ‘triadic reciprocity’ discussed within Bandura’s (1986) social cognitive theory (See Figure 6). In social cognitive theory, *“behaviour, cognitive and other personal factors, and environmental influences all operate interactively as determinants of each other”* (Bandura, 1986, p.23).



**Figure 6 - Schematization of the relations between the three classes of determinants in triadic reciprocal causation. (From Bandura, 1986, p.24)**

Bandura (1986) emphasises the temporal nature of interactions between behaviour and environment, by pointing out that events can be seen as either ‘environment’ or ‘behaviour’ depending *“...on which side of the ongoing exchange one happens to look first in the flow of events”* (p.26). This is shown diagrammatically in Figure 7.

Illustration of how the same events change their status from behaviour to environment and from environment to behaviour at different entry points in the flow of interaction between two people. The As are successive responses by one person, and the Bs successive responses by the second person in the dual interaction: S<sup>t</sup> represents "stimulus"; R represents "response"; S<sup>reinf</sup> represents reinforcer.



**Figure 7 - Changing Status of Environment and Behaviour (taken from Bandura, 1986, p.27)**

The transactional approach also de-emphasises the isolation of static moments in time for the study of the person-in-environment. Instead, it focuses on the reciprocal processes of the various components of the 'whole' across time. In this way, the approach is similar to the dialectic approach outlined by Georgoudi (1983), especially in its opposition to the academic practice of separating ontological domains. Indeed, Georgoudi's (1983) approach is particularly interesting, as it does not have the tendency to refute empirical exploration, as has sometimes been the case for example with writers from within the phenomenological approach (Graumann, 2002). Rather, the dialectic approach is critical of the over-reliance on empirical data which tends to restrict and obscure our understanding of a particular subject matter, partly due to its inherent 'snapshot' approach to phenomena (Georgoudi, 1983). The point then is to utilise empirical data where appropriate, but to complement this with a more holistic approach when it is found that the subject under investigation becomes restricted by the empirical approach. Rather than having to re-focus the questions, it is seen as appropriate to change the approach taken to the problem under investigation. Whereas empirical studies within psychology tend towards maximizing the proportion of

explained variance, the transactional approach (as used within this thesis) would expand the focus to include non-observed phenomena within the transactional whole being investigated. In many ways, even the most experimentally driven empirical studies do in fact place the findings within their holistic context when discussing the wider implications of the empirical findings being reported. However, at the end of the day, the unit of analysis is somewhat different, and it is sometimes the case<sup>5</sup> that in the absence of any kind of 'transactional' focus, some of the contextual arguments made in some studies might be at best described as speculative.

In much the same way as social psychology grapples with the problem of the 'individual' within 'society' (see e.g. Moscovici, 2001), environmental psychology faces a similar problem - that of the 'individual' in 'the socio-physical environment'. The person-in-environment unit of analysis, along with an appreciation of the importance of time (see Friedman, 1990) appears to offer a useful way to proceed with the aforementioned need to consider individuals, the socio-cultural context and the physical environment together.

In terms of how to proceed with this 'transactional approach' to research, Lawrence (2001) suggests (in his discussion about Human Ecology) that:

*"People-Environment interrelations cannot be understood in a comprehensive way by concepts and methods from one or a few disciplines. It is necessary to apply a wide range of concepts and methods, because environmental problems and social problems are not structured within traditional disciplinary and sectoral boundaries" (p.691).*

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<sup>5</sup> This does not mean that studies that claim to be transactional are inherently less speculative, but rather that studies that start with the 'transactional whole' as the unit of analysis are more likely to look for evidence pertaining to that unit of analysis as the research progresses. There are many studies that do in fact take such a holistic process without claiming to be 'transactional'. However, there are also many studies that attempt to place the findings 'in context' in a rather post-hoc manner, thereby potentially missing some of the complexities of the transactional whole.

It seems then, that the study of the transactions between people and their environments must by definition cross disciplinary boundaries, and in doing so, will often lead researchers into the un-charted waters of transdisciplinary research. If the study of people-environment relations from a human ecology stance leads to this necessary recognition of the transdisciplinary perspective, then the study of people-environment transactions must acknowledge the importance of this innovative manner of conducting research. That said, it is no understatement to suggest that the relationships between researchers in different disciplines is often considered to be 'conflictual' (Lawrence, 2001).

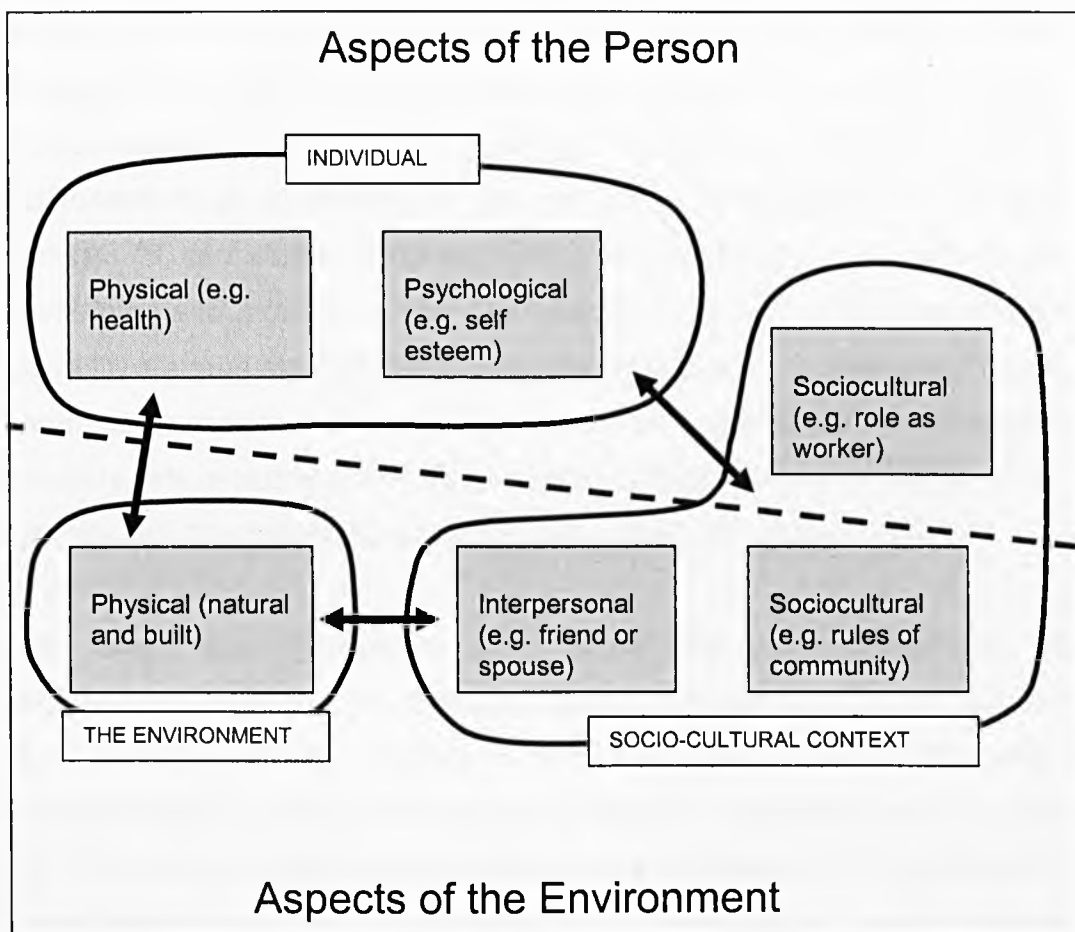
Werner et al. (2002) set out the following rather simplistic 8 guidelines for conducting transactionally oriented research:

1. Begin with a research problem which interests you.
2. Think of the phenomenon as a whole and identify its various aspects.
3. Explore the possible breadth of the project, by selecting which features to emphasise.
4. Seek mutual definition between aspects.
5. Gather data 'reflexively'.
6. Draw on multiple perspectives and participants to gather information.
7. Apply formal cause to the phenomenon.
8. Narrow the scope of analyses to manageable but meaningful portions.

The suggestion here is that transactional researcher cycles iteratively through these steps, rather than following the sequence in a '*lock-step and rigid way*' (Werner et al., 2002, p217). Such formulated guidelines are useful insofar as they make the study of person-in-environment transactions more do-able, and less daunting.



Although the transactional approach to people-environment studies defines the environment as being socio-physical, few studies attempt to document the various socio-political channels through which these transactions go in order to be adequately understood. One reason for the scarcity of studies which systematically examine people-environment transactions is the “*staggering complexity of the large-scale environment*” (Stokols and Shumaker, 1981), when compared with studies of the micro-environment, where the definition of variables and stimuli is arguably an easier task.



**Figure 8 - Combining Wapner's (1995) aspects of the 'person-in-environment' with Bandura's (1986) concept of 'Triadic Reciprocity'**

Combining Wapner's (1995) six aspects of the person-in-environment (Figure 5) with the concept of 'Triadic Reciprocity' (Figure 6) from Bandura (1986) provides a potentially useful way in which causal relationships within the person-environment transaction might be

investigated. This is shown diagrammatically in Figure 8. Although the differentiation between aspects of the person and aspects of the environment is in a way artificial (see Linneweber, 1988), focussing on isolated elements in this manner makes it more practical to plan and carry out research into people-environment transactions.

People's aesthetic and behavioural response to housing built-for-sale (i.e. developer led housing) is a good example of an issue which would benefit from a systematic study of the person-environment transaction. House-builders tend to work on the principle that they are building '*what the market wants*' if customers continue to buy their houses (Asquith, 2006). Changes in the nature of the housing product will only be made if there is some reason to believe that something about the product is leading customers to go elsewhere for their houses. As Rapoport (1971) says though: "*it cannot be assumed, just because people seem to accept something and adapt to it, that it is desirable and has no harmful effects*" (p.111). Various attempts have been made previously to find assessment methods to measure the aesthetic impact of buildings, but have tended towards lists of rather prescriptive criteria (Uzzell and Jones, 2000), which usually lack the holistic focus necessary in such a complex field.

One recent study (Ellingham, 2002) found that public preferences for different house styles had changed significantly over a thirty year period. This was observed by changes in price for houses with specific design characteristics. Although this particular study is arguably limited insofar as it relies on extrapolating from house price fluctuations, it illustrates the importance of studying the attitudes and preferences of people actually involved in the house-buying process. Combining such approaches with preference studies from the environmental psychology literature (e.g. Herzog and Sheir, 2000) might go some way to bridging the gap between theory and observable reality. If strong socio-political reasons exist for the housing environment to undergo a physical change, then it is vital to understand the relationships that exist between the people being housed and the complex system of individuals and organizations who create and

market housing. As Heft (2001) puts it: "...*human activity is always embedded in sociocultural structures*" (p.369). As such, any comprehensive study of activities such as house-purchase behaviour (or decisions) needs to be sensitive to the sociocultural structures within which such activities are embedded. The socio-political context outlined in section 1.2 demonstrated that there are various drivers for change in the area of house-building, and that moves towards sustainability are slowly beginning to filter through the complex system of housing provision in the UK.

Within the discipline of forestry, the potential trade off between sustainability and people's preferences (particularly aesthetic preferences) has been acknowledged for some time (Sheppard et al., 2004). However, within the field of architecture and housing, this need to reconcile aesthetic considerations with sustainability considerations has not been widely discussed outside the architectural community. Indeed, put simply, there appears to be a polarisation of opinion within the broad church of 'ecological housing'. On the one hand, there are some who feel that '*sustainable/ecological housing*' should express a particular aesthetic<sup>6</sup> (e.g. Farmer, 1996). On the other hand, there are others<sup>7</sup> who feel that the routine use of aesthetic indicators of sustainability (e.g. turf roofs, timber cladding) can create a '*façade of sustainability*', which might not necessarily reflect the true 'sustainability credentials' of any given house.

Relating this back to the academic field of environmental psychology, it has been argued that much research about environmental concern and environmental attitudes has focussed on general sustainability issues, to the neglect of those contextual factors which captured the interest and theoretical focus of environmental psychologists in the past (see Bonnes

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<sup>6</sup> This is similar in some respects to the viewpoint of John Gloag, who asked in 1934, when commenting about the use of mock Tudor beams on houses at the time: "*why do we live in this sort of half baked pageant, always hiding our ideas in the clothes of another age?*" (Quoted in Chapman and Hockey, 1999). Although this viewpoint was clearly not directed at 'sustainable architecture', it was expressing the view that the ideas of a given time should be somehow 'readable' in the architecture produced by that 'age'.

<sup>7</sup> Personal communication with members of the Aberdeenshire Design Forum

and Bonaiuto, 2002; Bonaiuto et al., 2002). The transactional and contextual approach (see section 1.3), puts environmental psychology in the position to attempt an understanding of specific pro-environmental behaviours, not in reductionist terms, but as individual actions nested within a broader social and contextual dynamic (Bonnes and Bonaiuto, 2002).

This thesis will attempt to look at 'sustainable housing' by considering individual actions associated with 'sustainable housing' as part of a larger dynamic of people-environment transactions which take into account the socio-cultural and environmental aspects of the person-in-the-environment.

#### **1.4 Aims, Research Questions, and Approach**

The aim of this research is to utilise the transactional approach outlined in section 1.3, for the study of sustainable housing. While not all components of the 'transactional unity' will be focussed on to an equal degree, the phenomenon of 'sustainable housing' will be conceptualized using person-in-environment as the unit of analysis. The emphasis will therefore be on building up a coherent picture of the 'transactional unity' of sustainable housing, rather than attempting to empirically document all individual person-environment relationships in the overall area of sustainable housing. This is important to state at the outset, both for the theoretical reasons outlined previously, but also because in such a wide, interdisciplinary area, it would be near-impossible to adequately document (let alone empirically test) all of the potential antecedent-consequent relationships between people and the environment under the overall umbrella of 'sustainable housing'. The consequent focus of this research is therefore concerned with the relationships between those individual actions related to 'sustainable housing' and the larger dynamic of people-environment transactions which take into account the socio-cultural and environmental aspects of the person-in-environment.

The three broad aims of this PhD are:

- To outline a theoretical framework for conceptualising the person-in-environment relationship with respect to sustainable housing.
- To explore and develop this theoretical framework using case studies which illustrate the importance of considering the individual, the socio-cultural context, and the environmental aspects of sustainable housing together.
- To provide empirical evidence to validate this theoretical framework.

The **first aim** will be tackled by building up a conceptual model of the transaction between people and 'sustainable housing'. This conceptual

model will be based on the published literature in the area of both people-environment studies and 'sustainable housing'.

The **second aim** will be tackled **through two case studies**, each of which focus on particular aspects which have been previously documented as being potential facets of 'sustainable housing' – namely, domestic water and wastewater systems, and exterior cladding materials.

It should be noted at this point that the choice of these two particular focal aspects within this thesis was driven to a large degree by the funded research context which this particular body of work fed into. The author carried out the study of sustainable water and wastewater systems as part of an internally funded research project in collaboration with the department of Engineering at the University of Aberdeen. Similarly, the study looking at cladding materials was carried out as part of a much larger funded research commission on which the author was employed, looking at client and market resistance to prefabrication and standardisation in housing. This funded research project had a particular interest in cladding materials, and this by necessity had a strong influence on the choice of case study to be explored within this PhD thesis<sup>8</sup>.

These **two case studies** are presented as an initial test of the ability of the conceptual model (i.e. the first aim of the PhD) to accommodate different kinds of related research findings.

The **third aim** will be tackled through an experimental study will then look at the factors influencing the *likelihood of purchase consideration* for 'sustainable housing'. This will be done by combining many of the issues discussed in the two previous case studies, by focussing on the sustainability aspects dealt with in these studies. This **third study** will explore the extent to which symbolically communicated sustainability

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<sup>8</sup> The study presented here as a case study within the context of this thesis was carried out by the author as part of a large project called 'Overcoming client and market resistance to pre-fabrication and standardisation in housing' which was funded as part of the joint DTI/EPSRC MCNS 'LINK' Programme Meeting Client Needs through Standardisation (MCNS 04/09). See Edge et al (2002) for more details.

principles (via timber cladding) might influence the various antecedents to **behavioural intention** with respect to the purchase of such housing. The main discussion of the research findings will therefore be most concentrated on this third case study, as the study has been designed by incorporating, where appropriate, the results of the two previous case studies.

## **1.5 Overview of Thesis Structure**

The structure of the thesis is outlined below:

Chapter **two** will focus on the various issues that are considered important for the study of sustainable housing from the perspective of environmental-psychology. The aim of this chapter is to build up a transactional model of sustainable housing.

Chapter **three** documents a study carried out looking at the psychological aspects of sustainable water and wastewater management within the domestic context.

Chapter **four** documents an aspect of the 'physical environment' component of sustainability by focussing on the perceptual aspect of sustainable housing – particularly in relation to external cladding materials.

Chapter **five** documents the factors influencing the likelihood of purchase consideration for 'sustainable housing' by combining the material presented in the previous case studies and synthesising the findings with the conceptual model outlined in chapter two.

Chapter **six** discusses the major findings from the research in relation to the conceptual model outlined in chapter **two**. Suggestions are made concerning ways in which the approach outlined can be taken forward within the study of sustainable housing. Furthermore, suggestions are also made concerning the potential for the research findings to contribute to the understanding of individual behaviour from an environmental psychological perspective.



## **2 A Transactional Model of Sustainable Housing**

### ***2.1 Introduction***

This chapter will focus on the various issues that are considered important for the study of the psycho-social aspect of sustainable housing. By using a person-in-environment unit of analysis outlined in chapter 1, a transactional model of sustainable housing will be proposed. Section 2.2 will look at the importance of house and home for people in their everyday lives. The chapter will then go on in section 2.3 to discuss the concept of sustainability in relation to housing design, and document some contributions from the social science literature that shed light on some of the psycho-social aspects of sustainable housing. This is followed in section 2.4 by looking at the literature on psychosocial aspects of the built environment, and how these relate to the potential acceptance of sustainable housing design. Finally, section 2.5 develops a theoretical model which will act as a lens through which to view the empirical findings in the case studies presented within this thesis.

## **2.2 House and Home**

### **2.2.1 The multiple dimensions of home**

What does the term 'home' mean? Given the frequency that the word is used in everyday language, it would seem intuitive that a word like 'home' would be fairly easy to define, and therefore operationalise for academic study. It appears, however, that this is far from the truth. Indeed, attempts to adequately define home in a way which is academically useful have tended towards rather long definitions, such as:

*"The home is that spatially localised, temporally defined, significant and autonomous physical frame and conceptual system for the ordering, transformation and interpretation of the physical and abstract aspects of domestic daily life at several simultaneous spatio-temporal scales, normally activated by the connection to a person or community such as a nuclear family". (Benjamin 1995, p.158)*

*"Home is a dynamic concept, grounded in emotional and experiential structures which perpetuates a state of mind and which reflects routine practices which may, or may not occur within a dwelling"*  
(Gurney, 1996)

It seems that home means different things to different people – hence the need for such attempts at all-encompassing definitions. Moore (2000) provides a good overview of the various strands of literature covering the 'meaning of home', and argues for a more contextualised concept of home, where individuals' concepts of 'home' are socially and culturally bounded (p.213). Lawrence (1995) notes the recent trend towards using the term '*home*' as a euphemism for house by those responsible for marketing 'houses' to the public. It seems that the word home is thought to conjure up images of something more special and marketable than

simply 'house'. Whilst this might seem like a rather banal observation, there are many complex questions that arise when considering this simple trend. If developers advertise homes for sale, then what attributes of the experiential structure of 'home' are to be expected by the house-buying public in addition to the physical fabric of the house? This tendency towards treating 'house' and 'home' as synonyms was also noted by Dovey (1985, p.33), who argues that 'house' is a tangible, empirical variable, whereas 'home' is intangible in its nature, and better suited to a phenomenological approach. The term 'home-owner' is therefore seen as academically problematic, as it is hard to operationalise for empirical study.

This need to 'dismantle' terms into operationalisable components is similarly picked up on by Rapoport (1995), who claims that the term 'home' is problematic and confusing in a scientific context, in part due to the tendency to use the term for ever broader sets of phenomena in both popular and academic contexts. An illustrative parallel argument is made by Rapoport (1995) for similar terms such as 'vernacular', which have suffered similar 'broad-definition' problems across different disciplines, making academic synthesis problematic. Many prefer to use the term '*dwelling*' for the academic study of what is commonly understood to be '*home*' (see e.g. Rapoport, 1982; Kaiser and Fuhrer, 1996). '*Dwelling*' is understood as being a process – something we do – "*finding a spiritual and physical connection between the self and the physical world*" (Saegart, 1985, p287), as opposed to '*home*', which is seen as part of the dwelling process. As Lawrence (1995) put it:

*"The notion of dwelling does not assume that the physical unit of a house defines the experience of home"* (p.56)

The first studies to systematically examine the term 'home' from a psychological viewpoint did so by attempting to 'dismantle' home into thematic groups of individual 'meanings'. Hayward (1975) identified 5 clusters of meaning. These were: *Physical Structure; Territory; A Locus*

*in Space; Self and Self Identity, and Social and Cultural Unit.* However, the sample of this defining study was small and restrictive, so it is unlikely that these particular 'meaning clusters' are psychologically universal. After its publication, Hayward's work was arguably misappropriated by the academic community, leading to the "*misconception that one authoritative set of meanings was a realistic goal for psychologists to pursue*" (Moore, 2000, p.210).

Many studies subsequently resulted in the production of such 'lists' or 'clusters' (e.g. Sixsmith, 1986; Tognoli, 1987; Saunders, 1989; Despres, 1991). However, as pointed out by Moore (2000), whilst these 'lists' are useful in defining a shared conceptual 'language' for talking about home, they are easily misconceived as being psychological universals, equally experienced by all individuals. Lawrence (1995, p58) makes the observation that societal dimensions (including ideological, political and socio-economic factors) are frequently ignored in studies of home, with more focus instead being given to the spatial, temporal and experiential dimensions.

### **2.2.2 The importance of the house in creating home**

Notwithstanding the aforementioned cautions regarding the definitional problems surrounding the word 'home', it is nonetheless clear that there is a strong relationship between 'house' and 'home'. Lawrence (1987) begins his article 'what makes a house a home' with the following definition of house:

*"The house is a physical unit that defines and delimits space for the members of a household. It provides shelter and protection for domestic activities"* (p.155)

Thus, house is basically the physical 'stuff' of the home environment – the physical space to be inhabited by members of the 'household'. He then goes on to elaborate this definition, emphasising the importance of the seemingly intangible aspects of housing:

*“Yet, the fact that houses in the same society have quite different shapes and sizes, and are built with a range of construction materials, suggests that beyond pragmatic parameters, other factors are of at least equal importance in determining their design” (p.155)*

Houses are very often the physical unit in which ‘home’ is experienced. Whilst it is important to acknowledge the differences in ‘home’ across individuals, society, and cultures, and also that ideas of home can extend beyond the *house-walls*, houses are very often the physical structures within which people construct the idea of home. Thus, houses might be described as ‘the place where dwelling most often happens’ – the ‘primary territory’ – the ‘place you go home to’.

Home is therefore recognised as being more than simply something ‘in the head’<sup>9</sup>. There is usually a physical aspect to home, and that physical aspect is usually found in the domain of ‘houses’. Furthermore, Moore (2000) makes the interesting point that *“It is ironic that while home is examined largely because it has physical form, this feature of home has been left relatively unexplored in comparison with the personal and psychological aspects”* (p.213).

### **2.2.3 Symbolic communications and identity**

The idea that the physical aspects of houses are important for the experience of ‘home’ has been studied from the perspective of housing symbolism. The self-presentation view (see Baumeister, 1982) views social behaviour<sup>10</sup> as being motivated by either attempting to please an audience, or attempting to *“construct one’s public self congruent to one’s ideal”* (p.3). From this perspective, objects and attributes of housing

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<sup>9</sup> Heft (2001) includes an interesting historical discussion about the place of the ‘environment’ in theories of perception. The idea that the environment might (or might not) be ‘only in the head’ has been widely discussed by both philosophers and psychologists for centuries. The fact that ‘home’ has both physical and ‘mental’ connotations makes home, like food, (as Lawrence, 1995 puts it) *“an interesting thing to contemplate”*(p.53)

<sup>10</sup> Examples of such social behaviour are: helping behaviour, conformity, aggression, etc., but might equally include object (e.g. house) acquisition and display.

would be seen as non-verbal symbols. These non-verbal symbols are used to communicate or express aspects of the house occupant, such as social class or personality (Rapoport, 1982; Sadalla et al., 1987; Nasar, 1989; Sadalla and Sheets, 1993). This has been demonstrated empirically by examining correspondence between particular house-styles and the personality characteristics associated with that style (Sadalla et al., 1987; Cherulnik and Wilderman, 1986). Indeed, it seems that **choosing to live in a particular style of house** is seen to imply something about the underlying dimensions of your personality (Sadalla et al., 1987, p.175). There is therefore an assumption that, whether consciously or not, we are all expressing something about ourselves through the houses we choose to inhabit<sup>11</sup>. According to Festinger's (1954) well known theory of social comparison, people use other people as a basis of comparison for themselves, and tend to choose people similar to themselves as a basis for such comparison. Indeed, in the context of housing, Sadalla and Sheets (1993) demonstrated that, when asked to rate the personality characteristics of the owners of various houses, people tended to prefer those houses associated with personality characteristics similar to their own. A recent study of living rooms (Wilson and Mackenzie, 2000) has shown that people are able to infer a wide range of personality characteristics from particular features of domestic interiors.

A study by Nasar (1989) found significant differences between sociodemographic groups regarding the connotative meanings inferred from various house-styles. The desirability of certain house styles was found to be related to occupation, education, and age. Interestingly, a comparison between architects and non-architects found a significant difference particularly in relation to ratings of 'friendliness' for different house styles. Indeed, in this study, there was speculation that architects

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<sup>11</sup> It is important to note here that this assumes there to be at least an element of choice involved in housing decisions, which is obviously not the case with, for example, forced relocations.

appeared to assume inaccurately that the architectural preferences of 'the public' would mirror the architectural preferences of their 'clients'<sup>12</sup>.

So, evidence has found that choosing a particular house style is an important communication involving the selection of symbols in the environment in order to communicate aspects of identity to a social audience (Sadalla and Sheets, 1993). Thus, housing styles, especially those style aspects related to building materials, have been empirically shown to be important beyond merely their functional utility. Sadalla and Sheets (1993) make the point that whilst social meanings vary across space and time, people's judgements about the physical properties of building materials have been shown to be relatively stable from culture to culture. So:

*"Wood is softer than stone or brick and warmer to the touch. Brick and stone are inflammable [sic], durable, and tend to be heavier than wood. Notwithstanding symbolic interactionist theory, it remains possible that aspects of the symbolic meaning of a building material derive from its universal perceptual and functional properties"* (Sadalla and Sheets, 1993, p.167)

Therefore, the personality dimensions inferred about the occupant of a particular house might be in part due to the physical properties of the building material itself (e.g. cold people live in stone houses!). While this may appear simplistic on the surface, it is an important idea insofar as it implies a level of 'universality' not present in the symbolic interactionist perspective (cf. Blumer, 1969), where meaning is assumed to be almost entirely socially determined.

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<sup>12</sup> This is important insofar as architecture as a profession arguably has the task of symbolically communicating with the general public. If, as has been frequently documented, there is a wide divergence between the architectural professions and the public in terms of architectural preferences (see Gifford et al., 2002), then the reasons behind this difference need to be explored, and understood in the context of the design process.

The idea that objects of housing are understood as non-verbal symbols is discussed in detail in a paper by Kaiser and Fuhrer (1996), who see dwelling as a means of achieving social influence and self-representation. The authors use the metaphor of speech to illustrate the various ways that we communicate through and hear communications from our dwellings. Cooper Marcus (1995) took a depth psychology approach to the study of housing symbolism, where the house was considered to be an effective symbol for unconscious feelings about the self. Although Cooper Marcus has been criticised for her rather over-generalized approach to theorizing (Twigger-Ross, 1997), the work is nevertheless highly relevant in this context, as the link is explicitly made (albeit simplistically) between the person and the self-as-expressed-by-environment, with the audience of expression being mainly non-significant others (e.g. people walking past). Similarly, Csikszentmihalyi and Rochberg-Halton (1981) studied houses and their contents and demonstrated empirically that houses can be symbolically both 'expressers' and 'creators' of self.

#### **2.2.4 The house as a material possession**

The above discussion of symbolism shows that houses are more than simply the 'physical stuff' necessary for the provision of shelter, but can also be an important means by which we communicate information about who we are and what kind of person we would like others to believe we are. A separate, but related area of academic endeavour has looked at the importance of house, seen as a 'material possession'. Dittmar (1992) discusses material possessions from a social-psychological point of view, indicating that possessions can be understood as having both functional and symbolic components. It is interesting to look at housing within this framework, especially as housing is physically rather large in comparison to many other material possessions. It is the word 'possession' that makes 'material possessions' interesting from a psychological point of view, and the addition of the word 'material' brings with it a more environmental-psychological focus. Insofar as personal ownership of a particular thing tends to decrease shared-control over that thing, thereby



increasing individual control over it, one might assume that owning a house gives a person feelings of greater control over their immediate environment. Whether or not these feelings of increased control are illusory, the vast increase in rates of owner occupancy in the UK since the 2<sup>nd</sup> World War suggest that it has become the 'desired tenure' for compelling social, political and psychological reasons. These reasons might include control over both the housing environment and also over personal financial security.

It should be noted that the stress here is on the term 'desired tenure', which includes not only the abstract notion of tenure, but also the material and economic advantages perceived as being associated with this tenure. There are clearly socio-political reasons for renting having become a marginalised tenure in the UK, including the large-scale sale of council housing to tenants at heavily discounted prices after 1980. As Daunton (1987) notes, the "*decollectivization of [housing] consumption*" (p.5) can be viewed as "*part of a wider political programme designed to change British society..... in order to create a 'popular capitalism'*". Daunton (1987) argues that the spread of owner occupation affects social attitudes unrelated to housing matters. By privatizing housing (thereby creating a large number of small-time property speculators), it is argued, society itself has become more ideologically private – more focussed on individual enterprise, where collective goals are somewhat de-emphasised<sup>13</sup>.

Related to the idea of housing as a material possession, is the concept of ontological security. Ontological security is defined by Giddens (1991) as "*The confidence that most human beings have in the continuity of their self-identity and in the constancy of their social and material environments*". Basic to a feeling of ontological security is a sense of reliability of persons and things. Saunders (1989) suggested that the home (specifically the owned home) provides the ideal conditions for

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<sup>13</sup> See Daunton (1987) for a more detailed discussion of these issues.

these feelings. This concept has been subject to much debate and criticism from a range of academics, and recent thinking seems to suggest that, although the concept in itself may well hold substantial weight, the idea that it is tenure specific is something of an academic fantasy (see for example Somerville and Knowles, 1991 or Gurney, 1996). It might be argued that a combination of tenure and physical aspects of the house (rather than only tenure differences) may help facilitate feelings of ontological security. In this way, the criticisms of people like Gurney (1996) can be taken on board by refocusing the concept of ontological security on the "house as a place to live" (i.e. home), rather than confusing the issue with socioeconomic status, tenure differences, or other financial aspects of house purchase. So, while home ownership may well, in societal terms, provide the best protection against financial insecurity, it is argued that housing tenure is less important than other psycho-social influences (cf. Kearns et al., 2000). Instead, it seems likely that house purchase can facilitate greater feelings of ontological security in a given socio-economic climate. It is possible that if there is a move towards sustainability as the dominant social paradigm (see section 2.3.2) that ontological (or existential) security might become more related to components of sustainability than to components of economic stability. Thus in a social climate with sustainability as the dominant paradigm, it is possible that simply knowing the 'sustainability credentials' of one's own house might lead to this sense of constancy and reliability of the social and material environment that is necessary to achieve a feeling of ontological security.

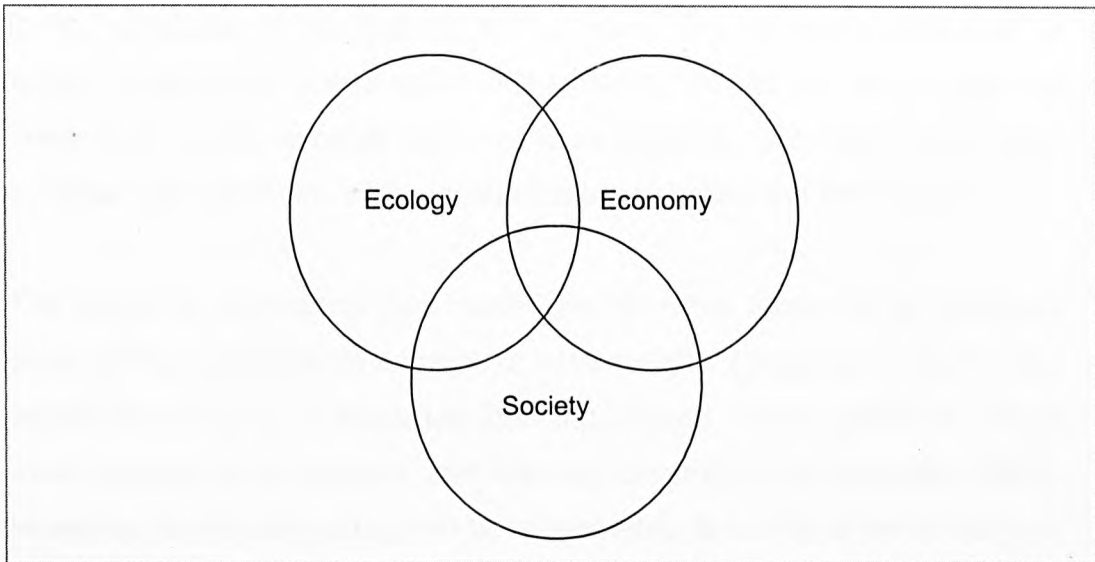
## **2.3 Sustainable Housing Design**

This section will outline some of the features of sustainable housing design, and detail some of the important psycho-social aspects of sustainable housing which are considered important in building up a picture of the 'person-in-environment' as detailed in section 1.3.

### **2.3.1 The multidimensional nature of sustainability**

In chapter one, the standard three-component model of sustainability was introduced – this was then re-interpreted for the purposes of this thesis as being: individual; socio-cultural context; and environment. In order for architects to be able to design 'sustainable houses', it is first necessary to achieve some consensus about what exactly 'sustainable housing' means. Although there is widespread recognition of the standard three-component model (see Figure 9) of sustainable development discussed in section 1.2, more often than not a single-focus approach is taken towards particular problems.

Hence, an architect may choose to create 'sustainable housing' by focussing mainly on the total energy consumption of the house being designed. At the end of the design process, the architect may emerge with an extremely energy efficient house-design which might or might not be described as 'sustainable'. A different designer may choose to focus more on the construction process, by trying to minimise the amount of waste produced during the construction of the house.



**Figure 9 - The three components of Sustainable Development**

There are any number of possible interpretations of the term 'sustainability' in this respect, but as we saw earlier with the term 'home', terms that become embedded in the popular imagination become representations of a much broader scope of concepts than was perhaps the original meaning. One might argue that this makes academic definition difficult (as is the case with the term 'home'), or alternatively, in the case of sustainability, a broadening of scope makes for a fuller understanding of the picture. Given that sustainability is not a definable 'thing' as such, but rather a process, or a social agenda, it is, in many ways, not surprising that the scope has broadened somewhat.

In recent years, there has been a resurgence of interest in so called 'sustainable houses' from the field of architecture, in part due to public dissatisfaction with the many personally and ecologically damaging aspects of so called 'standard' housing (see for example Pearson, 1991). As was mentioned earlier, democratic theory holds that *'individuals and their institutions cannot be considered in isolation from one another'* (Pateman, 1970, pp.42). However, in the case of recent housing design, this often does not happen, and might arguably be the cause of much dissatisfaction with contemporary housing. House-buyers are to a large degree dependent on *'their institutions'* (i.e. their socio-cultural context)

for the provision of housing for sale or rent. To be sustainable from a social perspective, the process of providing houses for *individuals*, by *institutions*, needs to be as democratic as possible, and this is only really possible with good two-way communication between the two parties.

The scientific community has, until fairly recently, focussed its attention more on the bio-physical aspects of sustainability (Sugiyama, 2001), and efforts considering 'sustainable housing design' have tended to focus more on ecological aspects, and less on social aspects (Milbrath, 1994). However, for housing design to be sustainable, it needs to be so from an ecological stance, and also from a psycho-social stance. It is unlikely that any ecologically-friendly housing design will become the next 'model' for housing in a given context if it is widely abhorred by the general public<sup>14</sup>.

Within the academic community studying vernacular architecture, it has sometimes been assumed that vernacular approaches are somehow inherently 'more sustainable' from an ecological standpoint. It has been pointed out recently by Meir and Roaf (2006) that this is not always the case. Indeed, sometimes very subtle variations of what might be termed 'vernacular design', if wrongly applied in locations geographically separate from their origin, can produce buildings that perform in a far less-than-optimal manner in terms of energy, for example (see Meir and Roaf ,2006). A delicate balance needs to be struck which carefully weighs up the success of any design from the point of view of the institutions that will create it, the individuals that will occupy it, and the ecological context in which it will sit.

### **2.3.2 The New Environmental Paradigm**

A paradigm might be thought of as the stage on which people act out the play of their everyday lives. All the rules and conventions governing the

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<sup>14</sup> It is also important to note that there are many changes in the ecological performance of housing that may not be noticed by the house-buying public. For example, the building regulations may insist on greater levels of thermal insulation, but this fact may not be picked up by buyers unless it is made salient in the house-builder's marketing materials.

direction of this play are encompassed within a paradigm. Thus, Capra (1997) defined a paradigm as:

*“a constellation of concepts, values, perceptions and practices shared by a community, which forms a particular vision of reality that is the basis of the way a community organises itself” (p.6).*

The belief paradigm that is dominant in a given society is known as its dominant social paradigm (DSP). Milbrath (1989) defines the term DSP as follows:

*“a society’s dominant belief structure that organises the way people perceive and interpret the functioning of the world around them..... from time to time, dominant paradigms are challenged so fundamentally that they give way to new paradigms; this process is called paradigm shift” (p.116).*

For several decades scholars have argued that our (Western) society's dominant social paradigm (DSP) has been challenged by a new worldview, which reflects many of the issues within the sustainability agenda discussed earlier (see section 1.1). This new worldview has been termed the 'New Environmental Paradigm' (e.g. Dunlap and Van Liere, 1978; Stern and Oskamp, 1987; Dunlap, 2002). Whereas the DSP in Western industrial societies emphasises economic self interest, democratic politics, and technological efficiency (Kilbourne et al., 2001), the 'New Environmental Paradigm' (NEP) instead emphasises the existence of limits to growth for human societies, beliefs about humanity's ability to upset the balance of nature, and humanity's right (or otherwise) to rule over the rest of nature (Dunlap et al., 2000).

Kuhn's (1970) essay on scientific revolutions and paradigm shift, makes the important point that '*...proponents of different paradigms practice their trades in different worlds...*'(p.150), suggesting that in order for true

paradigmatic shift to occur, all parties would need to agree on a way of seeing the world, and a set of terms through which to describe the world. Therefore for the DSP to become based more on sustainability principles, there needs first to be an agreed set of such principles within the new paradigm with which the majority of proponents are in agreement upon. Dunlap and Van Lierre's (1978) proposed New Environmental Paradigm is one suggestion regarding the content of such a shared language. Although the NEP set out by Dunlap and Van Lierre (1978) has been criticised for being defined largely by an attitude scale, and therefore failing to capture the essence of a paradigm (Kilbourne et al., 2001), it has nevertheless become widely used as a measure of general environmental concern and, more importantly, has shown that the issues covered by the NEP have had considerable staying power in the public imagination (Dunlap, 2002).

### **2.3.3 Psycho-Social aspects of sustainable housing**

When taken into consideration in designing houses, many aspects of sustainability have impacts beyond their physical manifestation within the final design. For example, the space needed for the provision of collection bins for materials to be composted, might need to be allowed for in the design of the interior space. Moreover, in providing such facilities, it is possible that there might be a knock-on effect in terms of promoting an ecologically benign behaviour (composting).

The pursuit of sustainable development demands that as a society we not only produce material goods and services in a more environmentally sensitive manner, but also that we engage in a process of re-visioning the practices and patterns of consumption that drive such production (Jackson, 2003). In moving towards more sustainable consumption practices, it is clearly important to be able to come to a consensus as to what sustainable consumption is before then going on to look at how we are measuring up to this ideal as a society.

While there are those who believe that 'consumption culture' can be changed to accommodate the needs of the sustainability agenda, there are also many who believe that the two notions are inherently incompatible, and that alternative lifestyles based on values such as sufficiency and sharing rather than affluence and individuality are required to achieve anything approaching a true state of sustainability (e.g. Schumacher, 1974; Vlek et al., 1999). There is a wealth of knowledge and expertise about the various flows of energy and materials (Stern et al., 1997) within nature and society that have been singled out as worthy of attention in terms of sustainability issues. As such, it is now usually possible to build up a model of something resembling an 'ecologically sustainable house' for a given situation based on current knowledge available.



Given that many consumption behaviours (e.g. eating, heating, cleaning, lighting and bathing) take place within the domestic setting (Vlek, Reisch and Scherhorn, 1999), the design of housing is a useful framework within which to look at ecologically sustainable behaviour. If there is resistance to the widespread adoption of certain ecologically sustainable behaviours, then it is important to explore the nature of this resistance, and try to assess the determinants from the perspective of the individual, society, and also the physical environment.

Different houses are considered to provide varying degrees of opportunity for people to behave in a sustainable manner. Such opportunities and constraints include those of a **structural** nature; a **communicative** nature; and also a **symbolic** nature. Examples of these opportunities and constraints can be seen in Table 1.

	Example
Structural	The presence of a composting toilet which necessitates some behavioural change
Communicative	User Guide / Manual provided with a 'sustainable house' which helps people understand how use their house in the most 'sustainable' manner.
Symbolic	External signifiers of a 'sustainable house', such as solar panels or turf roofs

**Table 1 - Examples of opportunities and constraints regarding ecologically sustainable behaviour**

It has been said before that the physical design of housing reflects dominant conventions about the conduct of relationships between people within the household, and the relationship between the household and the outside world (Madigan and Munro, 1999). In this manner, idealized notions of how we want to live are manifest in the physical design of buildings. In the sense that new houses are designed to be lived in, in the future, if as a society we wish to move towards a culture in which sustainability principles are more deeply embedded, then it is arguably

very important to embed such principles into the houses that are being built now. As was noted earlier *"it is no accident that [our] materialistic society should have produced a built environment which facilitates consumption and makes a non-materialistic lifestyle difficult"* (Smith et al., 1998, p.165). If society is to produce a built environment to facilitate lower consumption, and express non-materialistic values, then these principles first need to be documented, and means for their expression sought.

As well as understanding the opportunities and constraints that different house designs afford in terms of ecologically sustainable behaviours, it is also of great importance to have an understanding of the values and drivers of the housing occupants themselves. Much has been written about the relationship between values and environment-friendly behaviours (e.g. Stern et al., 1993; Thøgersen and Ölander, 2003), and also about the relationship between pro-environmental attitudes and behaviour (see Staats, 2003). However, many of these studies fail to adequately take into account the situational or contextual circumstances surrounding the sustainable behaviour under investigation, and have a tendency to emphasize individual dispositions instead (Stern, 2000). Whilst these individual dispositions are of great importance, and do contribute towards the likelihood of ecologically sustainable behaviours occurring, they need to be examined along with both physical and social contexts in order to provide a holistic, fuller understanding of the factors influencing such behaviour patterns.

Relating this back to the three-component framework introduced in the introduction (see section 1.2), the following sections will discuss the **individual**, **socio-cultural**, and **environmental** components of sustainability.

#### **2.3.4 The Individual Component of Sustainability**

Energy saving measures (Kempton et al., 1992; Poortinga et al., 2003) and also composting facilities (Edgerton et al., 2002) in a house are good

illustrations of systems which are well suited<sup>15</sup> to analysis from an individual-behaviour viewpoint. The success of such interventions within the house is highly dependent on their public acceptance, and correct management in use. In a similar manner, an individual's decision to purchase or not purchase a 'sustainable house' is another example of a phenomenon well suited to an individual-behaviour analysis. There has been much research into the link between attitudes and behaviour which seems to suggest that action or motivation to act is influenced primarily by our beliefs about a situation in any given context. These beliefs are thought to cumulatively influence attitudes (more stable structures, less context dependent than beliefs) which we hold about 'attitude-objects' (see Stern & Dietz, 1994). The attitudes that we hold about a given 'attitude-object' are heavily influenced by our value structure - a set of *"single belief[s] that transcendentally guides actions and judgements across specific objects and situations"* (Rokeach, 1972, p. 160). Given that values are more stable than beliefs, changes that take place within a person's value structure will be more robust, and therefore more likely to predictably motivate action, due to their enduring influence on evaluations of specific objects or events (Ajzen, 2001).

Blamey (1998) suggests that acceptance of policy initiatives plays an important part in motivating willingness to participate in environmental behaviour changes. While this might seem obvious, it points to the importance of understanding the factors governing the potential acceptance of such policy initiatives. If the achievement of sustainability with regard to domestic housing is potentially reliant on end-users changing their behaviour, then the emergence of environmental value orientations might be fundamental to achieving the goal of sustainability (see Stern & Dietz, 1994). Generally speaking, people who support environmental action tend to adhere to the 'self transcendent' value cluster identified by Schwartz (1992) and also support Dunlap and Van Liere's (1978) 'New Ecological Paradigm' (Stern et al., 1994). That

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<sup>15</sup> it should be noted that such systems are not only relevant from an individual standpoint, but are also strongly related to both the socio-cultural and environmental dimensions.

said, Thøgersen and Ölander (2003) make the important point that the direction of causality that is often inferred between values and behaviour might in fact be more complex than simply 'values lead to behaviour'. There are also good theoretical arguments for there being a causal link between behaviour and values, but the empirical strength of this link seems to be fairly weak (Thøgersen and Ölander, 2003).

In general then, sustainability measures which involve active behavioural change merit studies which take individual behaviour as the starting point for analysis. Examples include: recycling behaviours (Burn and Oskamp, 1986; Cheung et al., 1999), energy saving (Poortinga et al., 2003), water saving (Geller et al., 1983; Michelsen et al., 1999), and composting (Edgerton et al., 2002), all of which require some form of physical setup to be implemented, but require a large degree of behavioural input in order to be successful.

### **2.3.5 The Socio-Cultural Component of Sustainability**

In order to produce sustainable environments, communication between individuals and 'their institutions' needs to be congruous. Institutions are the means by which society manifests its values and goals. This is well described by Girard (1998):

*"Organisational rules, or institutions, shape society and cause changes. For example, let us think about the set of rules regulating the use of mass media (in particular television). They are able to affect people's way of living, ideas, values, myths, and hopes, thus affecting issues of meaning. They can also destroy local identities by proposing standardized visions of the world, values and interests and by demeaning original values.*

*Therefore, the institutions, on the one hand, reflect the culture of a society; on the other, they deeply change such a culture and, thus, reality and its evolution. "* (p.169)

Various systems operate as institutions through which individuals and their socio-physical environment interact. These include the private economic system (e.g. the market economy), the public economic system (e.g. the various forms of government regulation), and the social economy (e.g. organisations or other activities promoting non-monetary exchange).

In order to achieve the necessary degree of congruity between individuals and institutions, there has to be a good degree of shared understanding of the phenomenon in question, and a perception of mutual trust (cf. Renn, 1998). In much the same way that 'experts' and the 'lay public' have been shown to differ in their perception of risks or hazards (Fischhoff, 1995), so too do experts and 'the public' differ in their perceptions and evaluations of architectural design (Gifford et al., 2002; Hubbard, 1996; Hubbard, 1997). One might expect therefore that in an 'expertocratic' (Craig, 2002) social climate where differences between individuals and their institutions are heightened, it is likely that such differences might also be found in interpretations of 'sustainability' and 'sustainable housing design'.

When making a house-purchase decision, people are not only making a single rational decision based on whether or not they want to buy a particular house for a particular sum of money. Many other tangible and non-tangible factors are considered in parallel with any such economic decision. As Priemus (1986) makes clear, householders try and achieve the highest possible degree of congruity between the 'present residential situation' and the 'aspirational picture' (e.g. what a person would describe as their 'ideal house'). Thus, if a person is at the point where they are making a house-purchase decision, then a decision has been made to move towards this 'aspirational picture' by moving house rather than adapting to the present circumstances. Alternatives might be either improving the existing house, or re-evaluating the household aspirations. Therefore, it is only after a complex set of economic, social and

psychological factors have been considered that a house purchase decision will begin to be considered. Various economic, social and psychological factors will then be weighed up against each other thereby formulating a decision-context through which a preference can be arrived at. Moreover, this decision making process needs to be viewed within its socio-cultural context. For example, although an individual might be disposed towards a particular housing preference, certain advertising stimuli might well modify this preference (DiClemente and Hantula, 2003), so although the preference can be thought of as individual, the influences on that preference might be outwith the control of the individual in question.

The important point here is that social-cultural aspects of the 'transactional whole' discussed in section 1.3 can be explored by looking at what at first glance might appear to be individually oriented aspects. In much the same way that group dynamics cannot be studied by focussing on an individual outwith the group, individual economic decision making cannot be adequately documented without considering the individual decision maker in the social, cultural and economic context in which the decision is being made. If a house-buyer wishes to purchase a 'sustainable house', and this fits the 'aspirational picture' described by Priemus (1986), then the realisation of this 'aspirational picture' is heavily dependent on one's socio-cultural context in putting forward such housing for sale. Such housing will of course only be 'up for sale' if someone has already built it. Although it is likely that all houses in the UK will at some point in the future have to meet 'BRE Ecohomes' (or some other standard) rating<sup>16</sup>, the extent to which such houses will meet people's 'aspirational picture' will depend largely on whether the houses built to 'minimum-permissible standards' specifications match up to the picture in-the-mind that a particular housebuyer has of a 'sustainable house'. This is arguably not the case at present however, as illustrated by this recent quote from the website of the Hockerton Housing Project team:

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<sup>16</sup> Sustainable Homes Newsletter, Spring 2005, Issue 21, downloadable from <http://www.sustainable-homes.co.uk>

*"We frequently get enquiries from people looking to purchase a more environmentally friendly home and often in the South West. Unfortunately there are only a few small developers currently building homes to high sustainable standards in the UK"<sup>17</sup>*

This does not imply that there is in some way a Platonic perfect form of 'Sustainable Housing' of which developers should be building more. Rather, it is suggesting that the essence of 'sustainability' as understood in the public imagination might not be sufficiently captured in the product-driven nature of developer-led house building.

### **2.3.6 The Environmental Component of Sustainability**

When looking at the various relationships between people and the physical environment, it has been argued that many environmental psychologists have to a large degree neglected the physical environment (see e.g. Sime, 1999), preferring instead to take a more psychological focus on the person-environment transaction. Although it might be tempting to say that the 'environment' equates roughly with the 'ecology' bubble of the tri-partite sustainability model shown earlier in Figure 2, this would be misleading, as there are clearly physical or environmental aspects of the other two components.

Taking as an example the external cladding of houses, there is something of a consensus that (locally sourced) timber tends to have better ecological credentials (Marsh, 1997; Davies, I. et al., 2002) than many other construction materials such as masonry. The cladding material itself is the 'environmental' component of sustainability in this case, along with the various physical and ecological aspects of its performance as

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<sup>17</sup> The Hockerton Housing Project is the UK's first earth sheltered, self-sufficient ecological housing development. Project members live a holistic way of life in harmony with the environment, in which all ecological impacts have been considered and accounted for. The residents of the five houses generate their own clean energy, harvest their own water and recycle waste materials causing no pollution or carbon dioxide emissions. The houses are amongst the most energy efficient, purpose built dwellings in Europe. (<http://www.hockerton.demon.co.uk/>)

part of the building fabric. The 'individual' and 'socio-cultural' components are also important to consider in relation to the physical aspects. Thus, the external cladding materials of a house (e.g. timber or brick) will not only differ in terms of physical performance, but also in terms of evaluative image or aesthetic response (Nasar, 2000), and the socio-political framework creating drivers for change in this respect (BRE, 2003; Davies, I. et al., 2002). These issues will be discussed in more detail later, but the point to stress here is that the physical environment should neither be neglected or overly focussed upon in attempting to fully document any people-environment transaction.

### **2.3.7 Sustainability as a social dilemma**

Social dilemmas are situations where the individual and collective interests for carrying out particular behaviours are at odds. Dawes (1980) defined a social dilemma as being characterized by two properties:

*“(a) the social payoff to each individual for defecting behaviour is higher than the payoff for cooperative behaviour, regardless of what the other society members do, yet*

*(b) all individuals in the society receive a lower payoff if all defect than if all cooperate” (p.170)*

Many of the issues raised under the umbrella of sustainability are examples of such dilemmas. For example, it is to each individual's advantage to use as much energy and to pollute as much as possible, but in doing so, the collective interests of all are endangered, by necessarily exceeding the earth's 'carrying capacity' (Dawes, 1980). Various examples exist of everyday decisions that can be thought of in terms of social dilemmas, including: travel mode choice, recycling (including composting), house-purchase behaviour, food-purchase behaviour and energy use.



Indeed, as Staats (2003) notes, the situation is complicated further by the fact that 'environmental social dilemmas' are aggravated by the "*superimposition of temporal and spatial dilemmas*" (p.193). So, the lower payoff for all individuals defecting will not be experienced immediately, but at some point in the future, probably by other individuals in other geographical locations to those people endangering the collective interests. This is important insofar as it demonstrates the need to consider collective interests beyond those imposed by political and spatial boundaries. In other words, the collective interest in many environmental social dilemmas is referring to a very broad collective, and the societal institutions charged with redistributive effort (through the tax system) might not provide sufficient coverage of the 'collective interest' if inter-spatial, and inter-generational concerns are to be adequately reflected.

Several studies have shown that when faced with social dilemmas, people tend to evaluate choices in moral terms, and also that those people who view social dilemmas as a moral issue tend to cooperate, rather than defect (Nordlund & Garvill, 2003).

Given that in social dilemmas, the eventual outcomes of behavioural choices are by definition dependent on the choices of others, there will clearly be the need in such situations to take into account whatever is considered to be the social norm in that situation (Steg, 2003). This is similar to the 'subjective norm' component of the theory of planned behaviour (TPB) which will be discussed in section 2.4.4. Similarly, the evaluation of individual outcomes (i.e. the assessment of individual payoff) is likely to be reflected in individual attitudes (a further component of the TPB).

However, in addition to weighing up the self interests and social norms, it is also important for people to believe in their own ability to contribute to the collective interests (similar to perceived behavioural control, discussed in section 2.4.4). Furthermore, it is also important that people believe that if they do carry out a particular collectively beneficial

behaviour, that this behaviour will indeed be effective. In many ways, this is similar to the notion of collective efficacy discussed by Steg (2003), and also the idea of collective agency discussed later in section 2.4.7.

### **2.3.8 The importance of perceptions and behaviours**

The next section will discuss the importance of the psycho-social aspects of the built environment and will look at the various ways in which environmental perception and preferences result in particular behavioural responses<sup>18</sup>. The idea that manifestations of sustainability principles might have some impact on behaviour has been suggested in section 2.3.2, but this needs further theoretical clarification, especially regarding the particular ways in which the socio-physical environment might influence behavioural responses and indeed what these responses might be.

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<sup>18</sup> It should be noted that behavioural responses can be active or passive. For example, an active behavioural response might be deciding to make a particular purchase, whereas a passive response might be a decision not to do so.

## **2.4 Psycho-social aspects of the built environment**

### **2.4.1 Perceptions and Preferences**

Perception is often taken to mean 'the recognition and interpretation of sensory stimuli based chiefly on memory'<sup>19</sup>. The assumption in definitions such as this is that what happens when perception occurs is that individuals compare information coming from the senses with memories of familiar patterns, and process the result accordingly. In this way, the act of perception assumes there to be a correspondence between perceptual and cognitive processes, and characteristics of the physical environment (Bonnes and Secchiaroli, 1995).

Many experimental studies looking at (mainly visual) perception have been criticised as focusing almost exclusively on rather simple stimuli or geometric configurations, where the world is seen through people's eyes almost as a 'sequence of snapshots' (Gibson, 1979, p.1). When we perceive something (visually), we take in information using our eyes, and then some process gives that information 'meaning'. In this way perception involves some kind of information processing based on static retinal images, or '*making cognitive use of sensory data*' (Landwehr, 1990, p.105). If this is correct, then the assumption must be that all of the information to be processed based on this sensory data is already learned, and hence 'in the head'. J.J. Gibson's (1979) approach to visual perception is rather different to this. His theory holds that we make sense of the visual environment not by processing static pictures, but that static pictures are mere representations (often bad ones) of the environment itself. So for Gibson and others in the field of ecological perception, people are understood to perceive the environment by moving through it, and "*continuously transforming stimulus information*" (Landwehr, 1990, p.1). The various arguments and differences in the theories of visual perception will not be elaborated here, but are mentioned in passing as

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<sup>19</sup> The American Heritage® Dictionary of the English Language, Fourth Edition, Copyright © 2000 by Houghton Mifflin Company.

the discussion about environmental preferences should be read with these ideas in mind<sup>20</sup>.

In order for people to make use of perceptual information coming from the senses, it has been argued that people hold some form of knowledge structure, or 'schema' which guides both information processing and action. Several types of such schema exist such as object schema and event schema (Lee, 2003), but in considering the transactions between people and the physical environment, a particular type of schema is encountered. As Lee (2003) explains:

*"The type of schema most profitably considered by environmental psychologists is the socio-spatial schema. This is because the built environment is more or less isomorphic with the social system that is deployed within it. Also, because no human environment of any consequence can be perceived as a physical object in isolation from its social implications and behavioural activity patterns" (p.33)*

Ultimately, the environmental context of interest to this research is sustainable housing, so the research pertaining to this environmental context will be discussed in greater depth than that relating to other environments. Related to the above, the unit of analysis, might be loosely defined as the socio-spatial schema of sustainable housing.

In keeping with the transactional approach mentioned in section 1.3, Werner (2003) notes that:

*".....home interiors and exteriors reflect individual and social identities and aesthetic standards that develop over time. These standards are partly unique to the individual, but are*

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<sup>20</sup> The integrated dynamic approach to the study of perception described by Bonaiuto et al. (2003) provides a good overview of many of the issues related to visual perception and how they relate to other social and psychological processes.

*also informed by friends and neighbours, other local sources, as well as nationally available information.....”(p34)*

In order for there to be a shift towards sustainable housing, the design of such housing must therefore be considered from a perceptual viewpoint. Section 2.4.2 will look at environmental aesthetics and preferences with particular reference to housing environments and will discuss the various psychological processes through which these preferences might come about.

### **2.4.2 Environmental Aesthetics and Preferences**

There is much evidence to suggest that people vary in their assessments of quality regarding the built environment. Hubbard (1996) has argued that one of the fundamental distinctions between the various theoretical positions taken in the field of environmental preferences is “*whether they consider preferences as rooted in individual or social factors*”(p76). In an individually oriented approach, physical stimuli in the environment are seen as triggers to certain physiological and psychological responses. In contrast, the more socially oriented explanations for environmental preferences, tend towards something of a more sociological nature. Such approaches view environmental preferences as being constructed socially, based on ideological, political and economic structures (Hubbard, 1996).

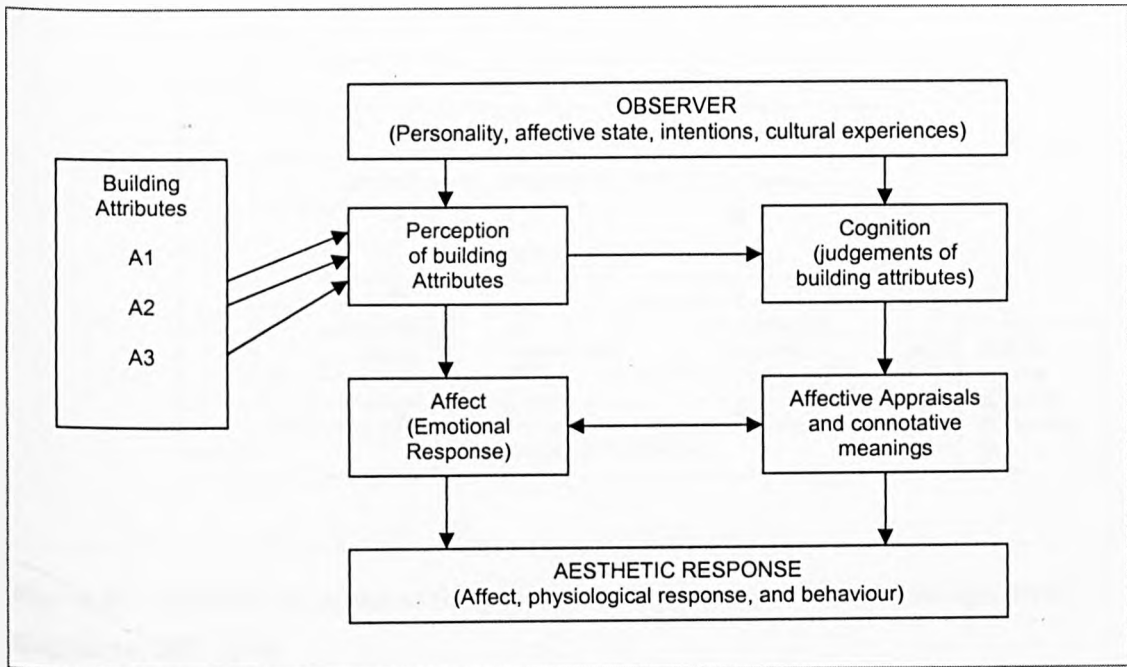
Research has shown that architectural evaluations by the public differ significantly from those of planners (Hubbard, 1994; 1997), architects (Hershberger, 1969; Devlin and Nasar, 1989; Nasar, 1983,1989; Wilson, 1996; Gifford et al., 2002), and other design professionals (Uzzell and Jones, 2000). In terms of sustainable housing, as was mentioned in section 2.3.1, a delicate balance needs to be struck which carefully weighs up the success of any design from the point of view of the social structures that will create it, the individuals who will occupy it, and the ecological context in which it will sit. Therefore if perceptions of the built

environment differ between the public and the social structures that create those environments, then it is likely that these differences are mainly of social (e.g. via socialisation into a particular profession) rather than individual origin (Wilson, 1996).

For example, in terms of perceptions of buildings, it has been shown that colour is associated with both perceived temperature and size, with 'warmer' colours leading to higher temperature estimates than 'cold' colours (Berry, 1961), and dark colours leading to perceptions of spatial crowding (Baum and Davies, 1976). If differences in the perception of such variables were found between lay people and design professionals, then this would create obvious problems for the designer in attempting to design for 'the public', as the personal preferences of the designer as an 'individual' might be at odds with the communicated preferences of the public for whom that designer is designing. This is especially important when it comes to considering the external appearance of buildings. As Nasar (1994) put it:

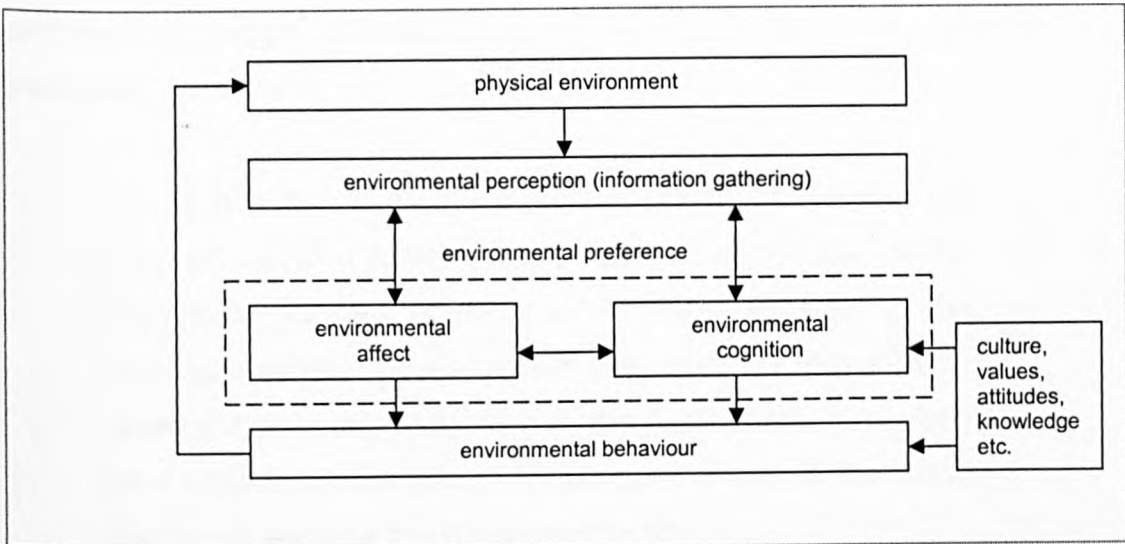
*"In dealing with the public appearance of buildings, design review should attempt to control the visual character for the public good"* (p.379)

Figure 10 shows a conceptual model of aesthetic response put forward by Nasar (1994). The main idea presented by this model is that visual perception (of building attributes) is followed by both affective reaction and cognition. This then leads on to an aesthetic response or behaviour.



**Figure 10 - Model of Aesthetic Response to Buildings (from Nasar, 1994, p.381)**

One of the few studies to date looking specifically at perceptions of sustainable design was carried out by Sugiyama (2001; 2002), who found three underlying perceptual categories influencing responses to sustainable design: Attractiveness, Tidiness, and Plainness. The attractiveness factor in Sugiyama's research can be thought of as the affective reactions within Nasar's (1994) model. There are clear similarities between Nasar's (1994) model of aesthetic response and Sugiyama's conceptual model of the perceptual aspect of sustainable design (see Figure 11), but there are notable differences.



**Figure 11 - Conceptual model of the perceptual aspect of sustainable design (from Sugiyama, 2001, p.4)**

The feedback arrow present in the model presented by Sugiyama (2001) between the environmental behaviour<sup>21</sup> and the physical environment is largely missing from Nasar's (1994) model. This is not to say that there is no link made by Nasar (1994) to the production of the built environment, and its link to preferences. Indeed, Nasar (1994) does describe these issues in great depth, so it is surprising that the model of aesthetic response presented has no such temporal qualities. Another interesting similarity is that both models mention both individual dispositions and 'culture' and indicate that these relate directly both to cognition and perception. Sugiyama's model however makes a direct link between 'culture' and 'environmental behaviour', whereas Nasar's model seems to imply that this relationship is mediated by perceptual processes. These issues will be discussed further in section 2.4.7.

Given that the concept of sustainability necessitates looking both to the past and the future, it is unsurprising that there are many parallels between sustainability and thinking about architecture, and the process of

<sup>21</sup> Environmental behaviour in Sugiyama's (2001) model is taken for these purposes to be synonymous with 'aesthetic response' in Nasar's (1994) model, on the assumption that a decision not to act can be categorised as a behavioural response.



architectural design. Canter (2001) sums this up well in the following passage:

*".....Architecture is always a statement now about what the notional use of a building is, but also an expression of the aspirations (or lack of them) of all those involved in the building process. Design cannot help but look to the future (even if it does this by looking to the past) at the same time as it shapes the present. Architecture is one of the ways that we all become time travellers"* (p.55)

Although it has been argued that in many ways 'green' sensibility in architecture is nothing new, the ways in which designers use external aesthetics to acknowledge links with the past, often involve using *"their particular interpretation of the general public's interpretation"* (Lee, 2001, p.164). To reflect successfully the concept of sustainability at the same time as acknowledging the past and present, designers first need to understand what 'sustainability' means for members of the general public. After all, how can a designer design an environment which reflects sustainability principles unless they can be sure they share the same interpretation of sustainability as the people who will inhabit the designed environment. This can surely only be achieved by designing *"with the user rather than for them"* (Lee, 2001, p.169), or indeed by carrying out research that attempts to unravel such issues, and finding ways to feed back such findings into the design process. If the very 'culture' which shapes the production of the built environment is to change by necessity<sup>22</sup>, therefore becoming more 'sustainable', then it goes without saying that the institutions within that culture need to change in a similar direction. However, in the case of housing (and in many other areas that need to address 'sustainability'), the inherent conservatism on both the supply and demand side of the housing process (see Ball, 1996) leads to a peculiar form of paralysis. Although the risks to both house builders

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<sup>22</sup> This assumes that it is accepted that change in the production of the built environment needs to change as a result of the international recognition of the importance of sustainable development.

and housing consumers are arguably rather low in the longer term, there is a fear that 'sustainable housing' will lead to some form of economic disadvantage (e.g. through being difficult to sell-on in the future). It seems that everyone wants to change, but no-one wants to be first.

On the relationship between 'culture' and 'environment', Rapoport (2001) suggests that it is impossible to relate 'culture' (or 'society') to housing, due to the generality and breadth of these concepts. He goes on to suggest that the problem of relating culture to housing might be better addressed by dismantling 'culture' into operational definitions of the various component variables that make up 'culture'. Although this sounds rather like a reductionist approach to the person-in-environment discussed in section 1.3, this is more in wording than in emphasis. In many ways, it is simply re-iterating that an important step in studying the person-in-environment is to "*Think of the phenomenon as a whole and identify its various aspects*" (Werner et al., 2002). Rapoport's (2001) conceptual model showing the various 'dismantled' components of culture and their relationship to the built environment is shown in Figure 12. By dismantling 'culture' in this way, it quickly becomes clear that there is a need to look at the relationships between individuals and the socio-cultural context they inhabit. If the built environment can be taken to be an expression of the socio-cultural context, then there must be means by which this expression takes place. A simple example here would be the way in which an architect responds to both an individual client's wants and needs, at the same time as reflecting the prevailing architectural rules and standards of the time. Some kind of synthesis is reached, and the built-environment (e.g. housing) can be seen in the words of Rapoport (2001) as: "*the organization of space, time and meaning and communication*" (p.154).

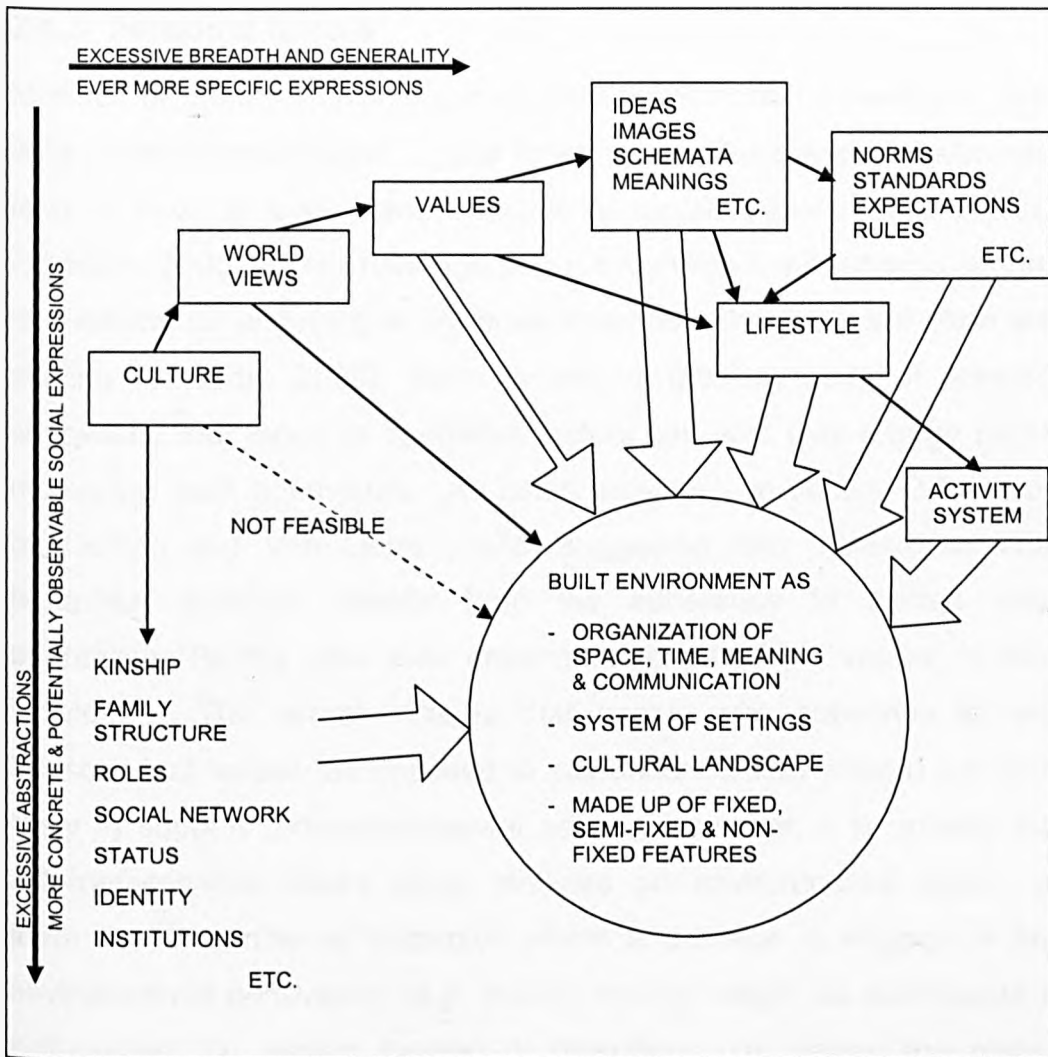


Figure 12 - Rapoport's 'Dismantling' of culture and relating its expressions to the built environment.

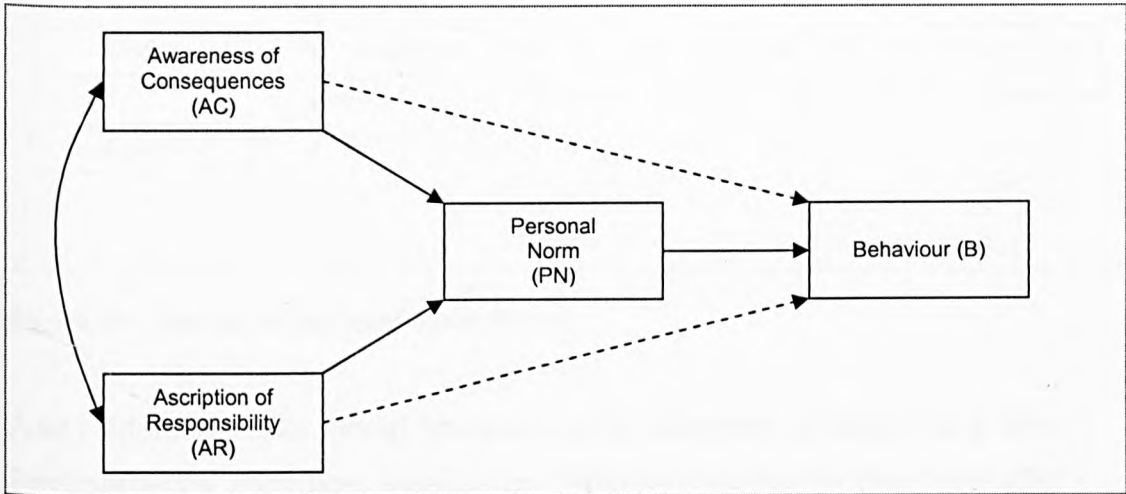
As can be seen from Figure 12, the shape of the built environment is influenced by a multitude of different facets of 'culture', some of which are easier to operationalise (and therefore research) than others, especially those whose expressions are more specific, such as the influence of rules and norms. As Rapoport (2001) says: "*Rules are...not only central in design, guiding choice among alternatives, but also guide appropriate behaviour in settings*" (p.154). The influence of norms and rules has been studied in a variety of applied settings, such as the role of norms on pro-environmental behaviour (e.g. recycling household waste or purchasing a 'sustainable house'). Section 2.4.3 discusses this area of research in more detail.

### 2.4.3 Personal Norms

In much of the literature discussing pro-environmental behaviours, there is "a common assumption..... that those who undertake such behaviours tend to have at least some altruistic or moral reasons for doing so." (Jackson, 2005, p.51). Although there is significant evidence to suggest motivations for engaging in pro-environmental behaviours are often self-serving (Jackson, 2005), there is also a growing body of research suggesting that moral or normative factors can also play a large part in motivating such behaviours. As noted previously in section 2.3.4, work by Dunlap and Van Lierre (1978) suggested that pro-environmental behaviour emerges directly from the adherence to certain value orientations (in this case 'new environmental paradigm' values) in each individual. The overall idea is that people who subscribe to self-transcendent values (as opposed to self-enhancement values) are more likely to support pro-environmental action. However, it is unlikely that self-transcendent values alone motivate pro-environmental action, as there are a number of examples where a decision to engage in pro-environmental behaviours (e.g. energy saving) might be attributable to self-interest (i.e. saving money) or biospheric (i.e. saving the planet) value orientations. The fact that these value-orientations are apparently mutually exclusive would suggest that other, more context-specific factors are likely to be at work. An example of a more context-specific theory will be discussed in section 2.4.4.

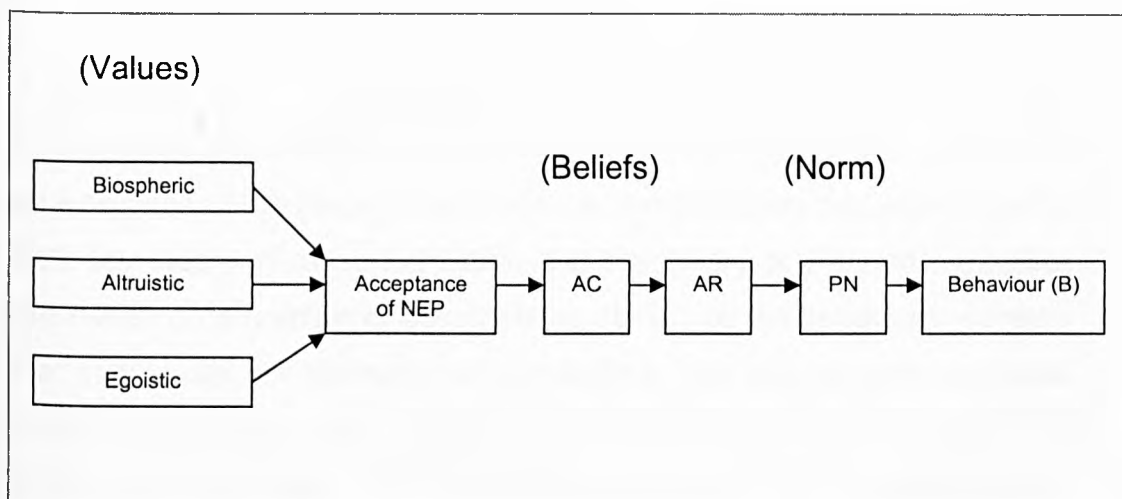
Probably the most well known theory of moral behaviour is that of Schwartz (1977), who saw personal norms ("*feelings of strong moral obligation that people experienced for themselves to engage in pro-social behaviour*") as being the only direct determinants of pro-social behaviours (Jackson, 2005, p.55). In Schwartz's theory, personal norms are made up of two antecedent components: **Awareness of Consequences** and **Ascription of Responsibility**, the strength of which mediate the link between personal norms and behaviour. So, to illustrate, "*those who feel morally obligated to recycle will engage in the act only if they believe in*

the positive consequences of recycling and feel personally responsible for these consequences" (Oom Do Valle et al., 2005, p. 368). This relationship can be seen in Figure 13.



**Figure 13 - Schwartz's Norm Activation Theory**

One of the difficulties with this theory (and indeed many theories looking at pro-environmental behaviour) is that supporting empirical evidence tends not to examine actual behaviour in practice, but rather studies restrict their focus to the antecedent conditions which are then assumed to predict behaviour. A variation on this theory proposed by Stern (2000), designed as a social-psychological model of pro-environmental behaviours, can be seen in Figure 14. Whilst there are some theoretical differences in the make-up of this model, the key similarity is that Personal Norms are seen as being directly antecedent to pro-environmental behaviours.



**Figure 14 - Stern's Value-Belief-Norm Model**

A key addition in this model however, is the influence of values (e.g. New Environmental Paradigm Values) on Personal Norms (in this case after having influenced beliefs regarding consequences and responsibility).

#### **2.4.4 The Theory of Planned Behaviour**

Earlier (section 2.3.4), the link was discussed between attitudes, values and behaviour with particular reference to environmental behaviours. In general, links between general 'environmental concern' and pro-environmental behaviour have been shown to be fairly weak (Maloney and Ward, 1973; Krause, 1993). Similarly, the relationship between environmental attitudes and ecological behaviour has been shown to vary in strength depending on a variety of issues, both methodological and theoretical (Stern and Dietz, 1994; Grob, 1995). Despite the large number of research studies examining the links between attitudes and environmental behaviour, it seems that attitudes alone are insufficient in the prediction of environmental behaviours. In a similar vein, the two previous models of perceptual response have a link implicit between 'environmental preference' and behaviour (or aesthetic response), although evidence for actual behavioural responses is somewhat lacking in the empirical record to date. In terms of sustainable housing, an example of a desirable behaviour might be the decision to purchase a sustainable house.

A useful theory for conceptualising the antecedent conditions associated with behaviour is the theory of planned behaviour (Ajzen, 1991), which is an extension of the theory of reasoned action (Fishbein and Ajzen, 1975). Both the theory of reasoned action and the theory of planned behaviour are based on a number of assumptions about human behaviour – chiefly that individuals act rationally, and therefore, use and process available information before acting (Oom Do Valle et al., 2005). The theory is summarised in Figure 15. Put simply, this theory sees behaviour as following directly from a behavioural intention (a strong behavioural intention is more likely to lead to actual behaviour). This behavioural intention is guided by three main factors: the attitude toward the specific behaviour in question; the beliefs about the normative expectations of others (along with the motivation to comply); and the perceived behavioural control or “*presence or absence of requisite resources and opportunities*” (Ajzen, 1991, p. 196)

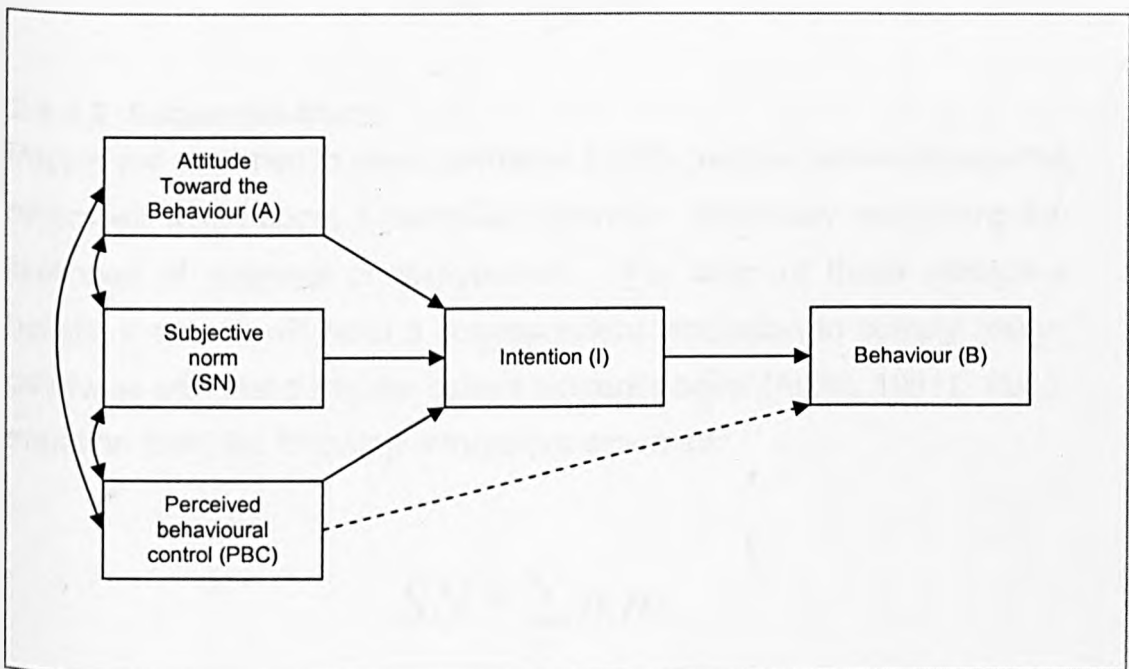


Figure 15 - The Theory of Planned Behaviour (from Ajzen, 1991, p.182)

This theory has received considerable empirical support (Ajzen, 1991; Ajzen, 2001; Staats, 2003) in demonstrating the antecedent conditions for

behaviour, and as such is thought to have a greater level of predictive power than the simple attitude-behaviour studies mentioned earlier.

So, behavioural intention is seen to result from a combination of three factors: **Attitudes** towards the behaviour in question, **Subjective Norm**, and **Perceived Behavioural Control**. Each of these antecedents to Intention will now be briefly discussed in turn.

#### **2.4.4.1 Attitudes**

The theory of planned behaviour takes an expectancy-value approach to the formation of attitudes (Ajzen, 1991). As such, attitudes ( $A_{obj}$ ) are seen to develop reasonably from the beliefs ( $b_i$ ) people hold about the object of the attitude. The way in which each belief influences an attitude is determined by a person's evaluation ( $e_i$ ) of that belief (i.e. strength and direction). Put in equation form, the following is assumed:

$$A_{obj} \propto \sum_{i=1}^n b_i e_i$$

#### **2.4.4.2 Subjective Norm**

People are assumed to have normative beliefs ( $n_i$ ) (i.e. beliefs about what others will think) about a particular behaviour, especially concerning the likelihood of approval or disapproval. For each of these normative beliefs, a person will have a correspondent motivation to comply ( $m_i$ ) or otherwise with that particular salient referent's belief (Ajzen, 1991). Put in equation form, the following is therefore assumed:

$$SN \propto \sum_{i=1}^n n_i m_i$$

#### **2.4.4.3 Perceived Behavioural Control**

It is one thing to have an intention to carry out a behaviour, and another to actually be able to carry out that behaviour in reality. However, even



assuming that it is actually possible to carry out a particular behaviour, it is also vital that the individual believe that they have sufficient volitional control to carry out that behaviour. Thus, it may be physically possible for a person to carry out a particular behaviour, but they may not feel they have sufficient resources or opportunities to carry it out to their best ability (Ajzen, 1991). Perceived Behavioural Control (*PBC*) is seen to result from both control beliefs ( $c_i$ ) and the corresponding power of those beliefs ( $p_i$ ).

$$PBC \propto \sum_{i=1}^n c_i p_i$$

Overall, the theory of planned behaviour has been shown to be robust in its ability to explain a reasonable level of variability in studies looking at pro-environmental behaviour (Jackson, 2005; Staats, 2003)

Although the utility (in terms of statistical prediction) of the theory of planned behaviour has clearly been demonstrated, it should be added that this theory is rather limited by the level of specificity of the domain definition. The theory assumes to a large degree that it is possible to describe not only the behaviour itself, but also the antecedents to that behaviour in a manner that is meaningful to the people being investigated. Even then, there is clearly a potential danger in such over-focussing in terms of domain of study, insofar as it might prevent the investigator seeing all of the 'characters in the story'. As the following quote from Uzzell (2000) notes, the important thing in explaining behaviour might well lie in the unexplained variability, which is often left to assumption and speculation.

*"It may also be that those who have the task of drawing upon and implementing the results of environmental psychological and other behavioural science research become frustrated at the amount of time, financial resources and effort that go into increasing the amount of variance*

*explained by contributory factors from 33% to 35%. While this means we have accounted for one third of the variance in a set of data, it also means that we still cannot explain two-thirds.....Can we cure ourselves of the 'nibbling syndrome' and start to make serious inroads into the 65% of the variance unaccounted for? Are we being blinkered in our cultural as well as theoretical perspectives?"*

It might be that the 'bigger picture' implied by the transactional view is not sufficiently encompassed by this theory (the theory of planned behaviour, or TPB). One way to make inroads into the 'unexplained 65%' might be to combine theoretical approaches that have hitherto not met, as a means to build up a more comprehensive conceptual model for the subject matter in question – in this case 'sustainable housing'.

The relative importance of Attitude, Subjective Norm, and Perceived Behavioural Control in the prediction of behavioural intention has been shown to be moderated in some cases by other factors, such as subjective knowledge or social information (Cheung et al., 1999). It is likely that factors acting as moderators will vary considerably depending on the behaviour under investigation. In the case of the current study, the influence of environmental preference is considered to be a potential moderating factor in the theory, and as such is seen as antecedent to behavioural context, as opposed to integral to the TPB component of the conceptual model<sup>23</sup>.

Although this closely defined expectancy-value approach might seem at odds with the holistic orientation of the transactional perspective, the "goal directed nature of psychological functioning" (Altman, 1985, p.28) is generally accepted by transactional orientations. However, it is important that any account of a particular behaviour is seen within the wider context of the various interrelations of people, places and society.

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<sup>23</sup> See section 5.2.2

### 2.4.5 The importance of memory and habit

Although it is not the case that theories such as the theory of planned behaviour have nothing to say about habit, Ajzen (1991) considers the relationship between habit and behaviour as being mediated in part by perceived behavioural control rather than direct. This assumes that all habitual responses are processed as information, albeit in a shortened way. However, several studies have shown that accounts of past behaviour can help explain a substantial portion of the additional variance not explained by the three components of the theory of planned behaviour (Ajzen, 2001). Others have argued that habitual patterns serve to circumvent information processing, so that once a habit is established following several similar behavioural patterns, processing of information is no longer required, as it becomes 'automatic' (Jackson, 2005). There has been much written in the psychological literature on the importance of being consistent with ones' self (e.g. Bem, 1972). As such, it is often seen as psychologically helpful to justify past performance by doing similar things in the future.

In many ways, this is similar to the spontaneous processing model proposed by Fazio (1990), which postulates that in certain circumstances, normative constructs guide behaviour. Fazio's (1990) model begins with the assumption that not all social behaviour is deliberative or reasoned, as is assumed by the theory of planned behaviour<sup>24</sup>. The model postulates that an individual's (social) behaviour is largely a function of the individual's perceptions in the immediate situation in which the attitude object is encountered. Fazio (1990) summarises the model in the following statement: "*The key to the model is attitude accessibility. The attitude must be activated from memory when the individual observes the attitude object if the attitude is to in any sense guide subsequent behaviour*" (p.81). A schematic diagram of Fazio's model can be seen in Figure 16.

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<sup>24</sup> It would be more correct to say that the theory of planned behaviour is only appropriate for behaviours that are deliberative or reasoned. The extent to which the authors of the theory assume that this applies to all behaviours (as Fazio, 1990 implies) is at best questionable.

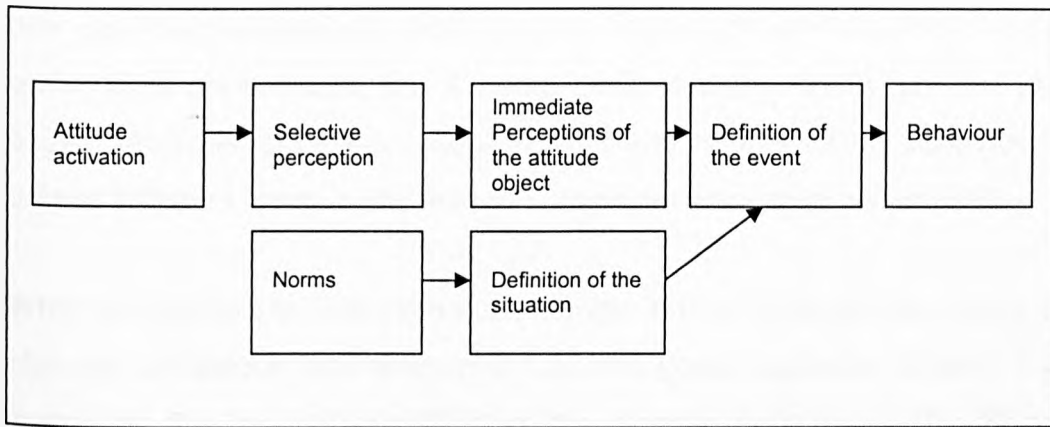


Figure 16 - Fazio's (1990, p.84) model of the attitude-behaviour process

As noted in section 2.4.4, an example for the context of the present research of a desirable behaviour might be the decision to purchase a sustainable house. Such a decision is very likely to involve aspects of both spontaneous processing (e.g. selective perception of desirable or undesirable attributes), and also of deliberative, reasoned processing (e.g. 'what would other people think if I made this particular purchase decision?'). Fazio (1990) does in fact propose that there is an interaction between automatic and controlled processes (in many cases), so depending on the attitude-object under investigation, attitudes are sometimes seen to be activated on mere observation of the attitude object, and in other cases arise from the reasoned processing implied by the theory of reasoned action (and its extension – the theory of planned behaviour).

This can be illustrated by looking at the example of housing. One might speculate that a house buyers' **attitude towards the physical form of a house** would be under the control of spontaneous processing (as outlined by Fazio, 1990), whereas the **attitude towards the purchase of such a house** would require the processing of information, and some form of psychological deliberation in order to arrive at a decision. The second attitude here (attitude towards the purchase) cannot surely be studied in isolation from the first attitude (towards the physical attributes), but unless it is assumed that the physical form is related causally to the purchase decision, then this aspect may well be ignored. For example,

one can imagine research looking at the impact of water saving devices on housing preferences, but it would be a step too far to assume any causal relationship between such results and house-buying behaviours, unless attitudes towards the actual house itself were also considered.

What is important to note from this example is that, although the theory of planned behaviour (see section 2.4.4) has good predictive power, it is limited by the level of specificity of the domain definition. The theory assumes to a large degree that it is possible to describe not only the behaviour itself, but also the antecedents to that behaviour in a manner that is meaningful to the people being investigated. In the case of the above example, any study using the theory of planned behaviour to look at house purchase behaviour would need to look specifically at attitudes towards that behaviour (e.g. attitudes towards buying a particular house) rather than related attitudes (e.g. attitudes towards the appearance of a particular house). This issue will be examined in more detail later.

#### **2.4.6 Building the theories into the conceptual model**

Starting from the conceptual model presented previously (see Figure 8) in section 1.3, it can be seen that the 'individual' and 'environment' components' of the model can be further elaborated by detailing some of the causal relationships which occur both between and within these components. Combining the previous models of environmental preference with the above models of attitude-behaviour relations, including the mediating variable 'behavioural intention' and also including influence of personal norms (but assuming the link to be mediated by intention, rather than direct as proposed by both Schwartz and Stern) leaves us with a conceptual model shown in Figure 17.

The inclusion of 'values'<sup>25</sup> within the box labelled 'Personal Context' is to acknowledge the effect of transcendental factors on the specific outcome response, as noted in section 2.3.4, and also because values are generally considered to be good predictors of attitudes towards emerging (i.e. new) attitude objects (Dietz and Stern, 1995). The inclusion of the box 'behavioural context' is to show that the model is restricted to attitudes towards those behaviours that are likely to arise from the perception of particular housing attributes, such as house-purchase decisions.

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<sup>25</sup> Although 'subjective norm' and 'values' might be thought of as similar concepts, they are not treated as the same here, as subjective norm is considered to be a more situation-specific belief structure than the more stable values, which as Schwartz (1992) put it 'act as guiding principle in [one's] life'.

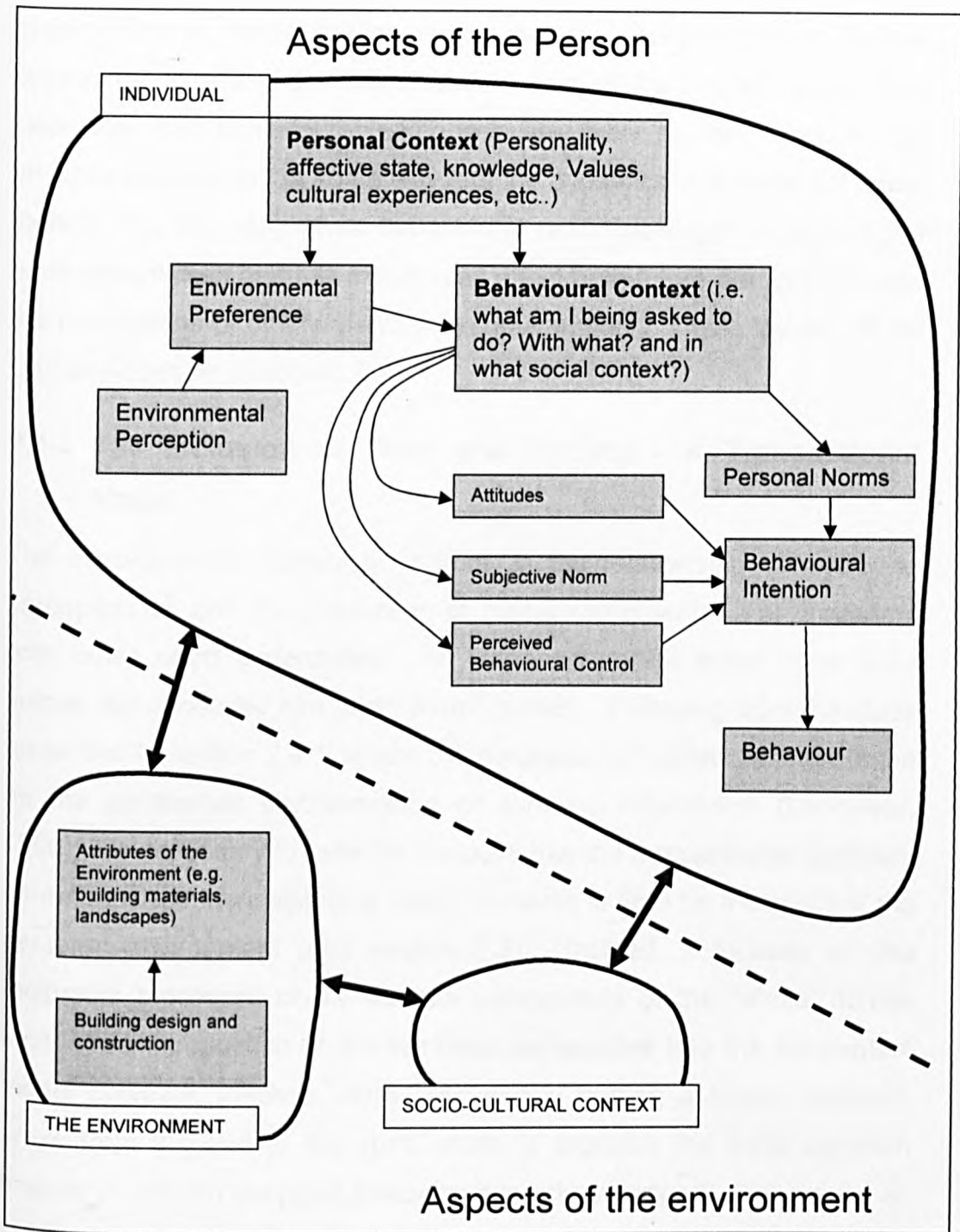


Figure 17 - Conceptual model with expanded 'individual' component

Thus behaviour (or aesthetic response) is now considered to be guided not only by affect and cognition (sub-components of the 'Environmental Preference' box), but also by attitudes and beliefs specific to the behaviour or response in question (**behavioural context**). At present, although this model assumes that the 'individual', the 'environment' and

the 'socio-cultural context' are related in a pattern of triadic reciprocity, as noted earlier, the socio-cultural context needs further elaborating to add to the comprehensiveness of the overall model. It is clear that any behavioural responses are likely to feed back to the physical environment in some way, but the dynamics of this are not made explicit thus far. Any given behavioural response might impact on the environment itself and this in turn may affect both future perceptions, and the perceptions of others viewing the environment. These issues will be discussed further in section 2.4.7

#### **2.4.7 The Inclusion of Time and Society - A Transactional Model.**

The importance of society or 'culture' in the relationship between the perception of, and the production of built environments is an important one, albeit often understated. As Rapoport (1995) asks: "*How does culture get translated into [built] form?*"(p.408) Following from the ideas presented in section 2.4.1, where the perception of environments is seen as the continuous transformation of stimulus information (Landwehr, 1990), it is necessary to reiterate the point that the transactional approach de-emphasises the isolation of static moments in time for the study of the person-in-environment (see section 1.3). Instead, it focuses on the reciprocal processes of the various components of the 'whole' across time. The introduction of the temporal perspective into the conceptual model however, involves more than simply putting a single feedback arrow from the end to the start, which is arguably the most common manner in which a temporal perspective is acknowledged. Clitheroe et al. (1998) describe this well in their work looking at contextual change. They see changes in context as being either gradual (in the case of contextual shifts) or sudden (in the case of contextual transformations). This is illustrated in Figure 18.



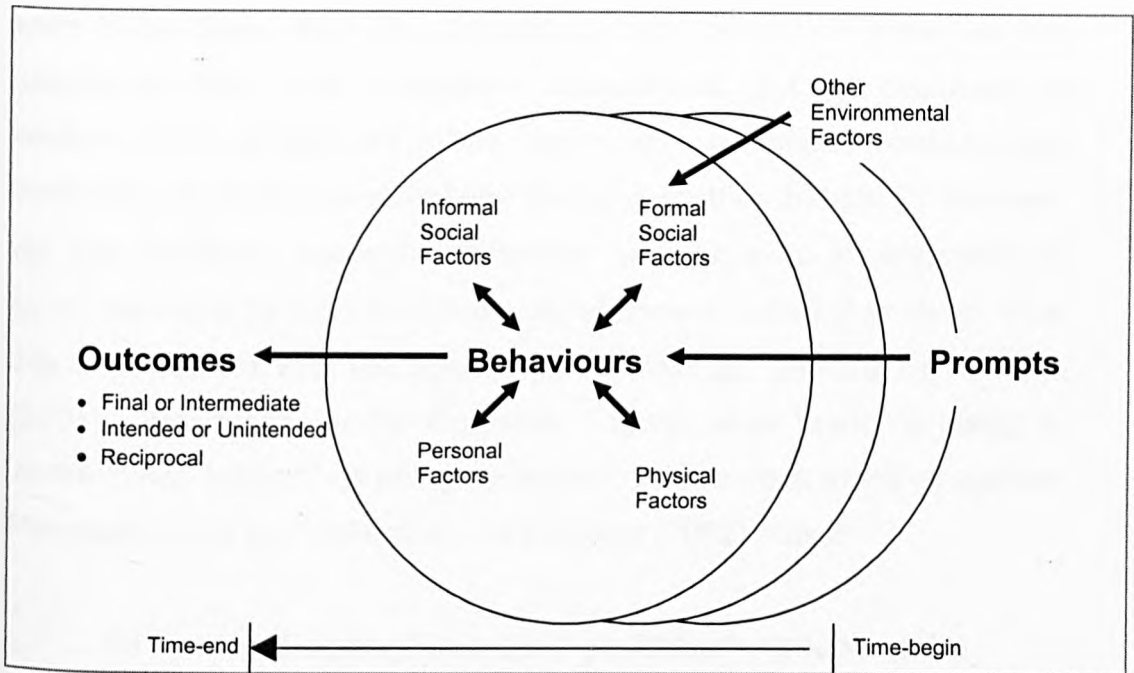


Figure 18 - Context, as conceptualised by Clitheroe (1998, p.106)

Simply adding a feedback arrow between 'behaviour' and 'physical environment' misses the importance of the various other features of 'context' that are seen within the transactional whole (see both Figure 5 and Figure 2). Rapoport (1995) points out that the relationship between people, culture and form is far from simple. It is not merely a case of 'culture impacting on form', but rather that aspects of culture impact on certain aspects of the built environment, which is in itself part of that very 'culture'. Moreover, it is important to consider not only **what** gets translated (e.g. from culture to built form), but also **why** it gets translated in a particular way (Rapoport, 1995, p.410). This seems particularly relevant to the study of sustainable housing, as the attributes under consideration progress beyond the technical and surface-functional into the socio-cultural domain. In much the same way as a house is more than simply shelter, a sustainable house is more than simply 'shelter that does not damage the natural environment'. The communicative aspects of material environments are all too easily forgotten in the pursuit of optimum technical standards.

If feedback between people and the physical environment in this case were to be direct, then the assumption must be that an individual has directly changed their immediate environment, but as discussed in section 2.3.5, people are often dependent on various socio-political institutions to make environmental changes on their behalf. If however, we see feedback between 'behaviour' and 'physical environment' as being mediated by the social and cultural context, rather than direct, then this is consistent with the agentic perspective put forward by Bandura (2001). Bandura's 'Social Cognitive Theory' sees human's ability to 'make things happen' as being mediated by three main forms of agency: Personal, Proxy and Collective. As Bandura (2002) puts it:

*"In personal agency exercised individually, people bring their influence to bear directly on themselves and their environment in managing their lives. In many spheres of life people do not have direct control over the social conditions and institutional practices that affect their everyday lives. Under these circumstances, they seek their well-being and valued outcomes through the exercise of proxy agency. In this socially mediated mode of agency, people try to get to those who have access to resources, expertise or who wield influence and power to act at their behest to secure the outcomes they desire" (p270)*

In this way, intentional behaviour is seen as achieving change either through direct personal action, or through the influence of others. In their discussion about self-determination theory, Hagger et al. (2006) note that one of the basic psychological needs of individuals is the "*desire to be a causal agent in his or her world*" (p.132). The third form of agency mentioned by Bandura (2002) however, is more complex, and fits well with the transactional approach of this thesis. Bandura (2001, p.14) notes that the collective performance of a social system involves transactional dynamics, and because of this, notions of collective agency are seen as emergent group level properties, rather than simply the sum

of agentic beliefs of individual members of the social system. Thus, we can expand the model developed in Figure 17 to involve agency-feedback as shown in Figure 19.

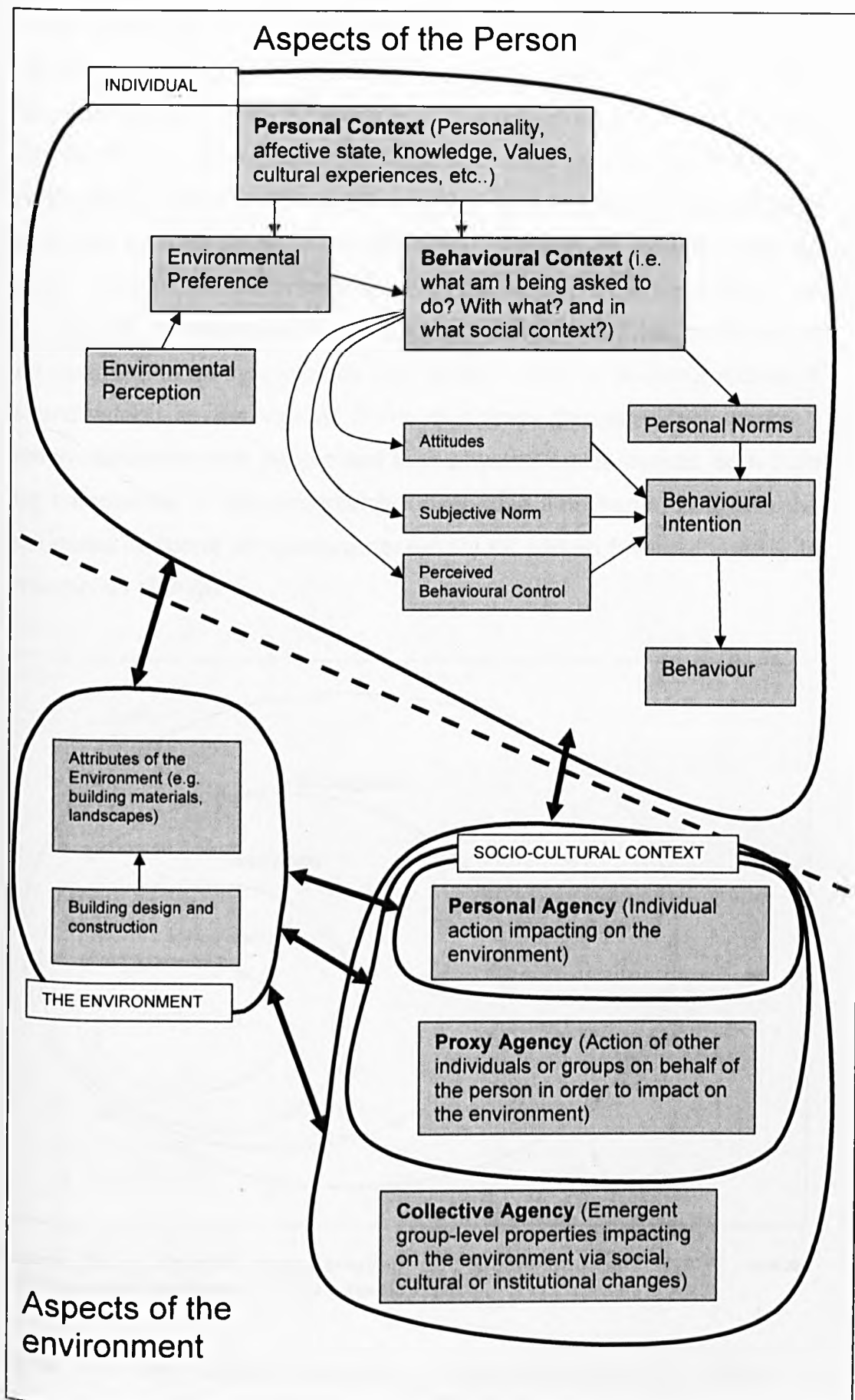
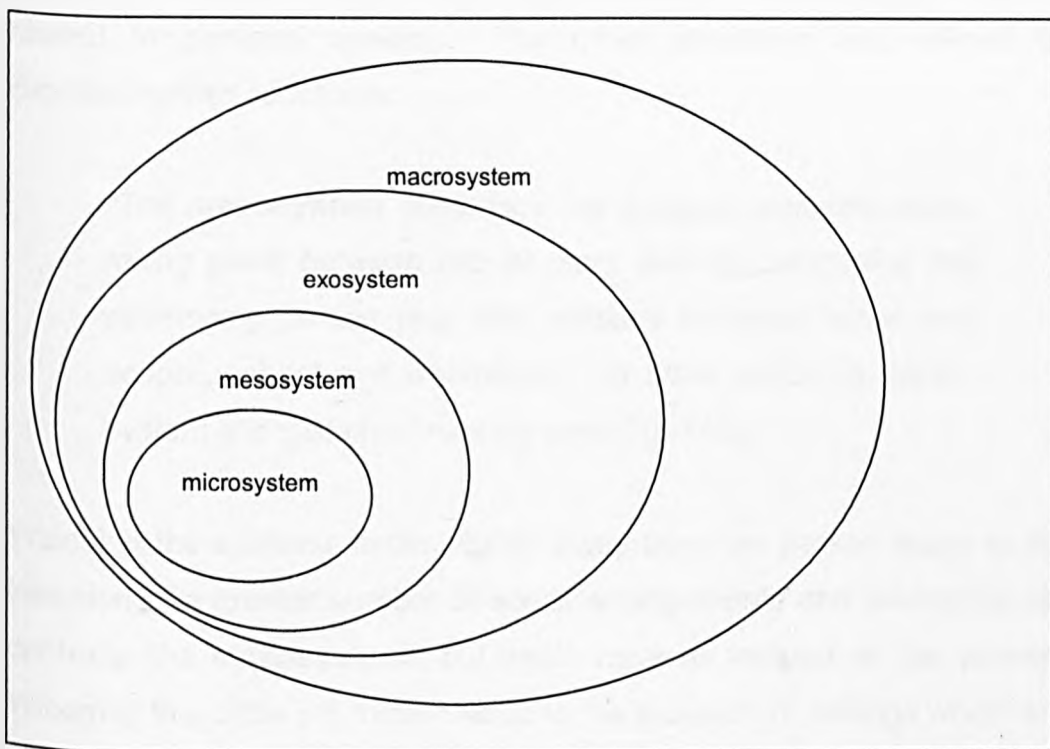


Figure 19 - Conceptual model with expanded 'socio-cultural context' component

In the conceptual model presented in Figure 19, the triadically reciprocal components relating to perception of the environment have been operationalised as: The Environment, The Individual, and Socio-Cultural Context. The Environment in question here is that of housing – particularly so called 'sustainable housing', and the attributes associated with such housing forms. The 'individual' component includes both the model of aesthetic preference and the theory of planned behaviour, as the two are considered as inter-related systems, given that behaviour is not assumed to be synonymous with 'action'. The 'socio-cultural context' is understood as the various forms of agency through which people's actions influence both people and their physical environments, both from the perspective of the immediately observable time-frame, and also the elongated temporal perspective necessary for certain forms of agency to accomplish change.



**Figure 20 - Graphic representation of Bronfenbrenner's (1979) nested interconnected systems of human development**

There are clear parallels between the temporal perspective shown in Figure 19, and the work of Urie Bronfenbrenner (1979; 2005), where,

drawing from Lewin's topological psychology, Bronfenbrenner sees people's ecological environment as a series of nested and interconnected structures (see Figure 20), the innermost of these being the 'microstructure', which is defined by Bronfenbrenner (2005) as follows:

*"A **microsystem** is a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical and material features and containing other persons with distinctive characteristics of temperament, personality, and systems of belief" (p.148).*

In a sense, the *microsystem* might be thought of as consisting of the **individual** component of the conceptual model, along with the immediate physical environment, and those aspects of the **socio-cultural context** related to personal agency. The other structures are defined by Bronfenbrenner as follows:

*"The **mesosystem** comprises the linkages and processes taking place between two or more settings containing the developing person (e.g. the relations between home and school, school and workplace). In other words, a meso-system is a system of microsystems" (p.148).*

Widening the systemic circle slightly away from the person leads to the inclusion of a greater number of social arrangements and environmental contexts (the **mesosystem**), but which have an indirect on the person. Widening this circle still further leads to the inclusion of settings which are one-step-removed from the persons immediate experience, but which nevertheless have an impact on the persons development over time. This is defined by Bronfenbrenner as follows:

*"The **exosystem**, encompasses the linkages and processes taking place between two or more settings, at least one of*

*which does not ordinarily contain the developing person, but in which events occur that influence processes within the immediate setting that does contain that person (e.g. for the child, the relationship between home and the parent's workplace; for a parent, the relationship between the school and the neighbourhood group)" (p.148).*

And then goes on to define the macrosystem.....

*"The **macrosystem** consists of the overarching pattern of micro-, meso-, and exosystems characteristic of a given culture, subculture, or other broader social context, with particular reference to the developmentally instigative belief systems, resources, hazards, lifestyles, opportunity structures, life course options, and patterns of social interchange that are embedded in each of these systems. The macrosystem may be thought of as a societal blueprint for a particular culture, subculture, or other broader social context" (p.150)*

Essentially, the macrosystem of Bronfenbrenner's ecological theory can be seen as a direct parallel of the 'Aspects of the Environment' components of the conceptual model being described here. It is very difficult to encompass this breadth of patterns in diagrammatic form, but the conceptual model presented assumes that the 'Environment' and 'Socio-Cultural Context' component of the model are understood in this holistic manner.

In terms of the environmental perception component of the model, the triadically reciprocal components '**individual**', '**environment**' and '**socio-cultural context**' are understood to interact with each other over time, and between contexts. As Lee (1973) puts it:

*“Perception of the environment is a complex interaction of both physical and social factors; of individual and group factors. It is also interactive and cyclic. Perception influences behaviour which in turn influences perception”*  
(p.114).

Moreover, the complexity of this interaction is due, in part, to the variety of potential ways in which perception can influence behaviour. Moskowitz et al. (2004) note that aspects of the environment can sometimes influence behaviour by automatically *“triggering goal pursuit”* (p.359). In other words, if certain features of the physical environment somehow suggest particular forms of behaviour, then this behaviour is more likely to be considered than if there is a perceived mismatch between the environmental ‘cue’ or ‘target’ and the behaviour in question.

The model presented in Figure 19 has been built up from the published literature in the area of both ‘sustainable housing’ and ‘people-environment studies’. As noted in section 1.4, the intention of the two case studies presented in the following sections (Chapters 3 and 4) is to test the utility of this theoretical framework to accommodate empirical data within the domain of ‘sustainable housing’. These two case studies will each focus on particular aspects which have been previously documented as being potential facets of ‘sustainable housing’ – namely, domestic water and wastewater systems, and exterior cladding materials. Although each case study can be seen as a stand-alone piece of research, they are best conceptualised within this thesis in terms of there being a ‘whole’ person-in-environment context (in this case sustainable housing), of which these case studies form a part.

The third case study (Chapter 5) will combine the issues raised in the previous two case studies, by looking at an example of a particular behaviour (buying a ‘sustainable house’), and discuss housing preferences in relation to the theory of planned behaviour (TPB) component of the model. This study will focus in particular on the



symbolic meanings ascribed to particular housing attributes, especially as they relate to representations of 'sustainability'. Finally, these findings will be discussed (Chapter 6) in relation to the conceptual model outlined above, along with recommendations for further research.

### 3 A Study of Psychological Aspects of Sustainable Housing: The case of domestic water and wastewater management<sup>26</sup>

#### 3.1 Introduction

This chapter will outline some of the possible psychological implications of embedding ecologically sustainable technologies within houses – using water and wastewater as a **case study**. As argued in section 2.3.4, it is useful when trying to understand the ‘individual’ component of sustainability to study sustainability measures which involve active behavioural change. Whilst there have been many studies of this kind looking at energy (e.g. Kempton et al., 1992; Poortinga et al., 2003) and recycling (e.g. Burn and Oskamp, 1986; Cheung et al., 1999), there have been fewer studies from a psychological viewpoint looking specifically at sustainable water and wastewater management (Vining and Ebreo, 2002). As such, this was chosen as the particular case study to be examined here. The overall context of wastewater management will first be introduced, and then a study of attitudes towards sustainable wastewater management technology will be presented and discussed in the context of the conceptual model outlined in section 2.4.7. Figure 21 highlights the components of the conceptual model that are particularly focussed on in this case study.

#### 3.1.1 Wastewater management: the context

The first covered sewers were constructed in the late 19<sup>th</sup> Century to address problems of disease and flooding, which were prevalent at the time. In these traditional sewers, underground pipes simply transported our waste away from the cities, to the rivers<sup>27</sup>, solving the immediate threats to human well-being. However, this soon became unsustainable

<sup>26</sup> Substantial sections of the literature review within this chapter have already been published in a book chapter by the author. See Craig (2002) for more details. The conference paper on which this book chapter was based won an award for the “best paper presented by a single author under the age of 35” at the 16<sup>th</sup> conference of the International Association for People-Environment Studies in Paris, 2000.

<sup>27</sup> In old English, the word sewer means ‘seaward’: i.e. waste is diverted towards the sea, via rivers (Balkema, 1999)

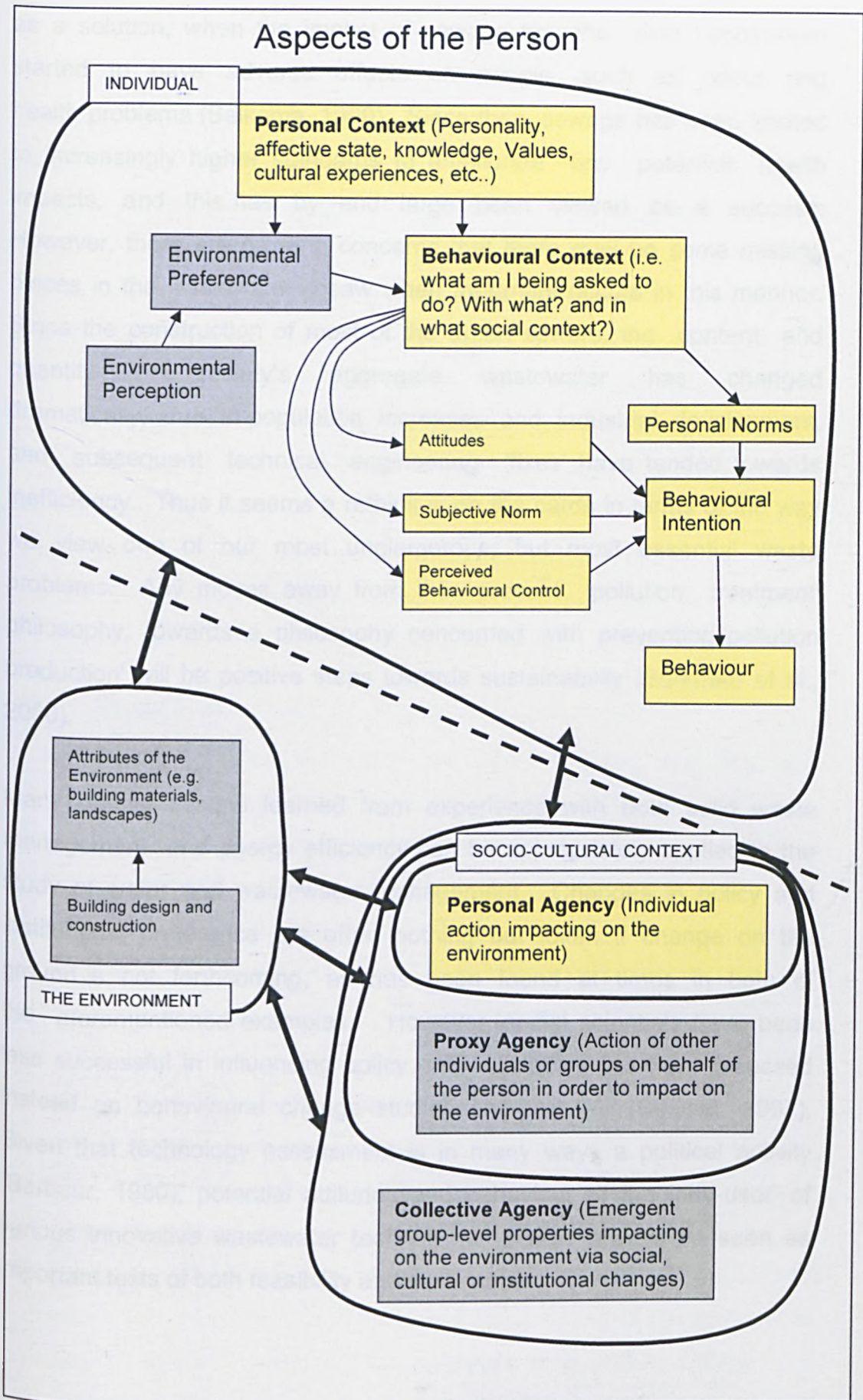


Figure 21 - Conceptual model with Case Study 1 foci highlighted

as a solution, when the impact of sewage on the river ecosystem started to have adverse effects on people, such as odour and health problems (Balkema, 1999). Since then, sewage has been treated to increasingly higher standards to ameliorate any potential health impacts, and this has by and large been viewed as a success. However, there are growing concerns that there may be some missing pieces in the wastewater jigsaw when treatment occurs in this manner. Since the construction of most of the urban sewers, the content and quantity of society's aggregate wastewater has changed dramatically, due to population increases and industrial development, and subsequent technical engineering 'fixes' have tended towards inefficiency. Thus it seems a rethink is on the cards in terms of the way we view one of our most unglamorous, but most essential waste problems. Any moves away from the present 'pollution treatment' philosophy, towards a philosophy concerned with preventing 'pollution production' will be positive steps towards sustainability (Burkhard et al., 2000).

Many of the lessons learned from experience with both solid waste management and energy efficiency can be appropriately applied to the study of water and wastewater management. Changes in policy and institutional preference are often nothing but token if change on the ground is not forthcoming, as has been found at times in both of the aforementioned examples. However, social scientists have been less successful in influencing policy and legislation, but have focussed instead on behavioural change studies and the like (Bechtel, 1997). Given that technology assessment is in many ways a political activity (Barbour, 1980), potential attitudes and behaviour of the 'end-user' of various innovative wastewater technologies should always be seen as important tests of both feasibility and sustainability<sup>28</sup>.

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<sup>28</sup> Methodologies such as Participatory Impact Assessment (PIA) might provide a possible way of incorporating such factors into the technology assessment process (see for example Schlumpf et al., 1999).

### **3.1.2 Sustainable domestic water and wastewater management**

In terms of the domestic setting, wastewater is transported via sewerage to either a centralised sewage treatment plant, or one of a variety of decentralised sewage treatment options, be they ecological or conventional (for a full review of treatment techniques, see Grant et al., 1996 or Burkhard et al., 2000). In terms of different sewage treatment options, even with the more ecological and decentralised options, an 'out of sight, out of mind' approach is more often than not taken by the general public. On the one hand, centralisation with all its advantages, seems to have created a potential psychological barrier to the successful implementation of sustainable water and wastewater management. Moves towards sustainability on the other hand, require an increasing focus on source control, and hence pollution production, rather than treatment. Some possible steps towards amelioration of water and wastewater problems at the household level are discussed below.

#### ***3.1.2.1 Reduce the volume of potable water required***

In some parts of the UK, water use often exceeds the regionally sustainable water supply (National Trust, 1996). In the UK, standards have long been in place governing the quality of water, regardless of the use to which the water is put. These regulations and standards (e.g. bathing water and drinking water standards) are crucial for health and hygiene reasons, and are strictly regulated (e.g. by DWI & SEPA<sup>29</sup>) for this very reason. However, treating water to potable (i.e. drinkable) standards is costly in terms of finance, energy, and infrastructure. Seen in this context, potable water is clearly a very valuable resource, but also one which we regularly waste without thought. At present, households account for 64% of all treated water use (Staufer, 1996). Installation of water saving devices in the home (e.g. low flush toilets, aerating taps, and suchlike) go some way to addressing this problem. Also, given that about a third of our total water consumption is used for flushing toilets (Griggs et al., 1997), collection of

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<sup>29</sup> DWI = Drinking Water Inspectorate. SEPA = Scottish Environmental Protection Agency



'greywater' (water from handbasins, baths, washing machines and dishwashers) for use in toilet cisterns makes sense in terms of sustainability and economics, although payback periods can sometimes be large (see Sayers, 1998; Naisby, 1997; Environment Agency, 2000). However, there are sometimes concerns voiced about the perceived safety of greywater (Olson & Bruvold, 1982; Shifflett, 1997; Naisby, 1997) with preference often tending towards rainwater harvesting, which can also provide a viable alternative to potable water.

### **3.1.2.2 Reduce the volume and content of wastewater from the house**

Recycling of greywater as discussed above goes some way towards reducing the amount of potable water required by domestic dwellings. However, from the point of view of waste produced, in terms of BOD<sup>30</sup> and SS<sup>31</sup> (two of the main measures used by regulators to assess the organic matter and pathogens in water), the wastewater content still remains high, if a little less diluted. In order to reduce the content of organic matter and pathogens in the wastewater, separation of waste would have to occur at source, which would invariably mean a change in behavioural patterns, as different toilets and plumbing would be required. Of course, if separation of waste were to take place at source (e.g. urine separation and dry toilets), then the aforementioned greywater would need to be put to some other use (e.g. washing or watering gardens). Given the cultural significance of the flushing toilet (Palmer, 1973), and the taboos surrounding human bodily functions (see for example Warner, 1999), it is likely that any radical changes in toilet design and corresponding behaviours will produce a negative reaction among many people. Behavioural patterns and corresponding attitudes regarding toilet practices such as flushing and then hearing the waste being 'flushed away' are deeply entrenched in

<sup>30</sup> BOD = Biochemical Oxygen Demand: Indicator of Organic matter content of a body of water, measuring by how much oxygen is being removed by decomposition.

<sup>31</sup> SS = Suspended Solids: Particles of grit, sand or organic matter suspended in a body of water

western society (Fismer and Wendler, 1996) and thus sensitive to change.

### **3.1.2.3 *Recycle the nutrients that are traditionally lost in conventional treatment processes***

As well as reducing the concentrations of organic matter and pathogens in wastewater dramatically, dry toilets and urine separation toilets also have the potential to provide for a variety of uses such as nutrient recycling or methane production (for transport). Burkhard et al. (2000) note that such techniques can also be very cost effective alternatives to traditional systems, given appropriate tariff structures. This idea is however, still seen as fairly radical within the UK.

Having identified some of the ways in which the wastewater management problem can be tackled in a more sustainable manner, the following section will introduce the issue of public participation in water and wastewater planning. This issue is relevant as it is considered to be a crucial part of the drive towards sustainability, as defined within Agenda 21. Moreover, it is also an issue frequently neglected by those advocating changes in the field of water and wastewater management.

### **3.1.3 Public participation in water and wastewater planning**

As previously argued in section 1.2, any planning process should be, by its very nature a social process, feeding ultimately into the 'goals of society' (Parker & Penning-Rowsell, 1980). Public influence on the planning process is one of the basic pillars of a participatory democracy, given that in theory, '*individuals and their institutions cannot be considered in isolation from one another*' (Pateman, 1970, pp.42). Thus, a diverse range of opinions should be accommodated and considered within any planning decision. However, all too often this is not the case, and the process suffers from both institutional problems, public indifference, and a basic lack of trust between stakeholders from the outset (Löfstedt, 1998).

Syme and Nancarrow (1992) note that public participation in water planning often caters only for an interested minority, which is arguably unrepresentative of the general public. Given that water management decisions are dependent more on human values rather than technical judgement (Syme & Nancarrow, 1992), methods for ascertaining public values and perceptions are crucial in gaining a full understanding of society's goals regarding water management. The situation where only an educated, affluent minority participates in such matters might be viewed as a failure of the participatory process rather than as a failure of the seemingly uninterested, who may instead be uncomfortable with the process itself.

Syme and Nancarrow (1992) found that public involvement in the water planning process could be predicted by a) perceived levels of desirable power for the water authority, and b) intrinsic interest in particular water issues<sup>32</sup>. The use of questionnaires and other survey methodologies can sometimes be used as an alternative, more user-friendly way of gauging public opinion than public meetings in the early stages of a water planning process. Once this 'public opinion' has been ascertained however, it is important that it is at very least 'seen to be' taken into account. Indeed, research has shown that in the area of water management, it is often better to treat public involvement as a negotiation process, rather than as a 'procedure with relatively unvarying sequence' (Syme & Eaton, 1989, pp 104).

Another factor influencing water planning decisions is the procedural fairness (see Lind & Tyler, 1988) perceived by participants in the water planning process. All too often participants take the view that the participation process is unfair, which can result in discussions about procedural issues (such as procedural justice and political efficacy) rather than the original topic. Thus issues become 'framed' and thereby

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<sup>32</sup> It should be noted however that, unlike earlier studies, no relationship was found in this study between education, income, age, and participation.



redefined by the participants (cf. Capek, 1993). It is also likely that perceptions of distributive justice play a strong part in public attitudes towards water management issues, given that water and wastewater infrastructure is by its nature a resource allocation problem. Clayton (1994) suggests that we should '*think through the effects of any policy and evaluate it from a number of different justice perspectives*' (p 208) in order to maximise the collective welfare. From this perspective, it is clear that environmental decision making is no longer a matter of simply weighing up the economic costs and benefits, but a complex problem requiring the consideration of such issues as procedural and distributive justice. Syme et al. (1999) found that on the whole, the public base their decisions about water planning on more complex dimensions than would be expected by many social-psychological theories. Examples include: moral obligation towards other human users, obligation for involvement in decision making, and the 'rights' of the environment.

#### **3.1.4 Values, Attitudes, and Behaviour**

Rousseau's political theory asserts that through participation in the decision making process, individuals become able to understand a given situation from the perspectives of both public and private interests (Pateman, 1970). Thus, public demands eventually converge with private wishes through the participatory process. Prior to the participation process, it is considered useful to have an understanding of the general values and attitudes of the potential participants, and thus the nature of 'public opinion'. Given that many decentralised wastewater management systems might require behavioural changes, a change in attitudes may also be required, especially if the attitudes and beliefs of potential users are inconsistent with the required behaviours.

Research into the link between attitudes and behaviour (see section 2.3.4) seems to suggest that action or motivation to act is influenced primarily by our beliefs about a situation in any given context. These

beliefs are thought to cumulatively influence attitudes (more stable structures, less context dependent than beliefs) which we hold about 'attitude-objects' (see Stern & Dietz, 1994). The attitudes that we hold about a given 'attitude-object' are heavily influenced by our value structure - a set of "*single belief[s] that transcendentally guides actions and judgements across specific objects and situations*" (Rokeach, 1972, p. 160). If the achievement of sustainability with regard to water and wastewater management is potentially reliant on end-users changing their behaviour, then an understanding of the beliefs and attitudes towards water and wastewater technology is required in order to consider possible behavioural change strategies. It seems likely that in general, those people with environmental value orientations (Stern et al., 1993) will be more likely to support the more ecological forms of wastewater management, given that more behavioural change is usually required.

### **3.1.5 Influences on acceptability of sustainable wastewater management**

As well as the above-mentioned influence of participatory procedures and individual value orientations, there are also various other factors that can influence the degree to which the public will be accepting of innovative water and wastewater technologies. One such influence is that of present water quality<sup>33</sup> (Olson & Bruvold, 1982). The influence of this, however will depend on geographical differences, and local water use patterns. Knowledge and past experience of water recycling systems may also have an influence on their acceptance, although there is some suggestion that this influence has been overestimated (Olson and Bruvold, 1982). Faith in technology

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<sup>33</sup> In other words, people who live in an area that has relatively low water quality might be more likely to accept innovative technologies, whereas those who have a high quality of water may feel that this may be threatened by such innovations.

has also been found to influence (positively) acceptance of renovated wastewater<sup>34</sup> (Johnson, 1971).

Age, gender and level of education are other factors that may influence acceptability. Olson & Bruvold (1982) studied the influence of these factors and found that age was correlated negatively with acceptance of renovated wastewater. Generally speaking, women appeared to be less accepting than men (although this may be specific to the populations studied). Also, those with a higher level of education appear to be more accepting than those with a lower level, although this may be confounded with the measures used to assess acceptability (willingness to pay might better reflect a respondents economic status than their acceptance). The issue of age is also important to study in light of recent predictions about demographic changes. For example, Aberdeen and Aberdeenshire Councils predict that between 1999 and 2016, the local older population will increase by about a third, whereas the younger age groups will decline in numbers (Structure Plan Area Forecasts, 1999).

The degree of bodily contact with wastewater required of end-users also seems to be directly associated (negatively) with the degree of acceptance. Watering the garden is likely to be more acceptable than washing clothes for this reason. However, studies have shown that attitudes toward body elimination (sic.) are affected to a large degree by occupation (Adams & Templer, 1980), suggesting that people who are in regular contact with human wastes (e.g. sewage workers, nurses) may show less disgust, and therefore be more accepting of renovated wastewater for potable uses than those in non-contact occupations (e.g. bankers). Studies from research into risk perception (e.g. Starr, 1969; Renn, 1990; Slovic, 1993) have found that people are more willing to accept risks if they are voluntary, of low catastrophic potential, familiar, and from a trustworthy source. This is important as water

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<sup>34</sup> Renovated water is a general term for the re-use of wastewater. It is less specific than the term 'greywater', as it can also include blackwater (water from toilets).

and wastewater technologies may be a focus of worry (see Macgregor, 1991), insofar as they may cause concern about deeply entrenched cultural beliefs regarding issues such as hygiene and safety.

Other psychological factors include 'Disgust Sensitivity' (Bixler and Floyd, 1997), aversion to the unclean, over-concern with health, and aversion to human waste, all of which have been postulated as having a negative association with the acceptability of reusing water (Olson & Bruvold, 1982)<sup>35</sup>. Cultural factors such as religion may also play a large part in determining attitudes (see for example Warner, 1999).

### **3.1.6 A study of psychological aspects of sustainable domestic water and wastewater systems.**

As outlined earlier, in light of various changes in institutional policy and a general increase in public environmental awareness, there is a need to rethink the way in which we view and deal with our water and wastewater infrastructure. The current trend of centralisation is now being questioned, often by those with environmental value orientations (see Stern and Dietz, 1994), who would prefer a more decentralised approach. Of the various techniques available for sustainable wastewater management (see Burkhard, Deletic and Craig, 2000 for a comprehensive review of techniques), two were selected for investigation by this case study. These were:

- Greywater re-use systems
- Compost toilets

These were chosen specifically because they both tackle the problem nearer to source than conventional wastewater treatment systems, and also involve the end user to some degree in their operation.

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<sup>35</sup> However, Olson & Bruvold (1982) found no association with faith in science and technology, aversion to change, or ecological concern.

Given the problems often inherent in the planning process, along with the acknowledgement that water management decisions are dependent on human values rather than technical judgement (Syme and Nancarrow, 1992), it is considered that there is a need to find ways of eliciting these values at an early stage in the planning process. As acceptability is thought to be a key indicator of a person's value structure (see Blamey, 1998), it is important to study influences on acceptability (and also awareness) of various technologies. Consideration of the impact of new technologies on end users is seen as an important test of both feasibility (acceptability) and sustainability.

This study sought the opinions and attitudes of the general public when presented with the idea of water recycling systems and compost toilets. It was thought that people would be more likely to support the idea of water reuse for irrigation and other non-potable purposes (see Dean and Lund, 1981), so the possibilities for using recycled water for drinking were not investigated in this study.

The fact that there is a greater demand for environmental protective actions and improvements can be reflected to some degree by looking at a person's 'willingness to pay' for such improvements. It was expected that a greater number of people would have a willingness to pay (WTP) for greywater systems than for compost toilets, and also that those who did have a WTP would be willing to pay a greater amount.

Although due to a rather sparse literature on the subject, this study was partly exploratory, *a priori* hypotheses include:

1. The majority of people will not be aware of grey/rainwater recycling systems.
2. People will have more concerns over safety for greywater systems than for rainwater systems.

3. Willingness to pay for both water recycling systems and compost toilets will tend to be rather low, but higher for water systems than for compost toilets.
4. Most people will not like the idea of compost toilets
5. People who live near to a decentralised treatment plant will be more aware of where their sewage is treated than those people whose sewage is treated in conventional centralised systems.

## **3.2 Methodology**

### **3.2.1 Research Setting**

This study was conducted in the Aberdeenshire region of Scotland in early summer, 1999. At this time, there was no water shortage regionally, and communications from both the Scottish Environmental Protection Agency (SEPA) and the regional water authority (NOSWA) to the public were mostly for information purposes. In the study region, the majority of dwellings are not equipped with water meters (indeed NOSWA, 1999 appeared to discourage their use for domestic properties), although homeowners can opt to have one installed if they pay the installation costs.

Two settings in North Eastern Scotland were used in this study: One rural village (Popn.  $\approx 616^{36}$ ), and one peri-urban suburb (Popn.  $\approx 2500$ ). It was decided that an urban sample should not be studied because of a lack of dwelling comparability (i.e. scenarios for systems to be put into flats for example, would be different than for single houses found in both studied locations). All surface water and screened sewage from the rural village had received tertiary treatment by a constructed wetland (which was visible from the main road running through the village) since 1998 (SEPA, 2004).

### **3.2.2 Procedure**

Methodologically, this study used a combination of two approaches: the face to face interview, and the postal survey. The face to face interview has many advantages, including high effective response rates, and a high level of control over question interpretation. However, time and cost issues (along with the need for extensive standardisation between interviewers) suggested that an alternative method be used. While postal surveys offer a cheaper, less time-consuming option, response rates tend

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<sup>36</sup> Populations calculated as estimates based on figures provided by Aberdeenshire Council in 1999, and a mean number of people per household of 2.7 (found in the present survey)

to be low, and there is the potential that respondent motivation might be lower, as there is no 'foot in the door' effect.

In this survey, questionnaires were hand delivered by the researcher. An introduction was given to the subject area, and respondents were then asked to fill in the questionnaire in their own time. Respondents were then left with the questionnaire, and told that they could either return it in a pre-paid envelope, or it could be collected by the researcher in three days time. This method has been proven as effective in previous studies (e.g. Naisby, 1997) as it has advantages of both time-conservation and respondent comfort, as respondents do not feel under pressure. All respondents were contacted during working hours (9am-5pm)<sup>37</sup>.

### 3.2.3 The questionnaire

Respondents were asked for a small amount of personal information, in order to look for possible socio-demographic trends in the results. This section of the questionnaire was placed on the last page, as respondents can sometimes be put off by the presence of personal questions at the outset (Breakwell et al., 1995).

In section **one** of the questionnaire, respondents were provided with a short text describing greywater and rainwater systems in straightforward terms (see Appendix 1), after which 10 standardised response questions (5 point Likert-type scale) followed, regarding general attitudes towards water conservation and grey/rainwater use. This approach was taken as it was felt that the Likert scale format increases the user-friendliness of the questionnaire, and thus respondent motivation. Two questions were also asked in section **one** regarding willingness to pay for water recycling systems, followed by two open-ended questions about who they felt should be responsible for picking up installation costs, and why.

Section **two** started in the same way as section **one**, with a description of compost toilets, followed by a simple question about whether or not

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<sup>37</sup> It is noted that this (contact time) may result in a slightly biased sample



respondents would ever consider having one installed. As these toilets were assumed to be very unfamiliar, it was thought to be more appropriate to offer open-ended responses about attitudes, rather than attempting to elicit responses within the constraints of a Likert scale. Willingness to pay was also studied in the same manner as for section one.

Three supplementary questions were asked at the end of the questionnaire regarding:

- a) Knowledge of sewage treatment location,
- b) Knowledge of regional water authority, and
- c) Opinions about water meters

Initial piloting of the questionnaire suggested that it would take about 15 minutes to complete, which was considered acceptable in terms of respondent motivation, as no further incentives to comply were given.

### **3.2.4 The sample**

A sample of 180 (60 rural, 120 peri-urban) were contacted and asked to complete the questionnaire. The response rate was fairly high, with 40% (N=24) of the rural sample returning the questionnaires, and 42% (N=50) of the peri-urban sample returning them. This response rate (combined = 41%) is larger than is often expected for standard postal questionnaires, suggesting a definite strength in the methodological approach. Although the final number of respondents (N = 74) is somewhat limiting in terms of statistical analyses, it is comparable to other studies which have used questionnaires as a component methodology in the process of documenting person-environment transactions (see for example Werner, 2003), and was therefore considered to be sufficient for the wider purpose of this thesis.

### 3.3 Results

#### 3.3.1 Socio-economic characteristics of sample

Of the total sample, 24 (32.4%) were from a rural location, and 50 (67.6%) from the peri-urban location. The socio-economic characteristics of the sample are presented in Table 2.

Socio-economic characteristics <sup>38</sup>	Sample		
	Rural	Peri-Urban	Total
<b>People Per Household</b>	<b>Frequency</b>	<b>Frequency</b>	<b>Frequency</b>
1	4	6	10
2	8	22	30
3	3	8	11
4	6	9	15
5	3	3	6
6	0	0	0
<6	0	1	1
<b>Sex</b>			
Male	4	20	24
Female	20	28	48
<b>Age</b>			
<20	1	0	1
21-30	3	3	6
31-40	5	12	17
41-50	4	12	16
51-60	3	10	13
>60	8	11	19
<b>Residential Status</b>			
Renter	7	3	10
Owner	16	39	55
Other (e.g. part owner)	1	7	8
<b>Length of Residency</b>			
<1 year	1	3	4
1-5 years	8	17	25
>5 years	15	26	41

**Table 2 – Socio-economic characteristics of the sample for the wastewater study**  
From the combined data of the 74 responses, the mean number of people living in each household came out to be 2.7. 66.7% of the sample

<sup>38</sup> Missing data are excluded from the results, and are not reported here.

were female. The median age category of the total sample was 41-50, and the distribution was skewed towards older people.

The majority of the sample were homeowners (75%), and this figure would be higher if part ownership (with housing associations) is included within the category. More than half of all the respondents had lived in their homes for over 5 years (58%), with only 6% having moved within the last year.

### 3.3.2 Greywater and Rainwater systems

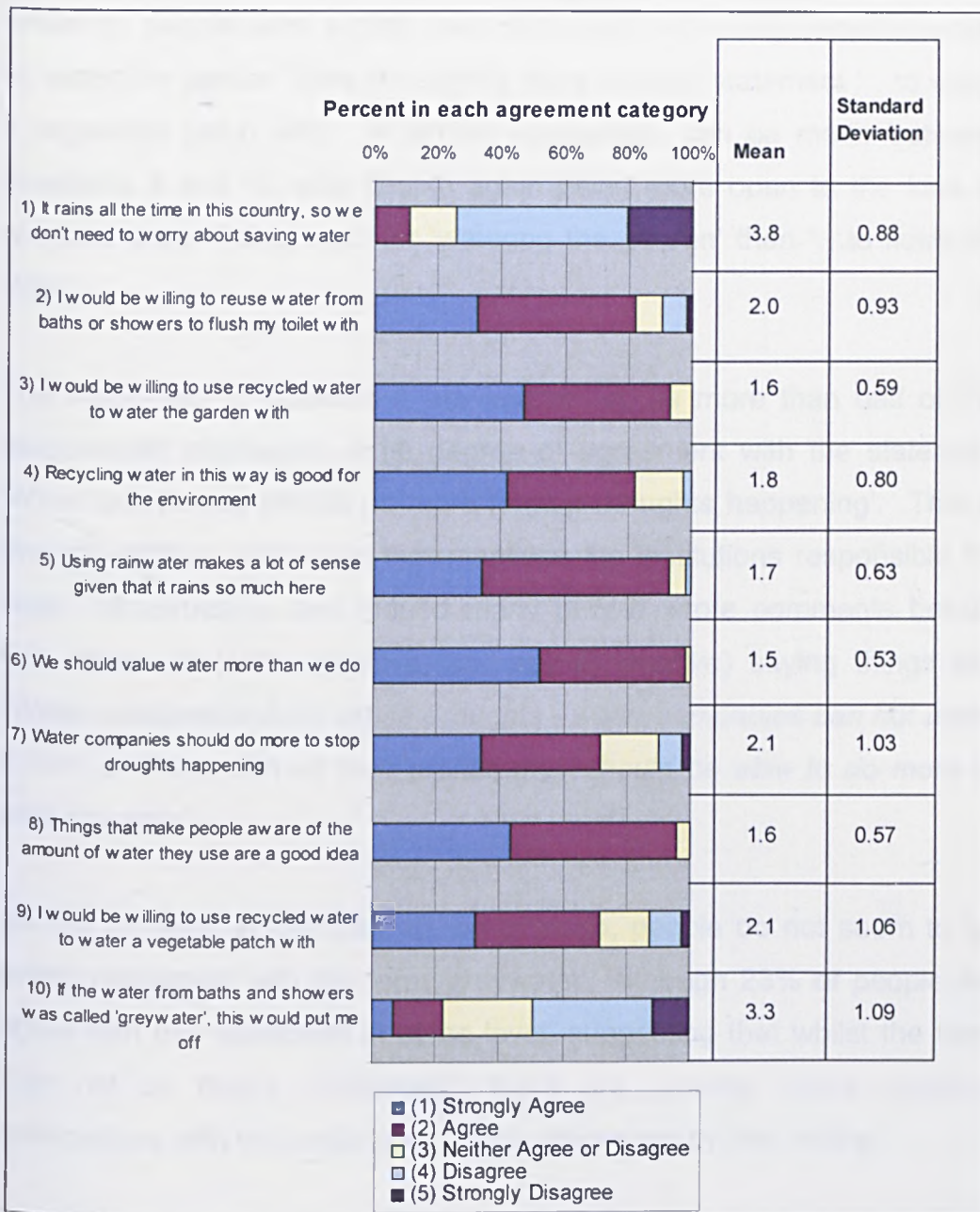
Respondents were first asked to read the following text, which was then followed by 10 questions about issues related to sustainable water management.

Over the past few years, water pollution and water shortage have become important issues in both Scotland and Britain as a whole. Water in our taps is treated to extremely high standards (to make it safe to drink), and it is this water that we use to flush our toilets with. At the moment, over a third of the total mains water we use goes on flushing the toilet. It has been suggested that we can reduce many of these problems by using water in a more environmentally friendly way.

This would mean using less water in general, and also possible re-using some of the water that we presently drain away down the plughole. This recycled water is not suitable for drinking, but if treated could be used to flush the toilet or water the garden. This water would be treated to a safe standard, but would be slightly cloudy in appearance. Only water from baths, showers and hand basins would be used in such systems.

Another way of using less mains water would be to use rainwater collected from roofs. The technology to collect, store, and use this water is fairly straightforward, and has the potential for large water savings.

The 10 questions measure people's attitudes toward sustainable water use. As such these questions correspond to the 'attitudes' box preceding behavioural intention in the conceptual model illustrated in Section 2.4.7. (see Figure 19) The results for the individual questions can be seen in Figure 22.



**Figure 22 - Descriptive Statistics for attitudes toward sustainable water management**

It is evident that with the exception of questions 1 and 10 (which were worded negatively), all attitude statements yielded a substantial level of agreement. Furthermore, there are some interesting differences between the responses on the individual attitude statements.

Comparing question 3 with question 9, it is evident that although the two statements received a broad positive response, due to their inherent

similarity, people were slightly less concerned with using recycled water to 'water the garden' than the slightly more specific statement '...to water a vegetable patch with'. A similar comparison can be made between questions 2 and 3, with people again being more open to the idea of recycled water being used for 'watering the garden' than '...to flush my toilet'.

The responses to question 7 are interesting, as more than half of the respondents expressed some degree of agreement with the statement 'Water companies should do more to stop droughts happening'. This is the only attitude statement that mentions the institutions responsible for water infrastructure, and indeed many people wrote comments beside this statement (some positive, and some negative) saying things like "*Water companies don't cause droughts - water companies can not make it rain*" or "*Yes, with all their profits, they should be able to do more to stop droughts*".

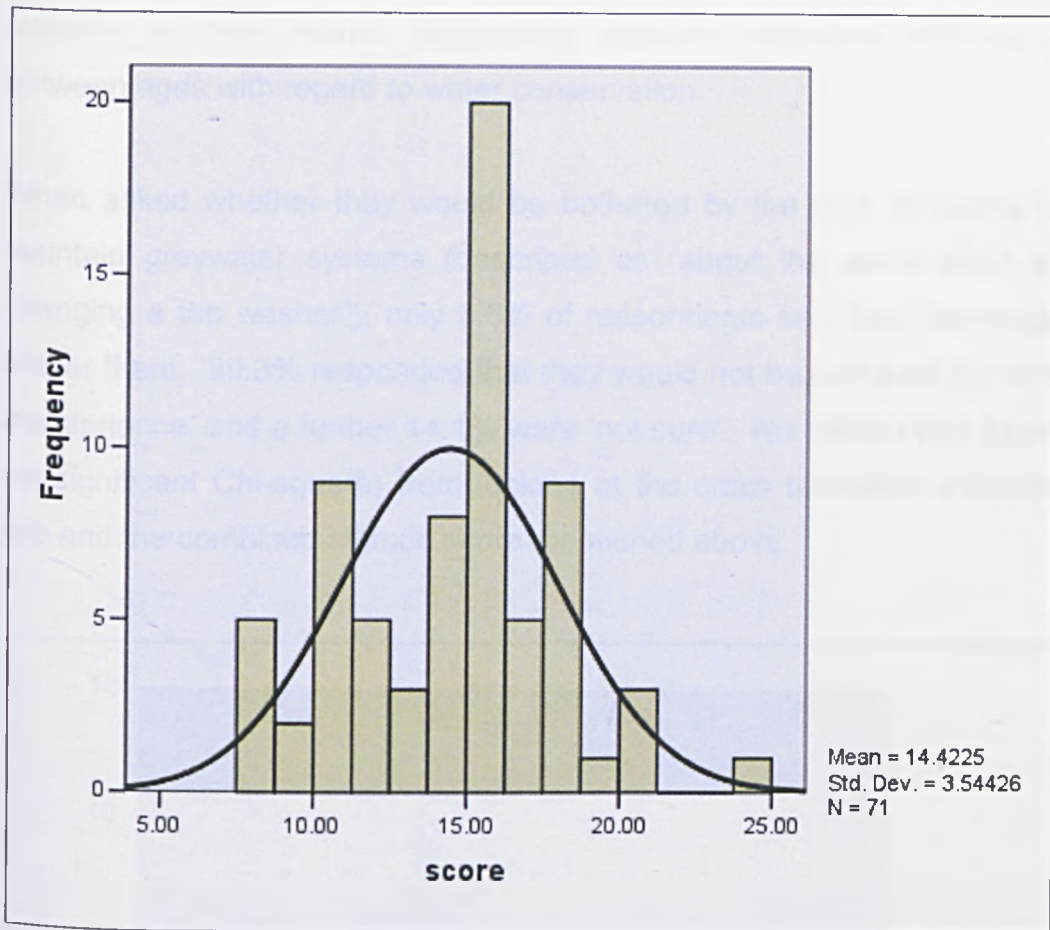
As can be seen in question 10, on average, people do not seem to be overly concerned with the term 'greywater', although 23% of people did agree with this statement at some level, suggesting that whilst the term may not be overly problematic, there are possibly some negative associations with the prefix 'grey' which are shown by this finding.

For clarity of interpretation of any combined analysis, questions 7 and 10 were omitted from any further analysis<sup>39</sup>. The remaining question responses were combined by simply adding up the responses (negative for q1), thereby producing a useful score for comparison purposes. Reliability analysis was performed on this scale (mean=14.4, SD = 3.54) to test its internal consistency, yielding a Cronbach's alpha of 0.72, which was considered satisfactory. The descriptive statistics for the items in the scale are shown in Figure 22, and the frequency distribution for the scores on this combined scale can be seen in Figure 23.

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<sup>39</sup> Question 7 was looking at perceptions of institutional responsibility, and question 10 was looking at peoples attitudes toward the word 'greywater' rather than the concept itself.





**Figure 23 - Frequency distribution for combined scale of attitudes towards sustainable water management**

Whilst detailed statistical analyses of this scale were not thought to be appropriate, an overall comparison of scores was thought to be useful. As such, the scores on the above scale were treated as a trichotomy, with categories (high, medium and low). This trichotomy can then be used as a combined attitude score to represent data in the form of contingency tables. By simply taking approximately 33% from each tail of the scale's frequency distribution, a three category distribution was created with 22 in the 'High' category, 28 in the 'Medium' category, and 24 in the 'Low' category. People who fell in the 'High' category tended towards the 'disagree' option, and were therefore deemed to be less 'environmentally friendly' in terms of water conservation. Clearly the opposite is true for the 'Low' category. It is interesting to see (Figure 24) that those with low scores (i.e. more water friendly) tended to be younger than those with

medium or high scores, suggesting possible attitudinal differences between ages with regard to water conservation.

When asked whether they would be bothered by the idea of having to maintain greywater systems (described as “about the same effort as changing a tap washer”), only 5.6% of respondents said that this would bother them. 80.3% responded that they would not be bothered by such maintenance, and a further 14.1% were ‘not sure’. No pattern was found (or significant Chi-square) from looking at the cross tabulation between this and the combined attitude score mentioned above.

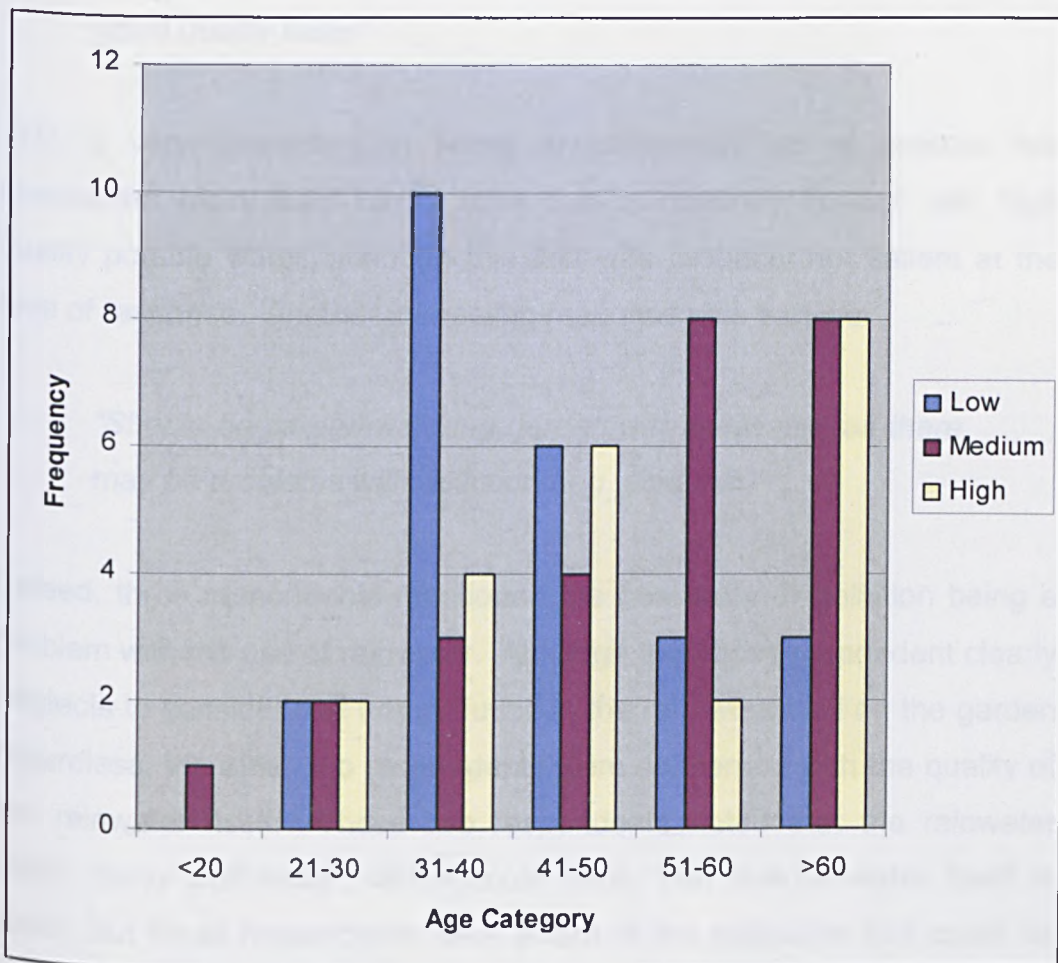


Figure 24 - Age of Respondents by Combined Attitude Score (Low, Medium, High)

Only 8.5% of respondents had come across greywater systems before (91.5% had not), compared to 19.7% when asked whether they had come across rainwater harvesting systems (80.3% had not). Those that had

come across rainwater harvesting systems tended to mention a water butt in the garden, from which the water was used for watering plants.

Looking at the two open-ended questions regarding whether respondents had concerns about using greywater or rainwater to water the garden with, the results were interesting in that more concerns were mentioned over greywater than rainwater, possibly reflecting a belief that rainwater is by its very nature a clean, wholesome source. Indeed as one person said:

*“Using rainwater for flushing toilets is a massive waste of good quality water”*

This is very interesting in terms of perception, as at present this respondent most likely has a toilet that is currently flushed with high quality potable water, although this fact was probably not salient at the time of response. Another interesting response was that we:

*“Should be careful watering garden with rainwater, as there may be problems with pollution (e.g. acid rain)”*

Indeed, three respondents mentioned the possibility of pollution being a problem with the use of rainwater. Although the above respondent clearly neglects to consider that any pollution in the rain would fall on the garden regardless, the other two respondents were concerned with the quality of the rainwater itself. These two respondents noted that the rainwater might “*carry pollutants*”, which could imply that the rainwater itself is clean, but these respondents were aware of the pollutants that could be picked up from roofs, and so on. “*Storage*” and “*Cost*” were two other themes of concern which were mentioned. By and large however, people did not tend to have many concerns about the idea of rainwater harvesting.



Concerns over the use of greywater yielded a greater number of responses. One frequently mentioned concern was regarding the use of greywater for gardening purposes, especially for edible plants. This fits in with the finding discussed above comparing questions 3 and 9. As one respondent said:

*"I would be worried about the amount of chemicals in the greywater for watering the vegetable garden and fields"*

Another respondent asked:

*"Would cleaning agents (soap, disinfectant, etc.) be removed prior to garden use? Harming plants, soil, and groundwater is equally environmentally unfriendly (as using excess water)"*

Such worries over safety of greywater suggest that attention would need to be given in any educational materials to the process by which greywater is cleaned. The description presented to people in this study did not go into much detail about this, which is probably reflected by these responses. It would also need to be made clear at what level of treatment it is 'safe' to use greywater on edible plants.

When indicating concerns over the use of greywater to flush the toilet, the main factors seen as problems were those concerning "storage", "installation" and "costs", although the effect of the greywater itself on the toilet was another factor mentioned:

*"Greywater from baths could cause a massive amount of soap bubbles from people with different additives to bath in"*

*"Would greywater cause some kind of discoloration of the toilet?"*

The more practical aspects of greywater systems mentioned seemed to show a great degree of understanding of what such systems might potentially involve:

*"How big is the unit, where would I keep it, what would it cost, what happens if it runs out of 'greywater'?"*

*"Problems with installation of pipes and plumbing arrangements"*

*"Might be problems of smell from greywater prior to reuse"*

*"Storage of water is a problem if each house does it. However, if there was a communal arrangement, then this would be OK"*

*"No problem with using greywater as long as it is only from my own house"*

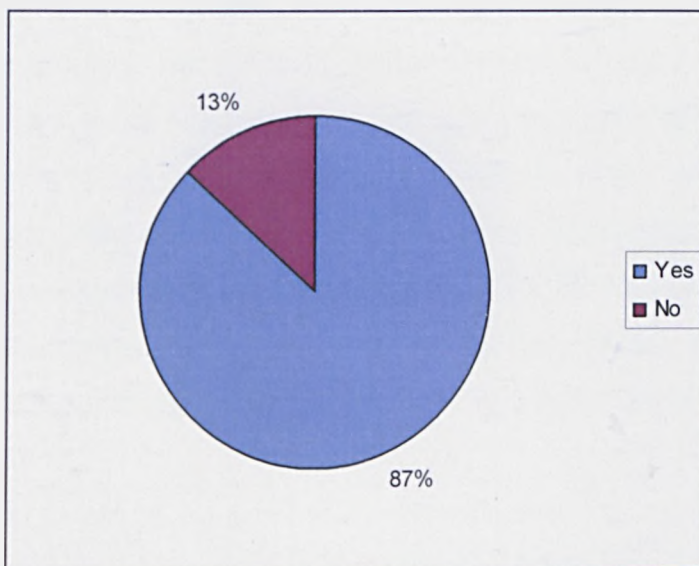


Figure 25 - Would you be willing to pay to have a water recycling system installed...?

As can be seen from Figure 25, 87% of respondents said that they would be willing to pay something to have a water recycling system installed. However, it should be noted that this response was made on the hypothetical condition of having a £50/year reduction in Council Tax<sup>40</sup>.

Of those 87% of respondents who suggested that they would be willing to pay something towards installation costs, there was an interesting pattern of results (see Figure 26) with 34% of respondents willing to pay less than £50. This is interesting in terms of the wording of the original question, as this suggested that £50/year would come off their Council Tax if they agreed to have such a system installed. With this in mind, people who stated that they would be willing to pay either £0 or <£50 should not be considered as having a 'willingness to pay' for these systems as such. Thus it can be concluded that just over half (54.7%) of the original 87% who said they were 'willing to pay' were in fact willing to end up out of pocket as a result of installation. Roughly calculated, this ends up with approximately 50% (rather than 87%) of people expressing a willingness to pay for these systems. Therefore in theory, 27% of respondents were willing to pay more than £150 for water recycling systems.

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<sup>40</sup> Council Tax is a UK local taxation system, where people are charged for local services at an amount calculated from the valuation band of their property.



**Figure 26 - How much would you be willing to pay to have a water recycling system installed?**

Respondents were then asked who they thought should pay for installing systems like this. Content analysis of this open ended question showed a range of responses (see Figure 27). Forty three percent of respondents thought that the 'Government' or 'Council' should pay, whereas 33% of respondents thought that Water Companies should pay. A further 23% thought that payment responsibility lay with the householder or owner, and a remaining 1% thought that the housebuilder should pay. Therefore 76% of respondents can be said to believe that the bill for installation of such innovative technologies should be paid for via the taxation system rather than personally financed, as all categories stated, apart from the householder/owner/builder, are publicly funded (in Scotland).

The reasons given as to why those identified in the above responses should be responsible for payment varied depending on who respondents thought should pay. Those advocating personal responsibility tended to cite reasons of individual responsibility, whereas many of those suggesting some kind of institutional responsibility tended to advocate some kind of shared responsibility, where individuals would make a token



payment, but water authorities or local government would cover the majority of the costs.

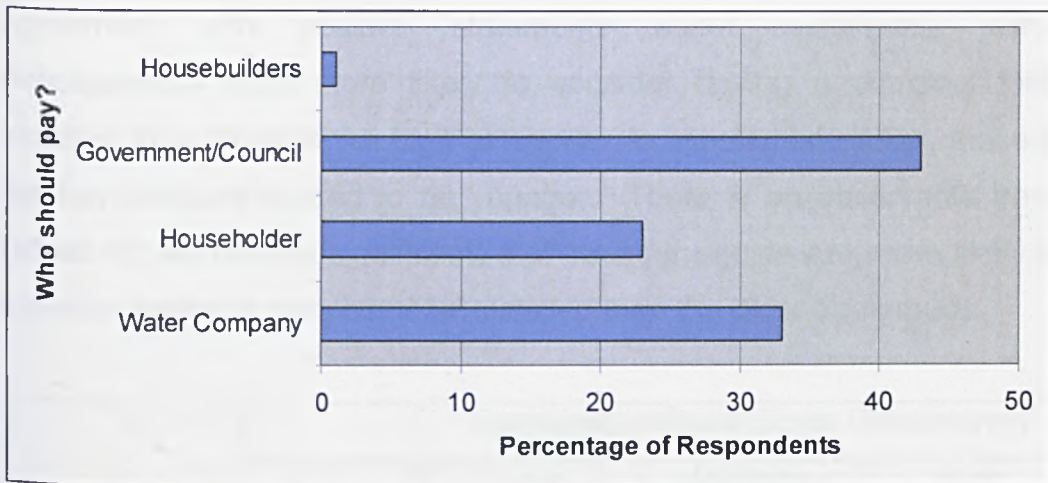


Figure 27 - Who do you think should pay for installing systems like this?

### 3.3.3 Compost Toilets

After reading through the following brief description and rationale about compost toilets, 20.5% of respondents said that they would (ever) consider having a compost toilet put in their property and 25% said that they would not.

As was described above, using rainwater and re-using water from our baths, showers, etc. would cut down dramatically on the amount of mains water used. However, some argue that to be truly environmentally friendly, it would be better to reduce the need to flush so much water down the toilet. This would mean using a different kind of toilet which does not have a water flush. While this can seem like a strange idea, it is now seen as a good solution to a serious environmental problem. In fact, the National Trust have started installing them at many of their sites around the UK. These new toilets either have no water in them, or use very small amounts of water. This not only saves wasting water, but also provides a useful compost which can be used for agricultural purposes. A lot of work has gone into designing these toilets, so they are hygienic and odour free.

Interestingly, 55% of respondents said that they were not sure, possibly implying an interest and openness towards innovative technologies such as this, if presented in an appropriate context. Cross tabulating this

result<sup>41</sup> with the water friendliness attitude score discussed in the previous section yielded an interesting result (see Table 3). It can be seen that those in the low category (i.e. those who had a stronger agreement with positive statements about sustainable water management) were more likely to consider having a compost toilet installed than those in the high category. As mentioned earlier, those in the low category tended to be younger. There is an observable trend (albeit not statistically significant) that younger people are more likely to consider having a compost toilet installed than the older age groups.

		Combined Attitude Score (Trichotomy)		
		Low	Medium	High
Would you ever consider a compost toilet?	Yes	9	2	4
	No	2	8	8

Pearson Chi-Square = 9.191 (df=2), p < 0.01

**Table 3 - Cross tabulation of combined attitude score and willingness to consider a compost toilet**

The open-ended question asking respondents to list their concerns about composting toilets also yielded some interesting patterns of results. Content analysis of the responses to this question showed that odour and hygiene considerations were by far the most salient issue in this context. As one respondent said:

*“It’s hard to believe that they would be totally hygienic and odour free, but it would be nice to see this concept in action to relieve any doubts. And surely if it was used for compost, you couldn’t put any toilet tissue down the toilet?”*

Of the main themes that emerged from the results, hygiene was mentioned more than anything else, with many people expressing concerns about children:

<sup>41</sup> People who responded ‘not sure’ were not entered into this analysis

*"I would need to ensure that all the waste was properly 'flushed away' – having children, I think this is very important"*

The second most frequently mentioned theme of concern was odour, which may be a result of the initial description being framed in a way as to make them out to be totally odour free. It should be pointed out here that conventional toilets are very rarely odour free, although this point is not made salient within the survey:

*"It might be very smelly and unhygienic. How much can you put on your garden before it starts to smell?"*

This is interesting, as it suggests the possibility that human waste and compost are seen as one and the same by many, which would certainly require education to overcome. Another possibility is that the idea of compost from these toilets is confused with sewage sludge, which as people are aware has sometimes been applied to agricultural land. As one respondent said:

*"I don't want sewage used to compost crops for human consumption"*

There were many other comments, including one or two saying that they had knowledge of spreading sewage sludge to land, and seemed to express displeasure and concern about it.

Apart from the frequency of mentioned concerns over both hygiene and odour, the results of this question were surprisingly positive, with many respondents asking valid questions about them or saying that they would be interested to find out more about such systems:

*“How do you clean them? Where does the waste go and how do you access it as a compost. I would take some convincing that they are odour free”*

*“I think it would be more of a hygiene issue. I would be concerned about viral infections passed in stools which may live on in the compost. I think I would have to read more about that before I was convinced”*

*“Although I compost my kitchen waste, I understand that human faeces are difficult to biodegrade. Even the rabbit droppings cannot be used neat. If reassured, I would consider this. I would prefer to recycle water before embarking on this”*

*“As long as they were totally hygienic, and I didn't have to empty anything at the end of the day, they seem like a good idea..... would the sewage go to a central collection automatically?”*

The only other theme that came up fairly regularly was that of cleaning and maintenance, with several respondents worried about the extra effort required.

Results of the questions regarding willingness to pay contrasted somewhat from the grey/rainwater section. 44% (compared to 87% for greywater systems) said that they would be willing to pay something to have a compost toilet installed in the house, and 56% said that they would not. However, although the number of respondents with a WTP is less in this case, the pattern of willingness to pay is comparable with that for grey/rainwater systems.



### 3.3.4 Supplementary Questions

When respondents were asked whether they knew where their sewage from their dwelling was treated, 33% said that they did and 67% said that they did not. Of those who said that they did, 77% correctly identified where their sewage was treated. A closer look at this statistic however, reveals an interesting pattern. In the rural sample, 100% of these responding to this question were correct in identifying where their sewage was treated, whereas only 50% of the peri-urban sample were correct. This suggests that to some degree, decentralised plants, which (as in this particular case) are sometimes more visible might lead to an increase in awareness of where ones sewage is treated. This might help in part to question the out-of-sight-out-of-mind tendency observed when most people consider the issue of wastewater treatment (Shields, 1999).

The question regarding knowledge of the regional water authority was an attempt to simply assess the public's awareness of the institutional responsibility for water and wastewater management. Results showed that 63% of people who responded to this question knew that the regional water authority was called NOSWA (North of Scotland Water Authority). More interesting, however, were the 37% who answered the question incorrectly. Some of the responses appeared to be a fair guess at what would constitute a reasonable name for a water authority (e.g. *Grampian water authority, Aberdeenshire Water, Aberdeenshire Council Water Board*, and so on). However, it must be noted that simply knowing the name of the water authority is not necessarily the best measure of awareness of the institutional component of water issues, it is simply a quick and easy measure of a particular component of institutional awareness.

An open ended question was asked regarding people's opinions about water meters. The resulting comments were content analysed, and then studied for patterns. Broadly speaking, there appeared to be a basic polarisation of opinion, with 40% thinking they were a good idea, 36%

thinking that they were a bad idea, and 24% remaining undecided. Nevertheless, the issue was clearly a salient one in the public's mind, as all respondents answered this question, often in a fairly detailed manner.

Several other issues emerged from this question, apart from the above mentioned three-part split. The impact of water metering on families was mentioned fairly frequently:

*"I think it would make it fairer for small families, but larger families would suffer"*

*"A good idea, but.....costly to install – makes people aware of the waste of water at present – not sure how it would balance with health needs if parents cut back on children's hygiene especially"*

*"A bad idea. Poorer families may try to "cut back" and present hygiene problems to themselves and neighbours in particular"*

Fairness considerations were mentioned frequently regarding the issue of water meters, especially in relation to families. Interestingly, this was often mentioned regardless of whether the respondent was for or against water meters in principle:

*"I don't agree with water meters. Water is a basic right to anyone regardless if they can pay or not"*

*"If water meters were introduced, people would be more economic with water, and it is a much fairer system"*

*"While I wouldn't suffer as a result of them, I think they can be unfair. Poor families shouldn't have to pay for a basic commodity and should be subsidised"*

This is interesting insofar as fairness perceptions are powerful behaviour motivators (*cf.* Syme et al. 1999), so any program which makes fairness considerations salient (as water meters clearly do) might well take people beyond the assumed price-incentive effect, to wider social consideration, which is arguably a prerequisite for true sustainability in the context of water and wastewater management.

### **3.4 Discussion**

This study set out to identify some of the psychological factors associated with the implementation of sustainable domestic water and wastewater technologies. Results show that respondents in the survey could be roughly categorised as either 'water friendly' or 'water unfriendly' (i.e. a broad dispositional attitude towards sustainable water management). Although not a great deal was (or could be) done with this categorisation, it is nevertheless an interesting idea, as previous attempts to categorise people as being either environmentally friendly or unfriendly might well miss the essence of this 'friendliness' by treating it as a bipolar trait. While it is likely that a general 'environmental' value orientation might predispose people to act in a more environmentally friendly manner (or to actively seek out information), it is from the subtle distinctions of exactly what constitutes 'environmental friendliness' that the differences emerge.

The findings from the present study suggest that greywater and rainwater systems are by and large fairly acceptable as a concept to the general public, although there are several concerns regarding the safety of such systems. Technology development and engineering, along with good quality public information would (if the economic climate was appropriate) probably go a long way to overcoming such potential barriers.

When it comes to composting toilets however, the story is predictably not quite so positive, although interestingly, people who were deemed to be more 'water friendly' were more likely to be 'pro-compost-toilet'. Most of the concerns raised about compost toilets concentrated on issues of odour and hygiene, with many people not believing that such toilets would be hygienic or odour free. That said, there was a reasonable level of interest (if not support) in the concept of compost toilets. Respondents often said that they would be interested to learn more about the idea, or would like to see the system working in practice. This is potentially a good argument for installing such systems in public buildings as is sometimes done in visitors centres (e.g. some National Trust Properties).

It was found that most people said they would be willing to pay something to have a water recycling system installed, but fewer were theoretically willing to pay for a compost toilet system. The majority of opinion supported the idea that public bodies should pay for such technologies through the taxation system<sup>42</sup>.

There was some support for the idea that people living near to a decentralised sewage treatment works were more aware of where their sewage was treated than those who were not. However, this was not always a positive thing, with some people mentioning problems regarding smell when the wind is in a certain direction. There was no demonstrated link found between greater awareness of local sewage treatment and water specific environmental attitudes.

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<sup>42</sup> It would be interesting to make a comparison with England, where water companies are privatised

### **3.5 Conclusions**

Focussing solely on domestic wastewater treatment, this study suggested several ways in which wastewater management could achieve greater levels of sustainability, by using a decentralised approach. Three source control methods were outlined: a) Reduce the amount of potable water required; b) Reduce the volume and content of wastewater from the household; and c) Recycle the nutrients that are traditionally lost in conventional treatment processes. Having identified some of the ways in which wastewater management could be approached in a more sustainable manner, the issue of public participation in water and wastewater planning was then discussed. It is concluded that public influence over the water and wastewater planning process is important:

- 1) politically;
- 2) for enabling the successful implementation of new innovative systems; and
- 3) for understanding public decision making from a justice perspective.

The influence of attitudes and value orientations was also discussed, and it was considered useful to have an understanding of these underlying processes before any participatory process occurs. If new policy initiatives are reliant on some form of behavioural change, it is thought that the emergence of an environmental value orientation may be more powerful in influencing acceptance than specific individual attitudes towards the wastewater issue.

Fitting the findings of this case study with the conceptual model presented in section 2.4.7, the focal aspect of the study was on the individual aspect of the transactional whole. Thus, environmental **values** (part of the '**personal context**') are understood to influence both the definition of appropriate behaviour and **attitudes towards that behaviour** or response (in this case acceptance or purchase of

sustainable water and wastewater systems). These **attitudes**, along with **perceived behavioural control**<sup>43</sup> (which was evident in many of the comments people had about the systems, such as concerns over ease of maintenance) and **subjective norms**<sup>44</sup> (e.g. the extent to which the installation of such technologies would be seen as acceptable by one's social reference group) are understood to influence **behavioural intention**, thereby increasing the likelihood of a greater uptake (or at least acceptance) of such systems. Whilst the environmental perception and preference components of the model were not measured in this study, it is likely that the visual impact of any such technologies would also have a significant impact on the potential acceptability of such systems in reality (the aesthetic component of housing will be examined further in chapter 4). Similarly, although the socio-cultural component of the transactional whole was not directly studied in this case, it was touched upon to a certain extent by the questions about who should pay for sustainable wastewater technology, with the majority of people feeling that financial responsibility for such systems should be publicly funded through the taxation system. This suggests that by and large people feel that appeals to agentic beliefs regarding **proxy** or **collective agency** is the perhaps the most likely means by which positive acceptance of sustainable water and wastewater technology would be translated into reality, especially from a financial viewpoint. That said, a significant number of people felt that the householder themselves should shoulder the financial burden of installing such systems. This would be a case of **proxy agency**, where a person has the intention to appropriate the services of a company to deliver a wastewater system to meet their specifications.

Ultimately, the ways in which the transactional whole evolves over time will be dependent upon various factors including the possible emergence

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<sup>43</sup> Perceived behavioural control is defined by Ajzen (1991) as '*peoples perception of the ease or difficulty of performing the behaviour of interest*' (p.183).

<sup>44</sup> Subjective norms are defined by Ajzen (1991) as '*the perceived social pressure to perform or not perform [a] behaviour*' (p.188).

of environmental value orientations<sup>45</sup> along with programmes positively promoting the use of such systems. Moreover, to be successful, the specification and design of these systems need to be acceptable not only from a technical viewpoint, but also from a social and psychological one.

This chapter has examined sustainable wastewater management, by taking into consideration mainly the '**individual**' component of the conceptual model presented in chapter 2. The next chapter will expand the focus to include the '**environment**' component of the model, and will present a study examining the perceptions of building attributes with particular reference to those building materials considered to be 'sustainable'.

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<sup>45</sup> Another way of putting this would be a shift away from the dominant social paradigm towards the New Environmental Paradigm (see section 2.3.4)



## 4 A Study of Perceptions of Cladding Materials<sup>46</sup>

### 4.1 Introduction

This chapter will examine the effect of building materials on environmental perception and behavioural intention. Whilst the case study presented in Chapter 3 looked at psychological aspects of a particular technology designed to enhance ecological sustainability, this case study will look at the aesthetic and symbolic aspects of the built environment which are considered to represent 'sustainability'. By looking specifically at the building materials visible on house facades (i.e. cladding materials), the effect of building attributes can be isolated, measured and better understood in the context of the conceptual model (see section 2.4.7.) presented earlier. Figure 28 highlights the components of the conceptual model that are particularly focussed on within this case study.

As noted in section 2.3.6, there is something of a consensus that (locally sourced) timber tends to have better ecological credentials (Marsh, 1997; Davies, I. et al., 2002) than many other construction materials such as masonry. Marsh (1997) compared the embodied energy of nine different materials used in wall construction, and concludes:

*"By removing the brick outer layer and replacing it with a timber-based cladding, there is a considerable reduction in [Embodied Energy]. Given the dominance of brick as a facing material in the UK housing market, there is certainly much argument in favour of encouraging the use of protective cladding systems that have much lower [Embodied Energy Measurements], even including for maintenance, as a method to reduce the environmental impact of construction materials" (p.154)*

<sup>46</sup> The study presented here as a case study within the context of this thesis was carried out by the author as part of a large project funded as part of the joint DTI/EPSRC MCNS 'LINK' Programme Meeting Client Needs through Standardisation (MCNS 04/09). See Edge et al (2002) for more details.

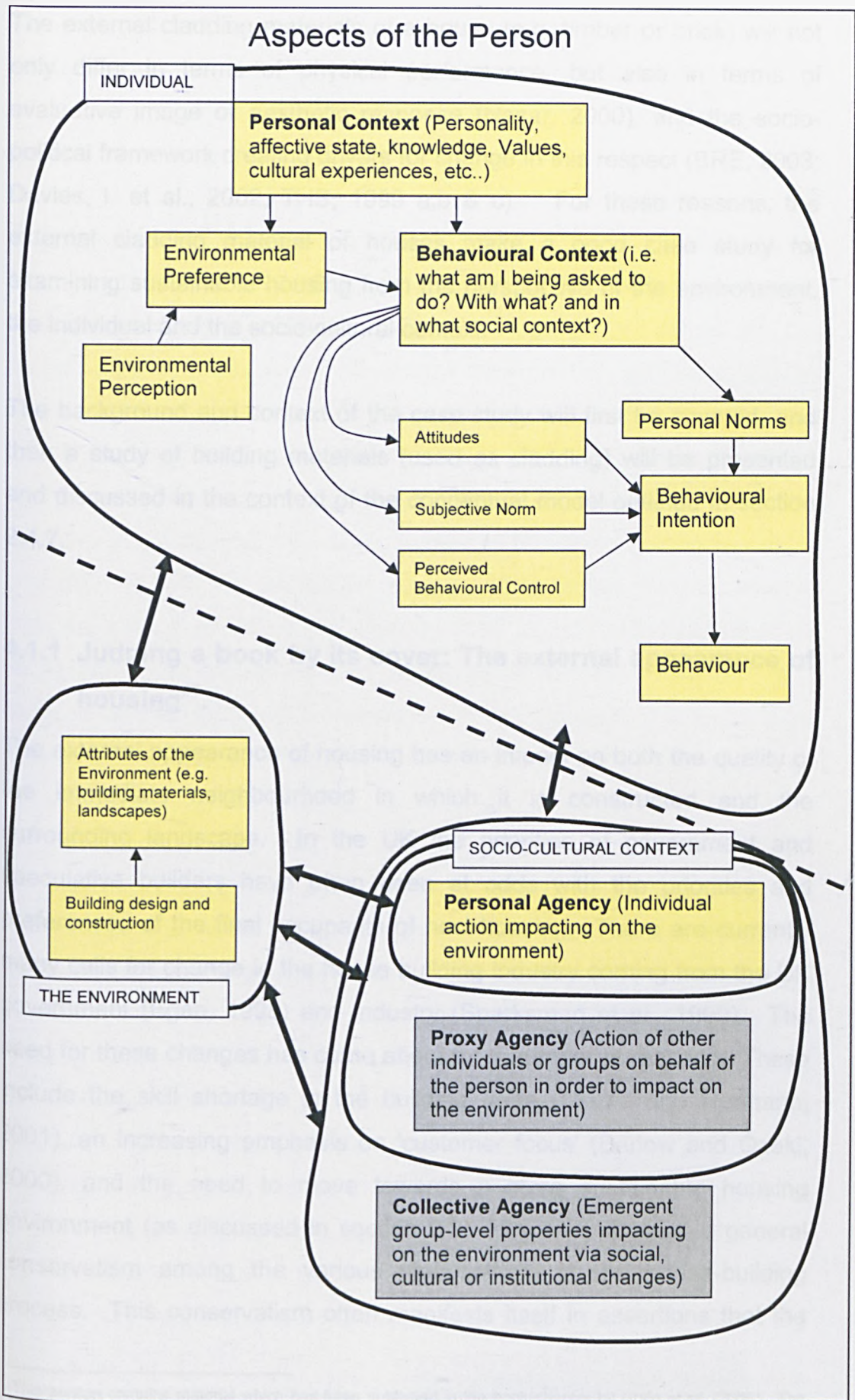


Figure 28 - Conceptual model with Case Study 2 foci highlighted

The external cladding materials of a house (e.g. timber or brick) will not only differ in terms of physical performance, but also in terms of evaluative image or aesthetic response (Nasar, 2000), and the socio-political framework creating drivers for change in this respect (BRE, 2003; Davies, I. et al., 2002, THB, 1999 a,b & c). For these reasons, the external cladding material of houses make a good case study for examining sustainable housing from the perspective of the environment, the individual and the socio-cultural context.

The background and context of the case study will first be covered, and then a study of building materials (used as cladding) will be presented and discussed in the context of the conceptual model outlined in section 2.4.7.

#### **4.1.1 Judging a book by its cover: The external appearance of housing<sup>47</sup>.**

The external appearance of housing has an impact on both the quality of the immediate neighbourhood in which it is constructed and the surrounding landscape. In the UK the priorities of government and speculative builders have often been at odds with the priorities and preferences of the final occupants of new housing. There are currently many calls for change in the house building industry coming from the UK government (Egan, 1998) and industry (Sparksman et al., 1999). The need for these changes has come about for a number of reasons. These include the skill shortage in the building trade (Clarke and Hermann, 2001), an increasing emphasis on 'customer focus' (Barlow and Ozaki, 2000), and the need to move towards a more sustainable housing environment (as discussed in section 2.3). However, there is a general conservatism among the various stakeholders in the house-building process. This conservatism often manifests itself in assertions that the

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<sup>47</sup> This section contains material which has been published in the book chapter by Craig et al. (2005). The paper was written by the primary author, and any sections contributed by co-authors have been removed from this thesis. Acknowledgement must be given however to Leanne Townsend (nee Abbott), for her assistance during the data collection phase of the study.

house-buying public are resistant to change in the housing product (Lutzenhiser and Janda, 1999; Ball, 1996), and that therefore some form of market transformation would be required to make such changes acceptable to the public.

At present, most timber frame buildings in the UK are constructed with an external masonry skin, which often serves only as a protective rainscreen cladding (Craig et al., 2005). There are various drivers influencing the recent emphasis on timber cladding, foremost of which is that of sustainability, along with various other cost and performance benefits that this technology might offer (Davies, I. et al., 2002). As one timber cladding specialist put it: *"housebuyers are often resistant to timber cladding since they perceive timber-clad and timber-framed homes to be somehow inferior to 'traditional' masonry-clad, timber framed houses"* (Davies, I. et al., 2002, p.7). The idea that people perceive timber as being somehow inferior is often stated by developers, builders and a range of built environment professionals, but evidence for this tends to be anecdotal<sup>48</sup>. The lack of empirical studies that evidence this claim was the starting point of this research.

The case study presented in this chapter looked at the effect of various external cladding materials on judgments made about detached houses. Various studies have previously shown there to be a relationship between the observable attributes of building exteriors and building preference (Herzog and Shier, 2000) and perceptions of housing quality (Reis, 2001). Further studies have explored the socio-psychological processes which contribute to housing preferences, which may manifest in ratings of the emotional qualities of the building itself (Nasar, 1994) and the social identity of potential occupants (Sadalla et al., 1987). Sadalla and Sheets (1993) argue that the materials from which houses are constructed convey more meaning to people than simply the physical properties of the

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<sup>48</sup> The only evidence that could be found relating to negative perceptions of timber house construction were three small public opinion polls by the Traditional Housing Bureau (1999a, b and c). Although these surveys were specifically concerned with the structure of the house as opposed to the cladding, the finding seemed to indicate that in general, a major concern people have related to house construction methods is the adequacy of timber in providing sound insulation.

materials. They argue, through a series of studies, that building materials employed on exterior facades have a function in defining the social identity of home-owners (Sadalla and Sheets, 1993), as well as having functional utility in themselves. So, for example, someone actively choosing to live in a timber-clad house might be rated (by others as well as themselves) as more artistic, or less conservative than those choosing an exterior facade of concrete block, if these were the personality characteristics attributed to these particular materials by the rater in question. It should be noted however, that Sadalla et al. (1987) found that interior cues were seen as a more informative measure of social identity than exterior cues, possibly due to the increased flexibility people have concerning the manipulation of interior cues.

Given the limited choice however, preferences for external cladding materials are likely to tend towards whatever is dominant within the experienced housing environment. For people to be able to employ the symbolic aspects of materials in the process of defining social identity (Sadalla and Sheets, 1993) would require an environment within which choice of materials for exterior facades is exercised in reality. While there are clear geographical variations in Britain in the use of different exterior cladding materials, there has nevertheless been a historical tradition and preference towards brick in England, and roughcast in Scotland.

Although innovation in the external appearance of dwellings was encouraged during the 1950s and 1960s (Brindley, 1999), the cleavage between the architectural and social discourses after that time arguably led to the ghettoization of many housing estates of "modern" design, thereby stigmatizing the use of innovative approaches to housing design. It would be interesting to know the extent to which any negative evaluations of a particular material are tenure-specific, and if so what the social effect would have been of such mass-innovation within the private housing sector. Although there is some evidence to suggest that timber



cladding has a long history in Scotland<sup>49</sup> (Edge and Pearson, 2001), it is nevertheless arguably not embodied within the collective memory, and is still considered by many to be in the class of 'unfamiliar'.

Of particular relevance here is the theory of social representations. Social representations (Moscovici, 2001) are the concepts shared as 'common sense' by members of a collectivity. According to Moscovici, the role of these social representations is to conventionalize something, or locate it in a familiar context. The social representation of timber cladding in housing (if indeed one exists) is likely to be responsible for resistance to or rejection of this material, if the established order, or what is familiar, is perceived to be in threat (Moscovici, 2001). Clearly there are parallels here with the idea of socially-shared schema, as Lee (2003) explains:

*"If many individuals share the same schema, a process of reification occurs – it assumes material form as a 'social representation'. It appears to 'belong' to, or to become normative within a society or subgroup. It is shaped, sharpened and strengthened by the media – and this serves in turn as a stimulus for invoking and further consolidating the schemata of individuals. The process is circular; the existence of a social representation ensures that many individuals construct the same kind of individual schema and this further strengthens the social representation" (p.52)*

This would suggest a need for a new representation of this particular issue (timber cladding) within society if it is to become acceptable and 'familiar'. Furthermore, if a generally positive social representation of 'sustainable housing' exists, or one emerges, then this is one possible way in which previously negative representations might become positive

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<sup>49</sup> It should be noted that Edge and Pearson (2001) looked at 'buildings' generally rather than just housing, and as such includes buildings not commonly included in discussions about the local materials and tradition of housing.

(i.e. the attribute becomes associated with a more positive social representation).

This can be linked with the idea that meanings associated with building materials are employed in the defining of social identities (Sadalla and Sheets, 1993). It is likely that due to this stigmatization of 'non-traditional' cladding materials, they will be associated with 'low-status', and are hypothesized therefore likely to be rated as less pleasant and worthy of purchase consideration than claddings such as brick and roughcast.

A study by Taylor and Konrad (1980) found that a sample of the Canadian population were generally unsupportive of the idea of a "*disposable urban fabric readily replaced in the cause of change*" (p305), but rather, tended to be strongly inclined towards the preservation of the past. The political impetus for change in the UK away from what is perceived as part of 'the past' towards something perceived as 'new' may receive a similar lack of support. It is interesting to note that the housing stock in Britain is fairly old in comparison to many countries, with 48% having been built before 1945. In the Netherlands, 47% of the housing stock has been replaced since 1971, compared with only 21.8% in Britain (Clarke and Hermann, 2001). It is quite likely that this fact will have a significant impact on the judgments people make about so called 'innovative' cladding materials, as these are likely to be made by way of comparison with what is generally thought of as an 'average house'. Therefore, if most houses a person is familiar with are clad in brick, and these houses also appear to be of a significant age, then it is hypothesized that the material brick is likely to be attributed with such qualities as 'tradition' and 'durability' as well as familiarity.

If timber cladding is understood to be 'more sustainable' from a technical and ecological viewpoint, then it is important to understand the social and psychological aspects of this facet of sustainability. There are two important questions in this respect:

1. How do people judge timber cladding when compared with other cladding materials?
2. What associations are evoked by timber cladding? Does the building material suggest 'natural' or 'sustainable', or something else (e.g. temporary/ high maintenance)?

These questions were examined in this study, along with various other questions pertaining to the study of perception of exterior cladding materials. First however, the development of the methodology for carrying out this large study will be elaborated upon in the next section.



## **4.2 Methodological Development**

### **4.2.1 Preliminary Study One - A Study of attitudes towards various house types**

A preliminary study was designed which was concerned primarily with the early development of a methodology to be used for looking at people's housing preferences. It was considered at the beginning of this study that in order to avoid potential occupants having to choose between one conservative design and another conservative design, it was important to find ways of assessing the key variables by which people decide on the suitability of a house in fulfilling their needs. This way, more radical design approaches could be introduced alongside more conventional designs, and the underlying threads of similarity teased out.

#### **4.2.1.1 Methodology**

In this study, twenty-one photographs of detached dwellings were selected from a large pool of pictures, on the basis that they were considered to represent a large range of house styles. These can be seen in Appendix 2. Four main criteria were assessed by this preliminary study: the **likelihood of purchase consideration**; the **pleasantness** rating; the extent to which the houses were judged as **traditional** or modern, and the perceived **durability** of the houses presented.

The first criterion – likelihood of purchase consideration was measured by presenting each photograph, one at a time, and asking respondents to place the picture under one of five pre-determined headings laid out on the table on large cards:

- Would Definitely Consider Buying
- May Consider Buying
- No Preference
- Probably Not Consider Buying
- Definitely Not Consider Buying

Respondents were asked to imagine they were in the process of buying a house and had an unlimited budget with which to do this. They were also asked to assume all houses presented to be in a desirable location, and of adequate size for their needs. Respondents were asked to try and ignore the differences in house size of the photographs presented<sup>50</sup>.

The second, third and fourth criteria were then measured, after shuffling the cards. Three large cards, each with a scale on were laid out in front of respondents. Each of these cards displayed a semantic differential scale, with ratings from 1-7:

- Pleasant.....Unpleasant
- Traditional.....Modern
- Durable.....Non-Durable

Each house was then rated one at a time on these three scales, by respondents. Results were recorded on a pre-printed form.

All 21 photographs were used in the study, following their selection as described above. The study was divided into three sections, including general demographic data. 17 respondents were interviewed, and the study took approximately 20 minutes per person to complete. All interviews supplied answers to all sections of the survey.

This study was regarded as a preliminary study, to tentatively explore issues of perception regarding detached houses. The sample was therefore, drawn mainly from staff within RGU, but outside the Faculty of Design.

Each interview was structured and delivered in exactly the same manner. Respondents were asked on completion of the survey if they had

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<sup>50</sup> This is clearly a methodological limitation of this study, which will be dealt with in the methodology for the following study.

understood the questions, and if they had maintained an interest throughout. No respondents indicated otherwise.

**4.2.1.2 Results**

Initially, respondents were shown each of the photographs, and asked to place them in one of 5 piles. The median results are summarised below. In the discussion, it should be noted that the mean and overall distribution for each house have also been considered.

Would Definitely Consider Buying	May Consider Buying	No Preference	Probably Not Consider Buying	Definitely Not Consider Buying
				

As described in the methodology, each photograph was rated against the three semantic differential scales. The results provide a rough indication of preference across the respondents, although the importance of size, apparent location, surroundings and condition must be recognised. More importantly, a number of key issues appear to be emerging, which will inform the next stages of the research.

Photographs G and I both scored highly against “would buy” and “pleasant”. It is notable that both houses are, broadly speaking, of an alien design to Scotland and are clearly North American. It would be interesting to obtain preference scores for such a building if subjected to UK climatic conditions.



G



I

Interestingly in this study, two of the most preferred photographs were clad in timber, which runs counter to the oft-said anecdotal evidence that the British buying public generally prefer brick cladding. However, the examples were clearly of an alien design to Scotland, and it is suggested that preference scores for timber clad buildings be obtained for buildings designed with UK climatic conditions in mind.

Photographs R and M both scored well against the “would buy” criteria, but less well than pictures G and I in terms of aesthetic preference. This could suggest that in some circumstances, an openness with regard to aesthetics might give way to a form of conservatism in the marketplace.



R



M

A surprising similarity emerged between the response pattern to photographs N and U. Although it could be argued that they represent two versions of the “norm” for estate housing in parts of the UK, the designs are clearly distinct. Respondents may have reacted differently in the survey where the house types were less varied, or where there was little danger of them feeling the need to present “strong views” against “unusual” designs.



N



U

Both houses D and Q scored very poorly. Given that these are both post war prefabricated houses, this suggests that there is a historical association between “prefabs” and poor quality. Indeed, a number of respondents stated during the interviews that the buildings were “prefabs”. This kind of historical association of certain housing attributes might have implications for the marketing of modern houses if they are seen to be associated with something negative in the past.



D



Q

Photograph H, showing a recent example of concrete architectural housing design scored poorly against the “pleasant” scale, although the “buy” scale was divided between clear markets. It is interesting that photograph T, also showing concrete housing but with strong references to designs of the 1930’s, scored better on both scales. This is an important finding, as it suggests that architecture as a design discipline indeed plays an important part in the market, as well as aesthetic, perception of properties. It is also important to note here that photograph H looks much more ‘closed in’ than photograph T, due to the differences in background, which might have a considerable effect on preference<sup>51</sup>.



H



T

On a similar note, photographs E and J, although fairly similar in terms of material and scale, scored significantly different results (photograph J was perceived in a much more negative manner). This is interesting due to their relatively minor construction differences, but highly significant architectural differences, which suggests that as well as material and

<sup>51</sup> Another point to note is that the differences might be partly due to the camera angle, suggesting that standardisation of this attribute might also be desirable.

form, the architectural detailing of houses is very important in determining people's perceptions of housing.



E



J

Photographs E, M and R scored well against “durability”. Each of these show buildings which arguably represented an idea of “familiar” design. By and large, ‘familiar’ buildings were perceived as being more durable than ‘non-standard’ buildings. This judgement was made in the absence of any knowledge about the buildings' construction, and clearly has implications for lending, building maintenance, and life-cycle assessment.

Image K, showing a timber clad 1.5 storey house, produced surprising results in the “would buy” sorting exercise. There appears to be two distinct “markets” for this type of property, which is of important to consider when looking at perceptions of building attributes. Rather than simply averaging out perceptual responses, it might be important to look for evidence of market segmentation.



K



L

It is worth noting that photograph L, showing a similar type of construction, achieved a uniform (i.e. not divided) high rating in terms of



preference, again suggesting that finish, use of materials and location are of very significant importance to perception. Especially with regard to the timber clad houses presented in the study, there appeared to be a distinct market cleavage in the 'purchase consideration' criteria: largely it seems based on the assumed location, and also on subtle differences of cladding finish, use of materials, and surroundings. The results of the plots of the semantic differentials can be seen in Figure 29 to Figure 32. Of particular note is the strength of association between pleasantness and potential purchase consideration (Spearman's Rho = 0.966,  $p < 0.01$ ), suggesting that pleasantness is a key variable in the perception and choice of houses.

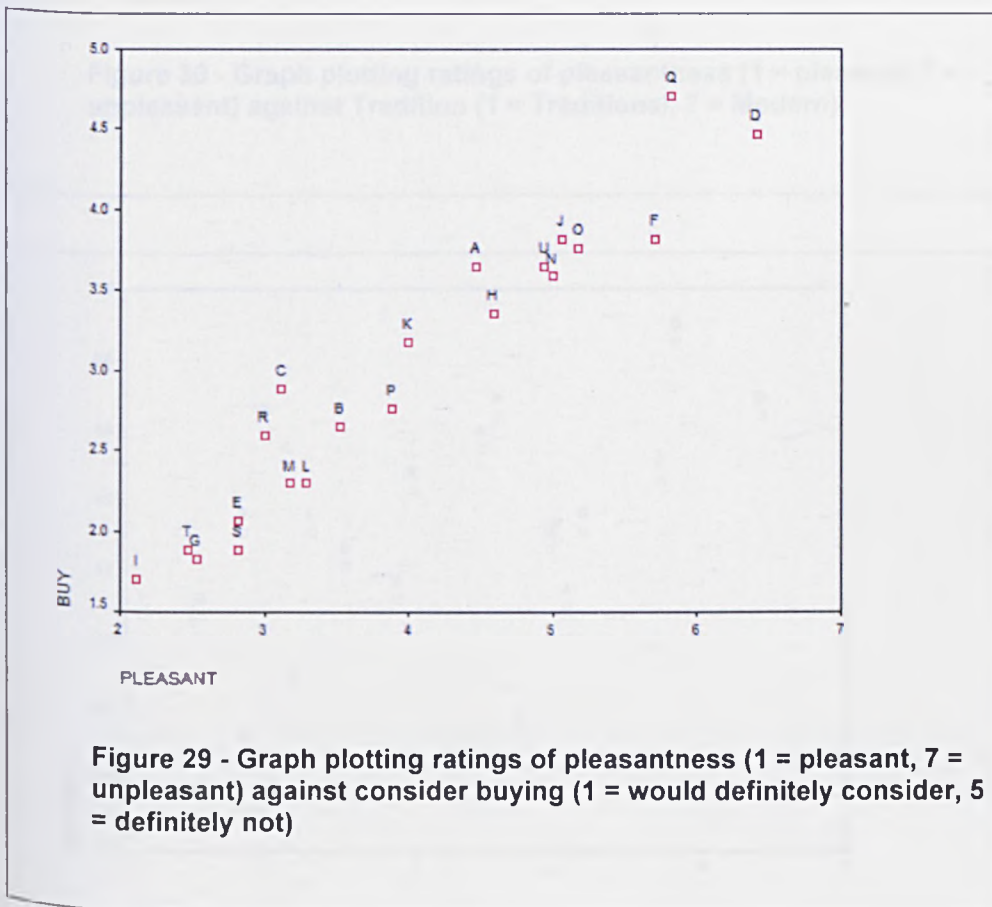


Figure 29 - Graph plotting ratings of pleasantness (1 = pleasant, 7 = unpleasant) against consider buying (1 = would definitely consider, 5 = definitely not)



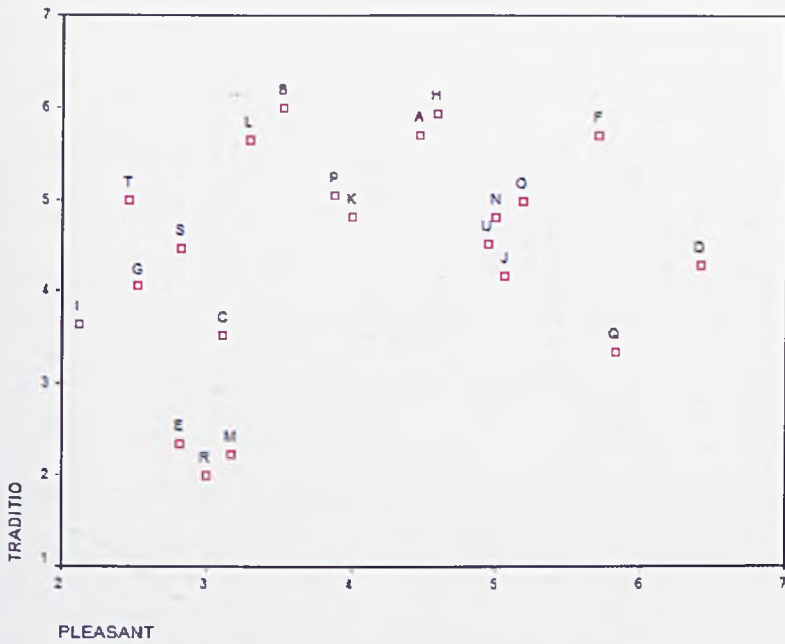


Figure 30 - Graph plotting ratings of pleasantness (1 = pleasant, 7 = unpleasant) against Tradition (1 = Traditional, 7 = Modern)

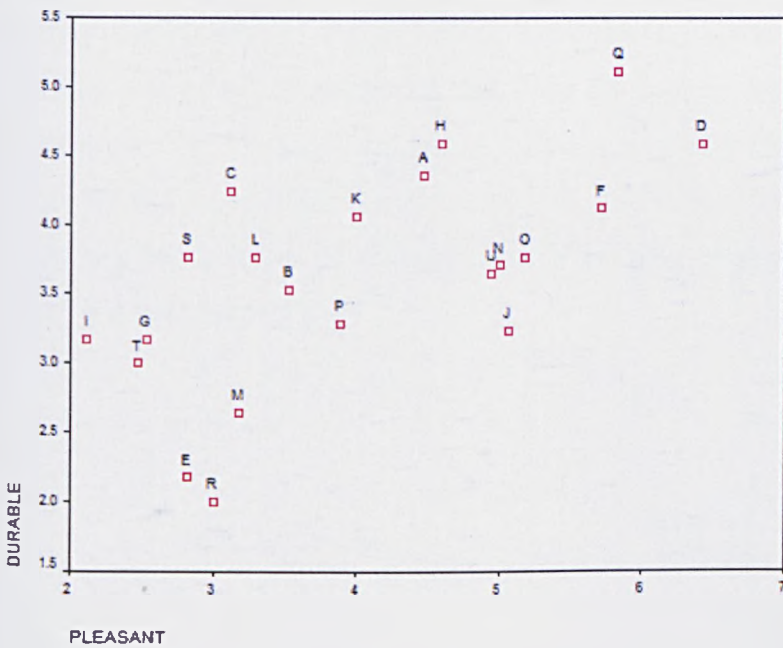
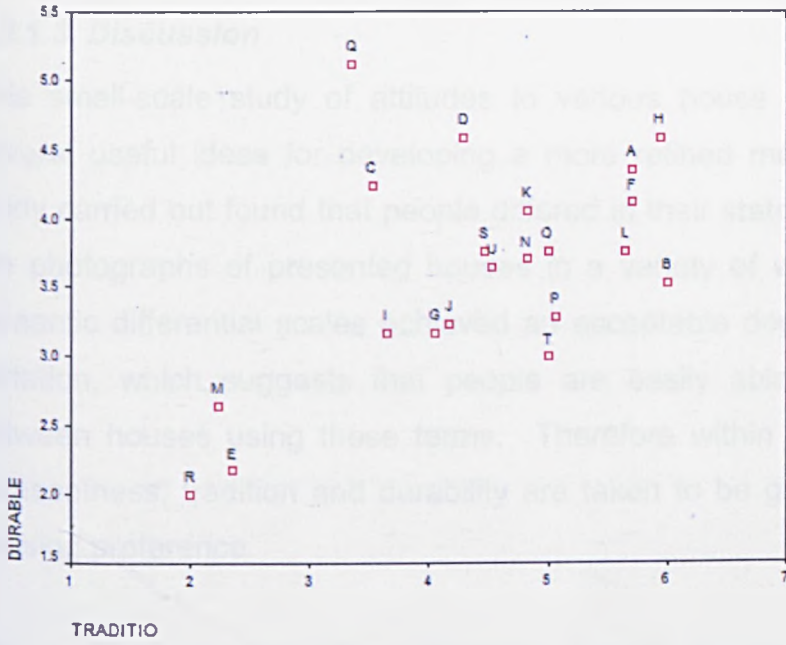


Figure 31 - Graph plotting ratings of pleasantness (1 = pleasant, 7 = unpleasant) against Durable (1 = Durable, 7 = Non-Durable)



**Figure 32 - Graph plotting ratings of Tradition (1 = Traditional, 7 = Modern) against Durable (1 = Durable, 5 = Non-Durable)**

#### **4.2.1.3 Discussion**

This small-scale study of attitudes to various house types suggested several useful ideas for developing a more refined methodology. The study carried out found that people differed in their stated preferences of the photographs of presented houses in a variety of ways. The three semantic differential scales achieved an acceptable degree of response variation, which suggests that people are easily able to discriminate between houses using these terms. Therefore within a given context, pleasantness, tradition and durability are taken to be good indicators of housing preference.

This preliminary study also identified several issues relating to the presentation of photographic materials in assessing preferences for house types. One important observation to emerge from carrying out this study was that it of great benefit, in housing preference studies, to (as far as possible) standardise the background to presented photographs, and to vary the attributes of the buildings themselves. This way it is possible to isolate the effect of particular building attributes on preferences and judgements. These materials might be created using techniques such as photomontage or computer visualizations, as finding the correct number of actual photographs of comparable form and scale and background would be extremely difficult.

## 4.2.2 Preliminary Study Two - Generation of Standardised Images

Following on from the decision taken at the end of the first preliminary study reported in section 4.2.1 to standardise presentation materials as far as possible, a selection of new house designs were acquired from a local timber frame manufacturer (see Figure 33), so that the houses finally selected would reflect the kind of designs available on the market.

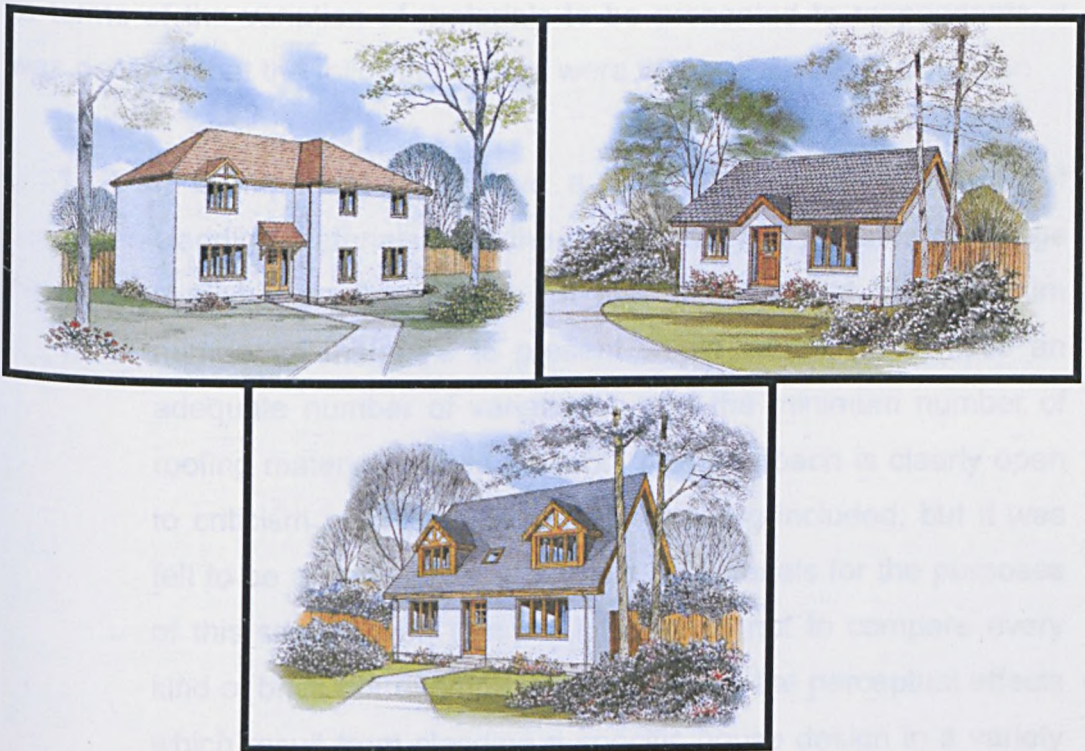


Figure 33 - House Designs used in the Cladding Study

Based on the finding from the study reported in section 4.2.1, it was decided that these houses should be presented in a way that the background was standardised, and therefore not a source of uncontrolled variation. An attractive background was chosen based on it containing a detached house of similar size and with no surrounding houses being visible. This background can be seen in Figure 34.





**Figure 34 - Background Photographs Used in Cladding Study**

In terms of the variation of materials to be presented to respondents, it was decided that the following factors were the main points to consider:

1. It is important to achieve a fairly representative sample of cladding materials from the vast number of possible claddings available on the market. It was decided that the minimum number of materials to present would be six (to achieve an adequate number of variations), and the minimum number of roofing materials would be two. This approach is clearly open to criticism of certain claddings not being included, but it was felt to be a representative sample of materials for the purposes of this study, given that the intention is not to compare every kind of brick (for example), but to explore the perceptual effects which result from cladding a specific house design in a variety of different materials. It was also decided that the timber cladding should be presented in both a horizontal and a vertical direction to examine any perceptual differences due to this.
2. It was felt that rather than simply choosing one given house and then re-cladding it in a variety of materials, it would be better to have a narrow selection of 'house types', as this improves the likelihood that a given respondent will be potentially interested in one of the houses, rather than simply rejecting every variation presented on the basis of size for example. Three house types were selected from a catalogue

of a timber frame manufacturer (see Figure 33), which included a one storey 2 bedroom bungalow, a one and a half storey 4 bedroom house, and a 4 bedroom, two storey house. The timber frame manufacturer was contacted, who kindly agreed to provide the scale plans of each chosen house type.

3. It is also important to consider the determinants and constraints which come from the chosen survey methodology. This study used a mainly quantitative approach, although space was be given for open-ended questions about each house presented, so that any particularly salient factors specific to material could be found and content analysed. In order to fulfil the statistical requirements necessary to make valid claims using such a quantitative approach, a large sample of respondents was required to satisfy the statistical assumptions about the data for tests such as ANOVA (Analysis of Variance). Details of the sample size will be discussed later.

As can be seen from Table 4, there are six cladding materials, two roofing materials<sup>52</sup>, and 3 house types to present to respondents. To ensure an even coverage of materials, this requires that 36 (6 x 2 x 3) variations be generated and presented in the survey.

<p><b><u>Cladding Materials to Present:</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Brick</li> <li><input type="checkbox"/> Roughcast</li> <li><input type="checkbox"/> Timber Cladding (Vertical)</li> <li><input type="checkbox"/> Timber Cladding (Horizontal)</li> <li><input type="checkbox"/> Timber Cladding (Horizontal) – painted green</li> <li><input type="checkbox"/> Prefabricated Roughcast Panels (Vertical)</li> </ul>	<p><b><u>Roof Materials:</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Slate</li> <li><input type="checkbox"/> Steel</li> </ul> <p><b><u>Houses to Present:</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> The Mulberry (1 storey)</li> <li><input type="checkbox"/> The Pine (1½ storey)</li> <li><input type="checkbox"/> The Elm(2 Storey)</li> </ul>
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**Table 4 – Details of House Variations used in the Cladding Study**

<sup>52</sup> It should be noted that roofing materials were included due to the requirements of the larger research project of which the reported research was part.

The images to be presented in the survey were generated by Modelling each of the house types in AutoCAD<sup>®</sup>, based on the plans provided by the developer. These models were then pasted as a layer into the two Photoshop<sup>®</sup> images of a background photograph (see Figure 34), by first lining up the CAD model with the photograph (Figure 35) and then rendering each variation with the particular cladding and roofing materials using 3D Studio MAX<sup>®</sup> (Figure 36). Once the rendered images were placed in the photographic background, a layer of shadows were added to the images to provide realistic shadows from the trees in the background image<sup>53</sup>.



**Figure 35 - Lining up the CAD model with the photograph**

<sup>53</sup> The computer visualisation work for this study was carried out initially by William Binnie and the final renders were done by Stephen Scott.





Figure 36 - Final Rendered image in Photographic Background

As there are two views of each house, this meant that the total number of images generated was 72. These images were then piloted to check that they were judged to be representing the cladding materials they were supposed to. The results of this pilot study are reported on in the next section.

#### 4.2.2.1 Pilot of Images

In order to check that each of the materials being presented in the computer generated images was judged to represent the materials that it was supposed to, a small pilot was undertaken to make sure that correct material judgements were likely.

A convenience sample of 18 people<sup>54</sup> were presented with 6 images (one for each wall cladding material) and asked what they thought the roof and external wall materials were made of. They were then asked to rate the degree of realism and the images on a scale of 1-5. Respondents were also asked to make any further comments regarding the appearance of the house.

<sup>54</sup> It should be noted that the convenience sample included architects, but this is not felt to be a problem in this context because if anything, architects are likely to be more critical of the visual representativeness than less.



100% of the respondents correctly named the cladding materials Brick, Horizontal Timber, and Painted Horizontal Timber. Around 90% of respondents correctly named Roughcast and Vertical Timber. The lowest correct response figure was for the material 'Precast Concrete', although even this material was correctly named by 72% of respondents. Roofing material achieved similar scores, with around 90% of people identifying both materials correctly. In terms of the degree of realism attributed to the materials presented, significantly more people rated the images as either 'Quite Realistic' (36%), 'Realistic' (26%) or 'Very Realistic' (16%) than the number of people saying that the images were either 'Unrealistic' (19%) or 'Not at all Realistic' (3%). The only comment that people made regarding the realism of the images was about the reflection on the windows being too light. This was then changed so that the reflections were darker, and then piloted on a small number of people, who all said that the reflections looked more realistic. Any other comments made were about the background itself, and as such were not considered, as this would not be a factor of variation in the final study.

Overall, the results of this pilot were judged to be satisfactory, and hence the images were included in the 7 surveys to be described in the following sections.

## **4.3 Final Methodology**

### **4.3.1 Introduction**

Following on from the methodological developments presented in section 4.2, details of the final testing materials used in the study of perceptions of cladding materials will be discussed in the following sections. Section 4.3.2 will discuss the design of the survey itself, and this will be followed in section 4.3.3 by a discussion of the various issues that arose in the creation of an internet based survey designed as a comparable data collection method to the paper-based survey.

### **4.3.2 The Survey: Overall Design and Variations**

To gather data about people's perceptions of each of the 36 house variations discussed in section 4.2 in a single survey would mean asking individual respondents to judge all 36 houses on various different criteria (10), which would result in a minimum of 360 questions being asked of a sample of around 50 people. While this has the advantage of not being a large sample, it was felt that the sheer number of questions would increase respondent fatigue and boredom and hence decrease rates of participation, and increase respondent dropout.

Therefore, it was decided to split the survey up into a number of different surveys, whereby each respondent would only have to make judgements on 6 houses in total. Initially, it was thought that 6 surveys would suffice (i.e. 36÷6), but given the need to randomise presentation order and assure that each respondent would see each given house type, cladding material and roof type, it turned out that the minimum number of surveys needed was 7. The final breakdown of the randomised survey variations required to ensure adequate coverage of each attribute is shown in Table 5. The actual surveys used in the cladding study can be seen in Appendix 3.

	Variation	Roof	1	2	3	4	5	6	7
1	HOUSE TYPE 3	Roughcast1(Walls)	Steel(Roof)						1
2	HOUSE TYPE 1	Timber1(Walls)	Steel(Roof)					1	2
3	HOUSE TYPE 1	Timber3(Walls)	Steel(Roof)			1			
4	HOUSE TYPE 2	Other (Walls)	Steel(Roof)			2			
5	HOUSE TYPE 2	Timber1(Walls)	Steel(Roof)				1		
6	HOUSE TYPE 3	Timber2(Walls)	Steel(Roof)				2		
7	HOUSE TYPE 1	Other (Walls)	Slate(Roof)				3		2
8	HOUSE TYPE 2	Timber3(Walls)	Slate(Roof)				4		5
9	HOUSE TYPE 1	Brick1(Walls)	Steel(Roof)		1				
10	HOUSE TYPE 3	Other (Walls)	Steel(Roof)	1					
11	HOUSE TYPE 2	Timber2(Walls)	Slate(Roof)					1	
12	HOUSE TYPE 2	Roughcast1(Walls)	Steel(Roof)		2			2	
13	HOUSE TYPE 2	Timber2(Walls)	Steel(Roof)						1
14	HOUSE TYPE 3	Timber3(Walls)	Steel(Roof)						4
15	HOUSE TYPE 3	Timber1(Walls)	Slate(Roof)	2					
16	HOUSE TYPE 1	Timber1(Walls)	Slate(Roof)					3	
17	HOUSE TYPE 3	Roughcast1(Walls)	Slate(Roof)						5
18	HOUSE TYPE 1	Brick1(Walls)	Slate(Roof)	3					
19	HOUSE TYPE 2	Timber1(Walls)	Slate(Roof)			3			
20	HOUSE TYPE 2	Roughcast1(Walls)	Slate(Roof)	4					
21	HOUSE TYPE 3	Other (Walls)	Slate(Roof)						4
22	HOUSE TYPE 3	Brick1(Walls)	Slate(Roof)				5		
23	HOUSE TYPE 1	Timber3(Walls)	Slate(Roof)		3				
24	HOUSE TYPE 3	Timber3(Walls)	Slate(Roof)					4	
25	HOUSE TYPE 2	Brick1(Walls)	Steel(Roof)						5
26	HOUSE TYPE 1	Other (Walls)	Steel(Roof)					5	
27	HOUSE TYPE 2	Other (Walls)	Slate(Roof)		4				
28	HOUSE TYPE 1	Timber2(Walls)	Slate(Roof)						6
29	HOUSE TYPE 3	Timber1(Walls)	Steel(Roof)		5				
30	HOUSE TYPE 2	Brick1(Walls)	Slate(Roof)						6
31	HOUSE TYPE 2	Timber3(Walls)	Steel(Roof)	5					
32	HOUSE TYPE 3	Timber2(Walls)	Slate(Roof)		6	4			
33	HOUSE TYPE 3	Brick1(Walls)	Steel(Roof)			5		6	
34	HOUSE TYPE 1	Timber2(Walls)	Steel(Roof)	6					
35	HOUSE TYPE 1	Roughcast1(Walls)	Steel(Roof)				6		
36	HOUSE TYPE 1	Roughcast1(Walls)	Slate(Roof)			6			

Table 5 - Breakdown of randomisation of survey variations

In terms of the questions that each respondent was asked to answer about each house they were presented, it was decided that responses should be sought to statements which people were asked the extent to

which they agree or disagree with each one on a likert scale (1 = strongly agree, 7 = strongly disagree) .

The 10 statements respondents were asked to rate in terms of agreement are shown in Table 6.

- |     |   |
|-----|---|
| 1)  | I would consider buying this house                    |
| 2)  | This house has a pleasant appearance                  |
| 3)  | The house style is "traditional"                      |
| 4)  | This house strikes me as being unusual                |
| 5)  | This house looks boring                               |
| 6)  | The colours of the materials complement each other    |
| 7)  | This house looks like it will last a long time        |
| 8)  | I find this house unappealing                         |
| 9)  | I would say the house style is "modern"               |
| 10) | I think developers could easily sell houses like this |

**Table 6 - Statements presented about each house variation**

People were also asked to write down any other comments that they had about the appearance of each house variation. Each respondent was also asked to answer the questions on the topics shown in Table 7.

- |     |  |
|-----|--|
| 1)  | Rank each of the houses presented in order of preference           |
| 2)  | What 6 factors are considered to be important when buying a house? |
| 3)  | Three general questions about the idea of a maintenance fund       |
| 4)  | Gender   |
| 5)  | How long have you lived in your present home?                      |
| 6)  | Age  |
| 7)  | How many people live in your household?                            |
| 8)  | Owned/Rented/Part owned, etc..                                     |
| 9)  | Type of property (House, Flat, etc.)                               |
| 10) | Approximate age of house   |
| 11) | Would you consider buying a house in a new housing development?    |

**Table 7 - Other questions asked of each respondent in the cladding study**

The number of each survey was printed on the back to make it easy to sort the different surveys on their return. Respondents were not told that the particular survey they received was one of 7 different possible surveys.

Each survey was printed in high quality colour on double sided A3 sheets, resulting in a 12 page A4 booklet on silk-finish paper. This created an attractive survey instrument for respondents to fill in (see Appendix 3), thereby increasing respondent motivation. A decision was taken on the basis of the high costs of colour printing for survey production to limit the number of printed surveys to 2730. Given that the response rate was unknown before the study began, and also it was assumed that any perceptual differences that could be isolated might be rather small, it was considered that in order to try and maximise the potential sample, a duplicate study would be created which would be run over the internet. The various issues involved in the creation of this study will be the focus of section 4.3.3.

#### **4.3.3 Creating a comparable internet survey**

Although the initial decision to create a comparable survey to be run over the internet was taken for reasons of sample maximisation, there are several advantages and disadvantages of this particular method that needed to be considered before developing this method further<sup>55</sup>.

Innovations and developments in social science methods have long been tied to both advances in technology and cost considerations. The introduction of telephone interviewing in the 1970's and more recent advances in computer assisted interviewing are two good examples of this (Dillman, 1999). The past few years have seen a growing interest in the use of both e-mail surveys and web-based surveys, primarily concerned with administering simple questionnaires. Dillman (1999) has laid out a comprehensive series of guidelines for designing such internet based questionnaires.

Whilst questionnaire survey techniques can be useful for making statements about groups of people, they can also be used (although are not often) for experimental or quasi-experimental investigations

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<sup>55</sup> More details can be found in Edge and Craig (2005).

(Breakwell et al., 1995, p.100). There is a growing interest in the use of the internet for experimental investigations in psychology (see for example Birnbaum, 2000 or Reips, 2003).

Delivering what are arguably fairly standard research instruments using the internet carries with it a variety of advantages and disadvantages. Whilst these considerations are written with standard research instruments in mind, they also hold true for experiments which might be described as innovative. The various advantages and disadvantages will be dealt with in turn here. Unless otherwise stated, the following list is adapted from Reips (2001b).

#### **4.3.3.1 Advantages:**

Access to demographically and culturally diverse population<sup>56</sup>. This is one of the oft-cited reasons for deciding to use the internet over pen and paper based methods. The over-reliance on students in psychological experiments is well documented, and the ability to gain access to an internet population which more closely resembles the population at large is very appealing. Although replication studies tend not to be the most favoured by academics, there is arguably a demographic 'generalisability vacuum' which needs filling for many studies in the social sciences. Such studies would benefit from the potential sample offered by internet based experiments. It is also the case that gaining access to very specific populations is made easier by the internet (e.g. certain special interest groups, or people with a specific medical condition).

Ability to bring the experiment to the participant. In terms of motivational power, the very fact that participants do not need to come into a laboratory or testing situation to take part is likely to increase both the motivation to participate, and the level of comfort whilst participating. By and large, members of the internet-using population are familiar with the

<sup>56</sup> It should be noted that this is also a disadvantage of internet methods, as discussed in section 4.3.3.2 about the digital divide.

situation of sitting at a computer and navigating their way through web pages, so the usability of such a survey should not pose too much of a problem.

High statistical power due to potentially large samples. Arguably this is also true for postal surveys (notwithstanding cost considerations), although the ability to customise surveys for regional, national and potentially international samples makes for a powerful argument in terms of the potential to achieve very large sample sizes. This has been used to great advantage by research teams carrying out projects spanning several countries.

Cost and time savings. One of the clearest initial advantages for using the internet as the means of data collection is the simple fact that large scale paper surveys tend to be very time-consuming and costly in terms of materials. Once an internet survey or experiment has 'Gone Live', the results can come back to the researcher in a format ready for analysis, with little or no intervention, thereby eliminating the need to type in data. Although there are costs associated with running internet based studies (e.g. costs of reliable servers), these can be managed and minimised. A great advantage of the internet in the pilot stages of research is the ability to respond to issues arising without the need to re-start the pilot from scratch (from simple spelling errors to serious navigational issues).

#### **4.3.3.2 Disadvantages:**

A certain level of 'technical know-how' is required. Although internet studies can reduce costs in terms of both finances and time, there is a time investment needed initially in order to learn how to carry out such studies technically. However, it should be noted that this is also the case for numerous other research techniques such as telephone interviewing, or the design of postal surveys. Once learned and practiced, specific technical know-how becomes less of an issue. Reips (2001a) notes that

if conducted carefully, the advantages of web-based research can far outweigh the disadvantages, although there is an 'alarming potential for configuration errors' which can lead to bias or misleading results.

Potential for multiple submissions. This is often mentioned as a concern for web experiments, although it appears that incidences of such behaviour are very rare apart from for technical or interface-based reasons (e.g. participants are not sure whether they have submitted the form or not, and therefore do the survey again). Most of the worries regarding multiple submission can be controlled for and guarded against by close inspection of the data (e.g. checking IP address), or the inclusion of some kind of identity check (e.g. email address).

Lack of experimental control. While it is true that there will be a level of uncontrolled variation due to technical set-ups and participant surroundings, in most situations careful experimental design can control for such issues if they are particularly important for the study being carried out.

Self selection. This is related to the manner in which people find out about the study in the first place. If the study is picked up by someone searching for "Web Experiment", it is likely to yield different results to a passing web-surfer clicking a link on housing website, for example. Targeting potential samples in multiple ways will go some way to reducing this problem.

Respondent drop out. While this is inevitably a problem, one advantage of internet surveys over paper surveys is that, if designed correctly, it is possible to find out at what point a respondent decided to drop out. This might have implications in terms of respondent motivation, or even something as simple as question wording.

The 'digital divide'. Broadly speaking, internet users tend to be younger, more highly educated, and richer than non users (Gardner and Oswald,



2001). This is important insofar as it underscores the importance of checking the demographic characteristics of samples relative to the population being researched. Whilst there is nothing a researcher can do to change the existence of this divide between those who do and those who do not use the internet, efforts can and should be made actively to seek out a greater number of people known to be under-represented in the internet population (e.g. older people with a low income) by for example targeting newsgroups or websites of interest to that population, or carrying out a non-internet-based study for these people to complement the internet findings.

Given its methodological importance, it is surprising that there are relatively few studies that have set out to compare internet and 'pencil and paper' surveys. Buchanan and Smith (1999) found that internet surveys were more reliable for the administration of personality testing than pencil and paper surveys. A recent study by Preckel & Thiemann (2003) however, demonstrated a high degree of comparability for both types of survey in relation to intelligence testing. McNally (2001) and O'Hanlon and Coleman (2001) have also carried out similar comparisons and found few differences. There are however various issues regarding topics such as navigation (see Norman et al., 2001; Olson and Olson, 2003) which need to be considered in making a comparable experience for the participants of an online study.

#### **4.3.3.3 *Creating the Internet Survey***

A considerable effort was made to ensure the most reliable set-up for the internet survey. The coding for the survey was a combination of HTML<sup>57</sup> and PHP<sup>58</sup>, with the results being written to a MySQL<sup>59</sup> database on a Linux Server. Initially, a test survey was set up to try and create the look and feel of the paper-based survey using the online interface. It quickly

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<sup>57</sup> See <http://www.w3.org/MarkUp/>

<sup>58</sup> See <http://www.php.net>

<sup>59</sup> See <http://www.mysql.com>

became apparent that there were various issues regarding both layout and navigation that would need to be changed in order for the survey to be a user friendly data collection tool. The first hurdle to overcome was the fact that in order to use a single entry URL<sup>60</sup>, and to ensure an even spread of responses across the different surveys, the survey instrument needed to be able to automatically randomise the survey number that respondents filled in. This was achieved by a simple piece of PHP code which allocated a variable (`$survey`) a random number between one and seven. This variable was then passed to a different PHP page which allocated an array of house numbers (`$house_no[x]`) to each particular case of the variable (`$survey`). Hence, the PHP code snippet for this was:

```
switch ($survey){
case 1:
    $house_no[1]=36;
    $house_no[2]=29;
    $house_no[3]=1;
    $house_no[4]=15;
    $house_no[5]=22;
    $house_no[6]=8;
    break;
case 2:
    $house_no[1]=2;
    $house_no[2]=16;
etc.....
```

i.e. these are  
the house numbers  
in survey no. 1

Once the array had been filled with the correct house numbers, which corresponded to the pictures presented in that particular survey, this array was simply passed to all subsequent pages and each house number was simply added as a prefix to a '.jpg' extension<sup>61</sup>, thereby ensuring that the correct images were presented in each survey.

Once this problem had been dealt with, it became clear that it would be necessary to pre-load the images in the order they would be presented in,

<sup>60</sup> The URL of the final survey is: <http://www.rqsurvey.org.uk/House/>

<sup>61</sup> There were actually two images to present, as the paper survey showed both a front and a side view of each house, so the prefix also had an 'a' or 'b' added to it before the extension.

to minimize any disruption due to slow connection speeds. This was achieved by pre-loading the images on the first page after the survey was assigned, and then loading up the actual survey into a separate window which was created as a 'pop-up' sized correctly to the respondents screen. In order to achieve a layout that did not appear 'cluttered' on the screen, it was not possible to display all of the ten questions at the same time. A further issue of navigation was encountered in the initial pilot stages of the survey, where people often mentioned that they did not have any idea how long the survey would go on for, and were therefore put off continuing. This is important insofar as respondents with a paper survey can simply leaf through the pages to see how long it is. Therefore, it was decided that a 'percent complete' bar be added to the survey which shows respondents how much of the survey has been completed. In the piloting of the survey, it was found that this increased people's motivation to continue with the survey. The 'Percent Complete' bar can be seen at the bottom of the screenshot shown in Figure 37.



Figure 37 - Screenshot of internet survey with 'percent complete' bar showing at the bottom

An interesting usability issue was discovered in the pilot phase regarding the use of 'radio' buttons. By watching people filling in the survey, it was noticed that most of the time people would move the mouse cursor so that it was placed above the radio button before clicking the mouse button to 'check the radio button'. However, sometimes it was noticed that radio buttons were apparently not being selected, even when people were clicking on them. The different states of the radio button can be seen in Figure 38, and the state of interest is the last one shown, where the mouse button has been depressed, and the cursor moves away from the radio button slightly before being released. This was found to be the cause of the apparently missing 'button clicks'.





	Mouse moves over radio button
	Left mouse button is depressed (but not yet released)
	Left mouse button is released
	OR.... Mouse moves cursor away from radio button slightly and then is released

Figure 38 - Radio Button States

This was considered to be a potentially serious usability problem in terms of the likelihood of missing data being accidentally generated, so a solution was sought. Various mailing lists were sent emails asking for advice on this as well as searching the internet for coding solutions for this, and eventually a solution was found which is shown in Table 8.

To stop the slight accidental movement of the mouse before release unselecting the radio button insert the following code into the HTML radio button INPUT tag:

```
onmousedown="if(this.disabled) return false; else {
this.checked=true;}"
```

Table 8 - Solution to Radio Button Problem

The other major problem to overcome in designing the presentation of the internet survey was that it was impossible to control the browser on which respondents viewed the survey. Whilst this problem is not too serious for fairly basic text based surveys, it becomes slightly more complicated when a detailed arrangement of both text and images needs to be ensured (both images needed to be visible at the same time as the question and the response buttons). This became particularly important as the images needed to be a minimum size to ensure comparability of survey instrument (i.e. the images could not simply be shrunk, otherwise respondents were not seeing the same quality of image as the respondents to the paper-based survey). The most workable solution to this ended up being simply to create separate surveys for the different browsers with a small script that automatically redirected the respondent's browser to the appropriate survey instrument.

As mentioned in section 4.3.3.1, a major advantage of internet surveys is that if designed carefully, the basic data processing (i.e. typing in the data) stage of the research can be almost eliminated. The results of the survey were written to a MySQL database which was designed to mirror the structure of the SPSS file into which the paper based surveys were to be input. This way, the final database file could simply be exported to SPSS<sup>62</sup> and analysed along with the other data file.

Due to the fact that the survey was not on a single HTML/PHP page, the results could not simply be written to the database as soon as the respondent clicked on the 'Submit' button. Instead, on the first page after the survey was assigned, a blank row was written to the database, and that respondent was assigned a unique id (`$id_variable`). This variable was then simply passed through the survey and the row in the database was updated accordingly by matching the database variable

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<sup>62</sup> SPSS can not actually import MySQL files, so the database had to be first loaded into Microsoft Access via an ODBC driver, and then exported as an Excel CSV spreadsheet. SPSS can then import the CSV file and the relevant labels could be added.



with the variable being passed as a hidden variable across the various survey 'forms'.

The survey was piloted after completion to ensure that it was working correctly in presentation terms (all minor faults were corrected at this stage), and that the data was arriving at the database in the correct format. Once this piloting stage was completed successfully, the survey was ready to be 'launched'.

#### **4.3.4 Procedure**

The paper survey (see Appendix 3) was hand delivered along with a freepost envelope in which the survey could be posted back by the respondent. Five areas in the Aberdeenshire/Aberdeen City area were targeted (Ellon, Kingswells, Westhill, Bridge of Don, and Aberdeen City Centre). When surveys were posted back, they were labelled with a unique identification number, which enabled each survey to be located if necessary after data entry was completed.

The URL of the internet survey was advertised throughout the UK via several press releases to the regional newspapers around the UK. Several estate agents were also contacted and asked if they would place a link to the survey on their websites. It was hoped that this would be a good way of attracting people that were actually in the process of thinking about purchasing houses.

#### **4.3.5 Details of the sample**

Table 9 shows the response rates for the paper-based survey by area. A total of 2728 surveys were delivered in the paper-based survey, which resulted in 715 completed surveys being returned (an overall response rate of 26.21%), which was reduced to 708 after incorrect<sup>63</sup> or empty responses were removed. 136 people responded to the internet survey

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<sup>63</sup> Incorrect responses are considered as being where it is evident that respondents somehow misunderstood the survey instructions, and for example consistently ticked more than one box on a single rating scale.

(after incorrect or empty responses were removed). Given the way in which the internet sample was contacted (by press releases in the local press), it is not possible in this case to adequately deduce an accurate response rate for the internet sample, as it is not possible to know how many people were aware of the survey. Therefore a total of 844 respondents participated in this survey. It should be noted however, that some of these responses are partially complete, in which case the incomplete sections have been coded so that the analyses treats such cases as missing data, so as not to bias the results. There was an approximate 50/50 gender distribution in the responses to this survey (49.1% male, 50.9% female). In order to amalgamate the results of the seven surveys, responses to each house were treated as if they were from a separate person<sup>64</sup>. As each respondent made judgements on six houses (out of a total of 36), the total number of effective respondents (for statistical purposes) is 5064 (844 x 6). Hence all subsequent analyses of material differences will assume a between-subjects design.

<b>Ellon</b>		<b>Bridge of Don</b>	
Total Delivered	593	Total Delivered	811
Total Returned	134	Total Returned	217
Response Rate	22.60%	Response Rate	26.76%
<b>Kingswells</b>		<b>Westhill</b>	
Total Delivered	274	Total Delivered	310
Total Returned	95	Total Returned	107
Response Rate	34.67%	Response Rate	34.52%
<b>Flats</b>			
Total Delivered	740		
Total Returned	160		
Response Rate	21.62%		

**Table 9 - Response Rates for Paper Survey by Area**

<sup>64</sup> Advice was sought from a statistician on this issue. Given that the portfolio of response sets is not perfectly counter balanced, it would be safer to not use any within-subjects analysis. Given that a larger effect size is needed in a between subjects analysis, there is a lower probability of a type I error occurring.

The returned responses were spread evenly across each of the seven surveys, resulting in an acceptable balance of responses across each cladding, roofing, and house type. The survey took approximately 15 minutes to complete, and a great deal of interest was generated, as reflected in respondents' comments.



## 4.4 Results

### 4.4.1 Demographic Characteristics

The demographic characteristics of the sample are presented in Table 10. As can be seen from the demographic breakdown, there were approximately the same number of males as females participating in the study. In fact the gender split is comparable with the gender split in the Scottish population (51.9% female<sup>65</sup>). The median age category of the total sample was 41-50, and the mode was 31-50.

The majority of the sample owned their own houses, either outright or with a mortgage (Combined=86%). This is higher than the average for Scotland (which is 63%<sup>66</sup>). More than half of all the respondents had lived in their homes for over 5 years (Combined=51.1%), with only 13.4% having moved within the last year. 70% of the sample lived in either houses or bungalows (compared with 64% for the Scottish population<sup>67</sup>) and 25% lived in flatted accommodation (compared with 36% for the Scottish population<sup>68</sup>). A total of 76% (compared to 82% for the Scottish population<sup>69</sup>) of the sample lived in households comprising 3 or less people.

### 4.4.2 Overall Preferences

An initial check was performed on the data to test the hypothesis that brick was likely to be attributed with such qualities as 'traditional'(q3) and 'durability'(q7). As shown in Figure 39, brick is rated as the most traditional closely followed by roughcast (Brick/Timber2 – Mann-Whitney U:  $z = 6.38$ ;  $p < 0.05$ ), and also the most 'long lasting' or 'durable' (Brick/Roughcast – Mann-Whitney U:  $z = 4.00$ ;  $p < 0.05$ ) of all the cladding types.

<sup>65</sup> Taken from <http://www.scrol.gov.uk/>

<sup>66</sup> Taken from <http://www.scrol.gov.uk/>

<sup>67</sup> Taken from <http://www.scrol.gov.uk/>

<sup>68</sup> Taken from <http://www.scrol.gov.uk/>

<sup>69</sup> Taken from <http://www.scrol.gov.uk/>

Socio-economic characteristics <sup>70</sup>	Categories	Total	
		Frequency	%
<b>Sex</b>	Male	400	49.1
	Female	414	50.9
<b>How long lived in present home</b>	< 1 year	109	13.4
	1-5 years	288	35.5
	5-10 years	187	23.1
	>10 years	227	28.0
<b>Age Band</b>	16-20	10	1.2
	21-30	181	22.3
	31-40	212	26.1
	41-50	194	23.9
	51-60	113	13.9
	>60	102	12.6
<b>How many people live in household</b>	1	180	22.4
	2	292	36.4
	3	138	17.2
	4	162	20.2
	5	22	2.7
	>5	9	1.1
<b>Tenure</b>	Owned outright	178	21.9
	Owned with mortgage	520	64.1
	Part owned	42	5.2
	Rented	67	8.3
	Other	4	0.5
<b>Type of Property</b>	House	401	49.4
	Bungalow	167	20.6
	Flat	204	25.2
	Maisonette	12	1.5
	Other	27	3.3

**Table 10 - Socio-economic characteristics of the sample for the cladding study**

<sup>70</sup> Missing data are excluded from the results, and are not reported here.

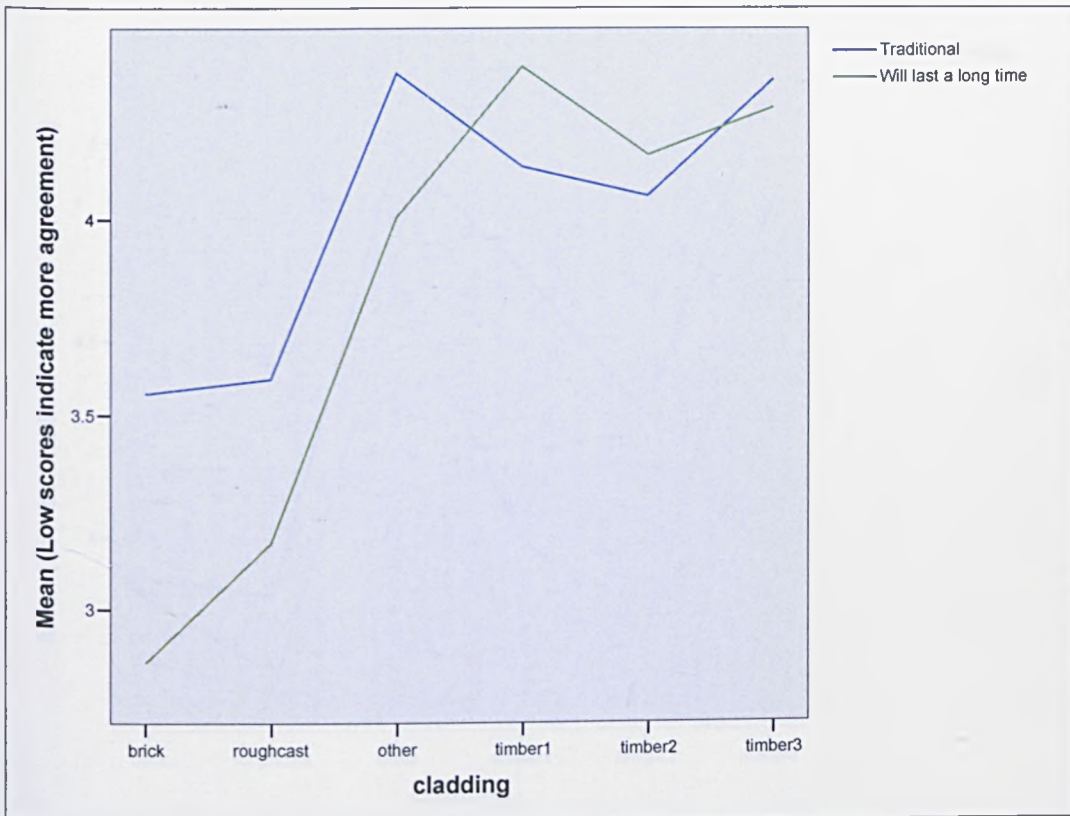


Figure 39 - Effect of cladding material on perceptions of tradition and durability

A check was also carried out to see if 'non-traditional' cladding materials were generally rated as less pleasant (Brick/Timber1– Mann-Whitney U:  $z = 3.46$ ;  $p < 0.01$ ) and less worthy of purchase consideration (Brick/Timber2 – Mann-Whitney U:  $z = 4.37$ ;  $p < 0.01$ ). As Figure 40 shows, in general this was confirmed for both, although timber 2 (horizontal timber cladding) stood out in both cases as both more pleasant and also more worthy of purchase consideration than the other 'non-traditional' claddings. In fact, the difference between the overall ratings of pleasantness for brick and timber 2 were not statistically significant.

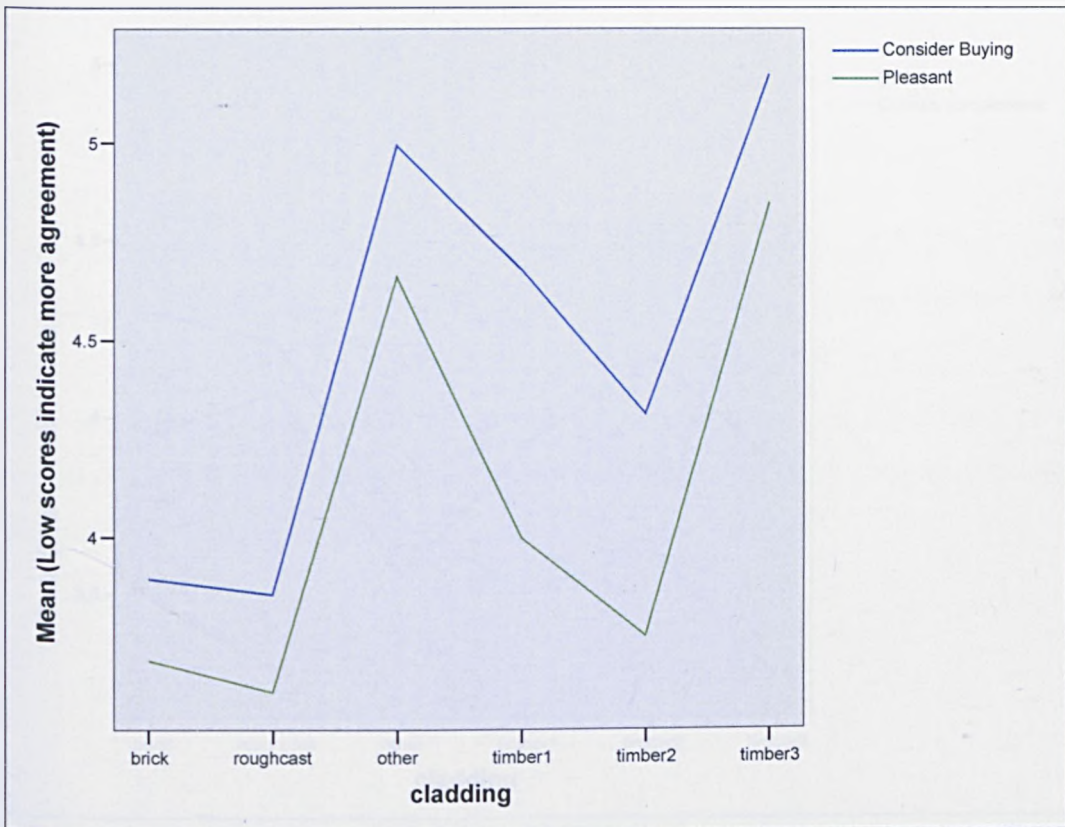


Figure 40 - Effect of cladding material on perceptions of pleasantness and purchase consideration

Examination of the responses to the remaining questions (see Figure 41 and Figure 42) show that on average, both roughcast and timber2 are considered as materials that better complement the other aspects of the houses. Timber2 is rated as the least boring material, closely followed by roughcast. Brick and roughcast are seen as the least unusual materials, whereas all of the timber claddings are rated as being unusual on average (Brick/Timber1– Mann-Whitney U:  $z = -10.01$ ;  $p < 0.01$ ). Brick, Timber2 and Roughcast are also rated as being less 'unappealing' (i.e. more appealing) than the other materials (Brick/Timber1– Mann-Whitney U:  $z = -2.71$ ;  $p < 0.01$ ), as well as being rated as the most 'saleable' materials (Brick/Timber1– Mann-Whitney U:  $z = -12.70$ ;  $p < 0.01$ ).



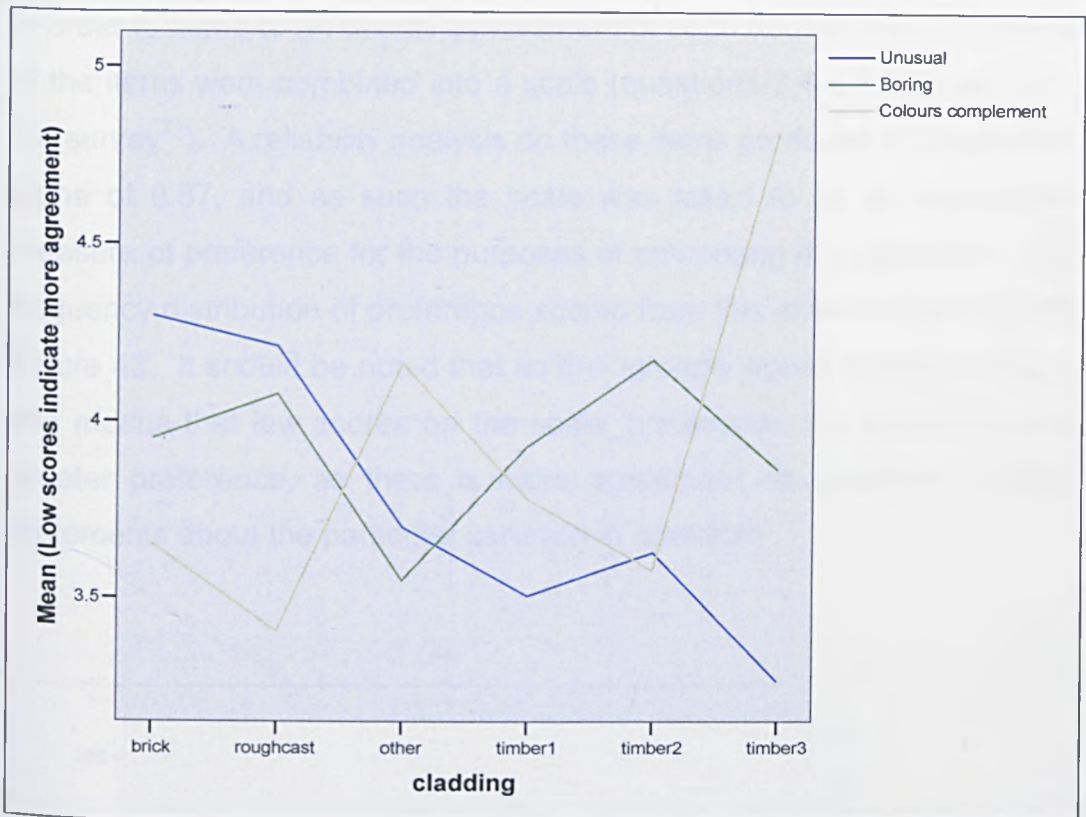


Figure 41 - Effect of cladding material on perceptions of unusual and boring and materials complement

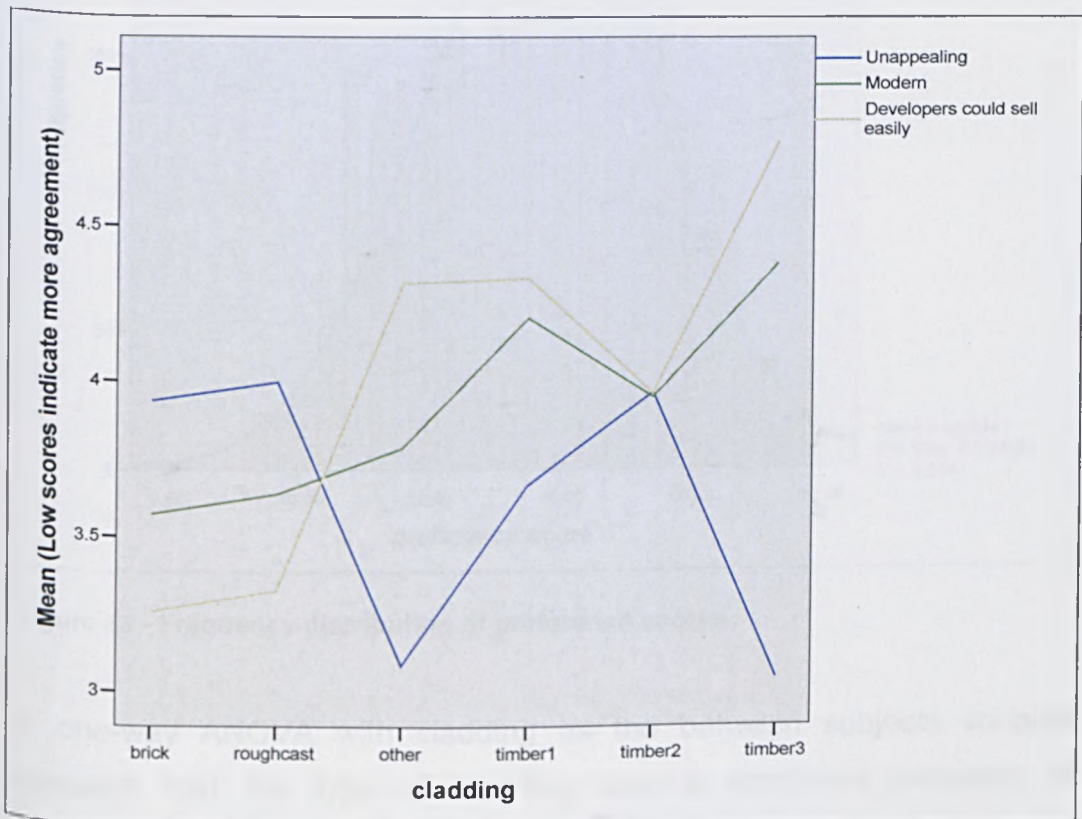
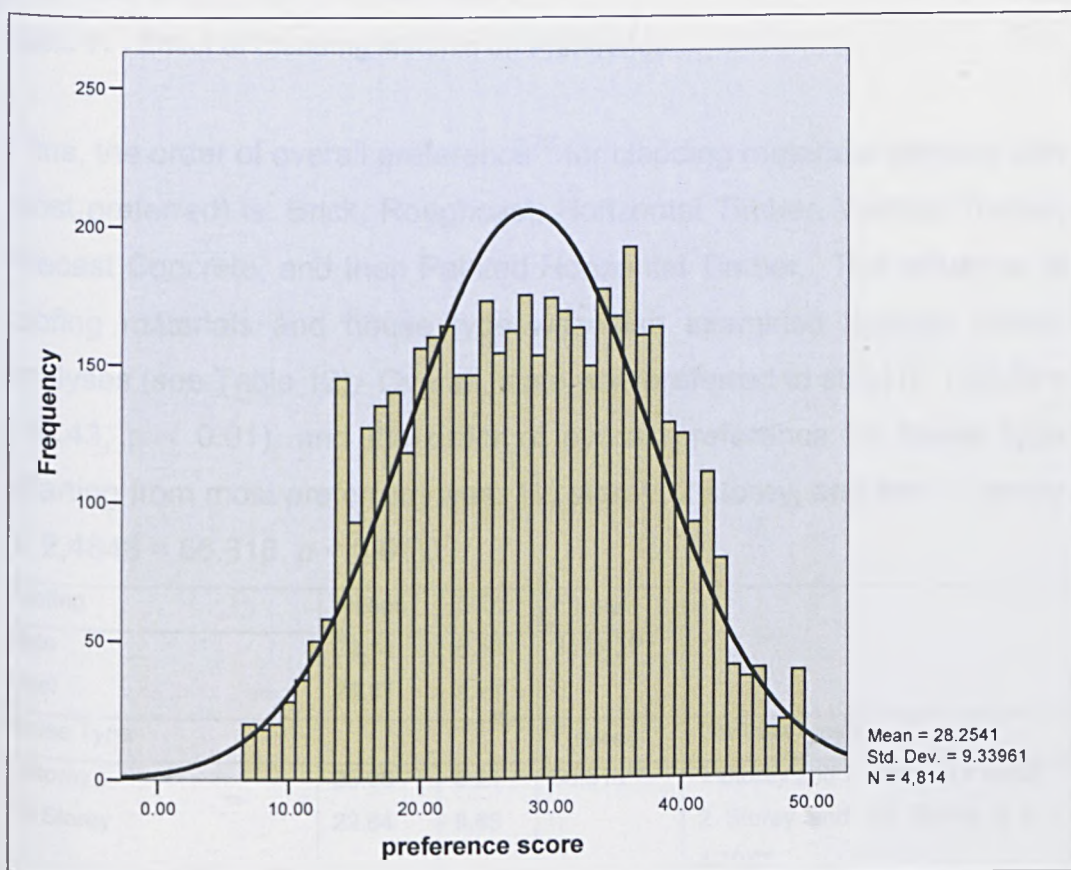


Figure 42 - Effect of cladding material on unappealing, modern, and saleability

In order to come to an overall assessment of each house-variation, seven of the items were combined into a scale (questions 3,4,6,7,8,9 and 11 in the survey<sup>71</sup>). A reliability analysis on these items produced a Cronbach's alpha of 0.87, and as such the scale was taken to be an acceptable measure of preference for the purposes of comparing the variations. The frequency distribution of preference scores from this scale can be seen in Figure 43. It should be noted that as the 'strongly agree' category was 1, this means that low scores on the scale 'preference' are indicators of a greater preference, as there is more agreement on positively worded statements about the particular variation in question.



**Figure 43 - Frequency distribution of preference scores**

A one-way ANOVA with cladding as the between subjects variable revealed that the type of cladding was a significant predictor of preference ( $F_{5,4845} = 109.2, p < 0.01$ ), as measured by the scale

<sup>71</sup> Items 6 and 9 were recoded as (8 minus score) because they were worded in the negative.

described above. This effect was examined in more detail by contrasting each of the claddings with one another using t-tests. With the exception of the contrast between 'brick' and 'roughcast' ( $t = -0.171$ ,  $p > 0.05$ ), all other contrasts were significant (see Table 11).

Cladding	Means	S.D.	F <sub>(5,4845)</sub>	Contrast t-tests
Brick	20.84	7.95	109.2**	Brick and Roughcast ( $t = -0.171$ )
Roughcast	20.91	8.63		Roughcast and H-Timber ( $t = -6.99$ )**
Precast Concrete	26.42	7.94		H-Timber and V-Timber ( $t = -3.74$ )**
Vertical Timber	25.25	8.15		Precast and V-Timber ( $t = 2.94$ )**
Horizontal Timber	23.77	7.80		Precast and P-H-Timber ( $t = -4.47$ )**
Painted Horizontal Timber	28.20	8.04		

\*\* significant at the  $p < 0.05$  level of significance

**Table 11 - Effect of Cladding Material on Preference**

Thus, the order of overall preference<sup>72</sup> for cladding materials (starting with most preferred) is: Brick, Roughcast, Horizontal Timber, Vertical Timber, Precast Concrete, and then Painted Horizontal Timber. The influence of roofing materials and house type was also examined through similar analyses (see Table 12). Overall, slate was preferred to steel ( $F_{1,4849} = 316.43$ ,  $p < 0.01$ ), and the order of overall preference for house type (starting from most preferred) was: 1½ storey, 2 storey, and then 1 storey ( $F_{2,4848} = 56.318$ ,  $p < 0.01$ ).

Roofing	Means	S.D.	F <sub>(1,4924)</sub>	
Slate	22.14	8.59	316.43**	
Steel	26.37	7.91		
House Type			F <sub>(2,4848)</sub>	Contrast t-tests
1 Storey	25.95	8.21	56.316**	1 Storey and 2 Storey ( $t = 6.82$ )**
1½ Storey	22.84	8.65		2 Storey and 1½ Storey ( $t = -3.70$ )**
2 Storey	23.96	8.43		

\*\* significant at the  $p < 0.05$  level of significance

**Table 12 - Effect of Roofing and House Type on Preference**

<sup>72</sup> Overall preference in this case is that which was measured by the aggregate preference score described earlier.



A further ANOVA was carried out in which all three factors (Cladding, Roofing, and House Type) were entered into a factorial analysis. A quarter of the preference variation could be accounted for by the independent variables ( $R^2=0.245$ ). All main effects and interactions came out as significant at the  $p<0.05$  level of significance, including a significant main effect of cladding material on preference ( $F 5,4815 = 153.83, p < 0.001$ ), which means that even when roofing and house type are taken into account, cladding material is still a significant predictor of preference score as measured in this survey. As can be seen from Figure 44 and Figure 45, roofing appears not only to be responsible for lower levels of preference (as indicated by higher scores), but it also effects the way in which certain cladding materials are perceived relative to particular houses. For example, the preferred cladding for house type 2 with a slate roof is roughcast, whereas when the roofing material was changed to steel, brick became the preferred material. This is an interesting effect which shows the importance of looking at materials in context, as is the case in this study.

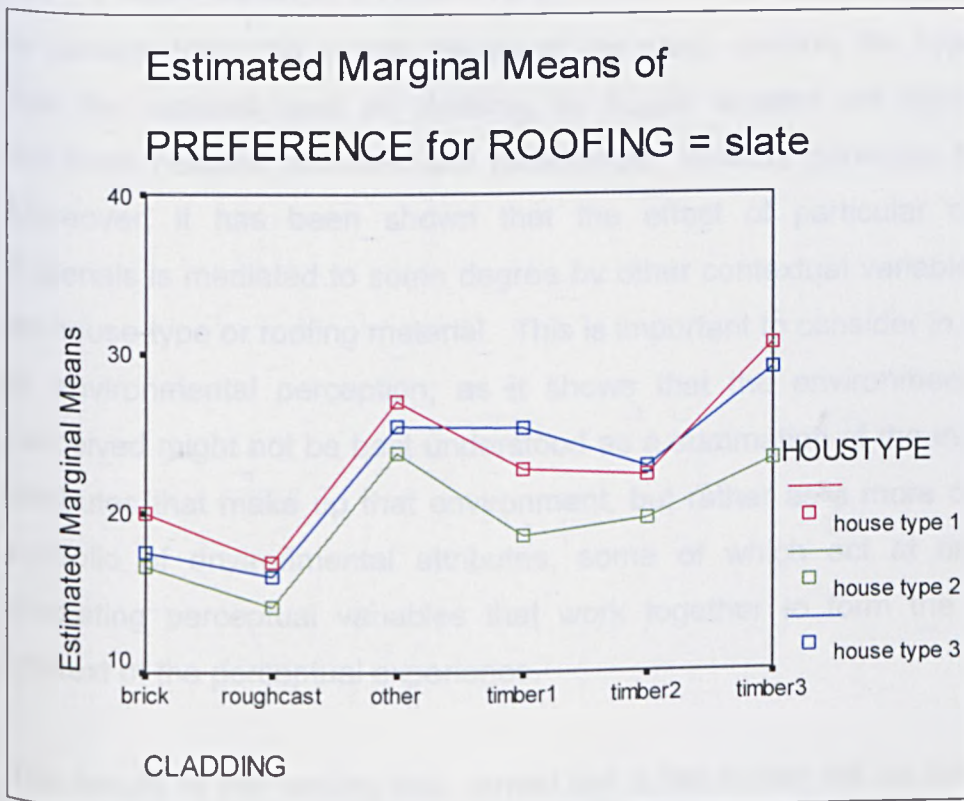


Figure 44 - ANOVA plot for preference X cladding X house type for slate roof



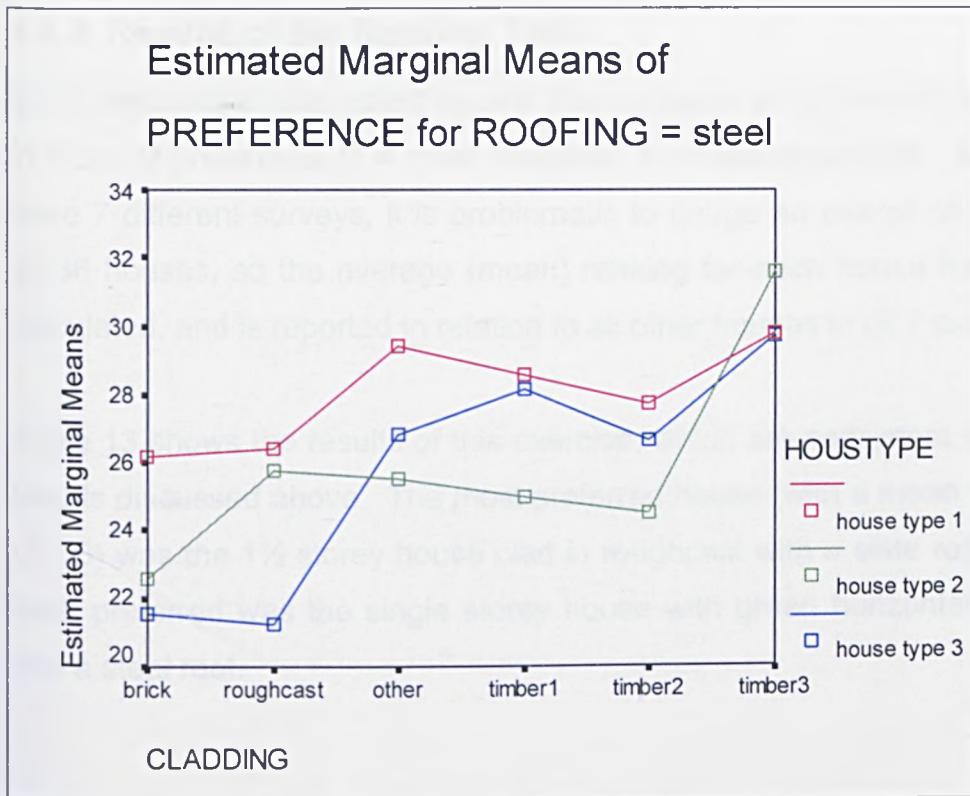


Figure 45 - ANOVA plot for preference X cladding X house type for steel roof

#### 4.4.2.1 Discussion of Overall Preferences

In general then, the overall results of the study confirm the hypothesis that the material used as cladding for house facades will significantly influence peoples attitudes and preferences towards particular houses. Moreover, it has been shown that the effect of particular cladding materials is mediated to some degree by other contextual variables such as house-type or roofing material. This is important to consider in relation to environmental perception, as it shows that the environment being perceived might not be best understood as a summation of the individual attributes that make up that environment, but rather as a more complex portfolio of environmental attributes, some of which act at times as mediating perceptual variables that work together to form the overall context of the perceptual experience.

The results of the ranking task carried out in the survey will be discussed in the next section, before then going on to discuss the results outlined above in some more detail.

### **4.4.3 Results of the Ranking Task**

Each respondent was asked to rank the 6 houses which were presented in order of preference (1 = most preferred, 6 = least preferred). As there were 7 different surveys, it is problematic to gauge an overall ranking of all 36 houses, so the average (mean) ranking for each house has been calculated, and is reported in relation to all other houses in all 7 surveys.

Table 13 shows the results of this exercise, which are consistent with the results discussed above. The most preferred house (with a mean ranking of 1.6) was the 1½ storey house clad in roughcast with a slate roof. The least preferred was the single storey house with green horizontal timber and a steel roof.

House Number	Survey	Mean Ranking	House Type	Cladding	Roof
15	1	1.6	2	roughcast	slate
13	6	1.82	2	brick	slate
19	5	1.84	2	timber 2	slate
27	6	1.99	3	roughcast	slate
25	4	2.25	3	brick	slate
17	3	2.54	2	timber 1	slate
31	2	2.69	3	timber 2	slate
23	2	2.72	2	other	slate
26	5	2.72	3	brick	slate
16	2	2.76	2	roughcast	steel
1	1	2.8	1	brick	slate
28	7	2.85	3	roughcast	steel
3	3	2.99	1	roughcast	slate
14	7	3.03	2	brick	steel
26	3	3.14	3	brick	steel
31	3	3.22	3	timber 2	slate
21	4	3.25	2	timber 3	slate
18	4	3.3	2	timber 1	steel
21	7	3.3	2	timber 3	slate
20	6	3.31	2	timber 2	steel
5	5	3.32	1	timber 1	slate
35	7	3.54	3	other	slate
7	7	3.55	1	timber 2	slate
29	1	3.58	3	timber 1	slate
32	4	3.63	3	timber 2	steel
2	2	3.86	1	brick	steel
30	2	3.89	3	timber 1	steel
24	3	3.92	2	other	steel
16	5	3.93	2	roughcast	steel
8	1	4.12	1	timber 2	steel
36	1	4.12	3	other	steel
11	4	4.13	1	other	slate
11	6	4.29	1	other	slate
4	4	4.4	1	roughcast	steel
12	5	4.56	1	other	steel
33	5	4.63	3	timber 3	slate
6	6	4.67	1	timber 1	steel
6	7	4.72	1	timber 1	steel
22	1	4.77	2	timber 3	steel
34	6	4.91	3	timber 3	steel
9	2	5.05	1	timber 3	slate
10	3	5.18	1	timber 3	steel

**Table 13 - Overall mean preference ranking of each house**

The pattern seen in this analysis closely resembles the results from the combined preference scale. As shown in Figure 46, brick is the most

preferred overall (although it was a roughcast house that came out top), followed by roughcast, horizontal timber, vertical timber, precast-roughcast, and green horizontal timber.

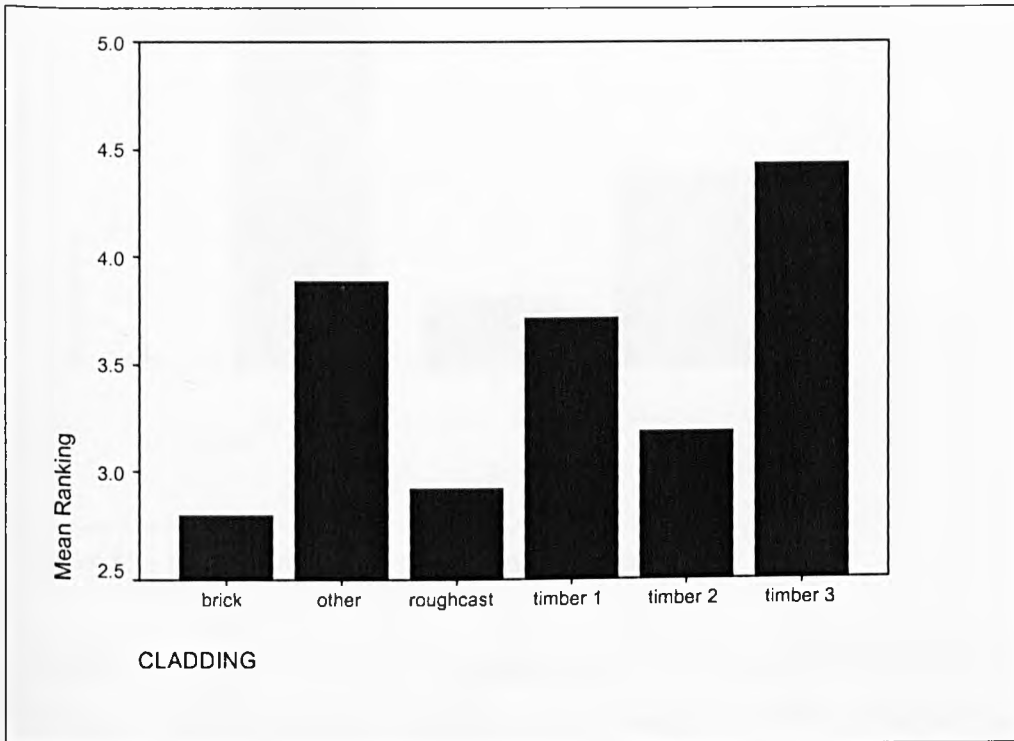


Figure 46 - Mean preference ranking by cladding

The results for both roofing (Figure 47) and house-type (Figure 48) are similar in that they confirm the patterns outlined earlier in the results.

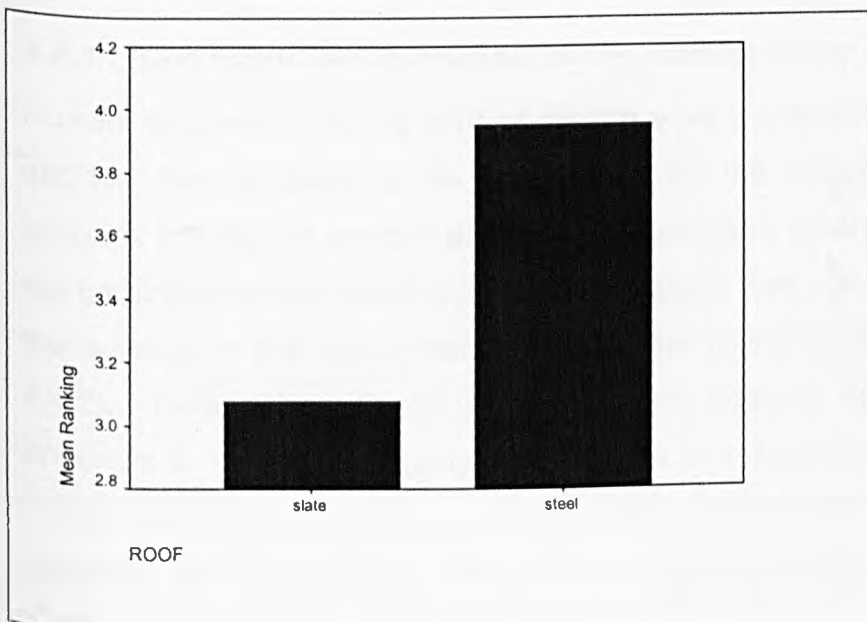
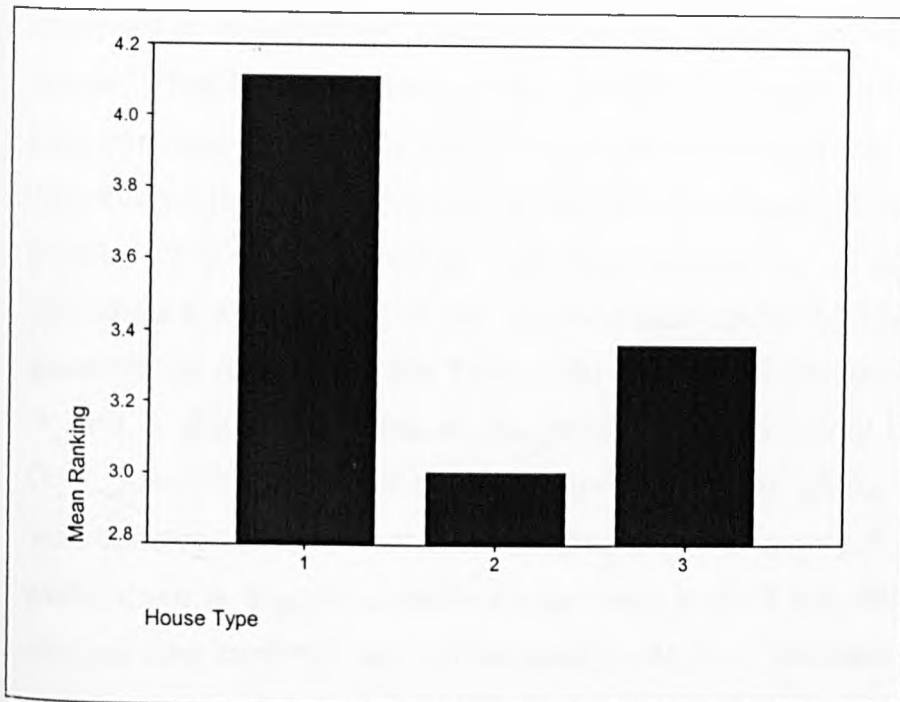


Figure 47 - Mean preference ranking by roofing



**Figure 48 - Mean preference ranking by house type**

While the results of the ranking task confirm the patterns exhibited in the ratings, it is interesting to explore these results further by looking at the overall frequency of responses for each category. This will be looked at in the following section.

#### **4.4.3.1 Correspondence analysis of the ranking study**

In order to examine the patterns of response for the ranking study, it was decided that an analysis be carried out on the frequency tables of rankings in order to explore any trends or patterns emerging that might not be evident in the rating study. This analysis was done by combining the surveys in the same manner as for the rating study (see section 4.4.2). Detailed results of correspondence analysis can be seen in appendix 4. In order to gauge the pattern of responses across all 36 house variations, the same approach was taken as before (i.e. each response was assumed to come from a different survey and therefore treated as a between-subjects design).

Correspondence Analysis (sometimes known as correspondence factor analysis) is a technique used for treating contingency and frequency tables<sup>73</sup>. The first two factors of this analysis<sup>74</sup> accounted for 86% of the total variance. Factor 1, which accounted for 64% of the total variance was interpreted as '*preference*', which is to be expected, as this is what people were being asked to rank the houses on. Factor 2, which explained a further 22% of the variance was harder to interpret, but an examination of the plot (see Figure 49) shows that the extreme rankings '1' and '6' share similarities on this dimension which might be interesting. One possible interpretation might be something along the lines of '*aesthetic conservatism*' or '*interestingness*'. In this way, it could be that whilst there is a good spread of responses around the middle rankings, the extreme rankings are not actually based on aesthetic criteria, but possibly on pragmatic concerns such as re-sale potential. Thus, an interesting design might not be rated negatively, but might not be rated as the most-preferred due to a lack of aesthetic comparisons from which to judge that particular combination of materials. At the other end of the scale, the least preferred options might be affected in the same way, with the green cladding material being most associated with temporary buildings (this is discussed further in section 4.4.5).

Of particular interest here is the finding that house number 15 (one and a half storey house, roughcast façade, slate roof) and house number 19 (one and a half storey house, horizontal timber façade, slate roof) often seem to be ranked as being the most preferred. House number 13 (one and a half storey house, brick façade, slate roof) was also often ranked as being the most preferred, but is not discussed any further here, as a comparison between render and timber fits in with the material presented

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<sup>73</sup> The underlying assumption of correspondence analysis is that rows and columns of the table are independent. The analysis, by breaking the tables into smaller ones, aims to elicit the deviations from independence. It reclassifies the rows and columns and ranks them in order to provide the best association. This association is expressed by a correlation coefficient (between rows and columns) which is the square root of the eigenvalue of the dimension. The output provides the coordinates for each modality in order to locate them in each factor. The relative contribution (RCO) expresses a part of the modality explained by the factor, and the absolute contribution (CTR) expresses the modalities contribution to the factor. The labelling of the factors is based on the CTR, with those modalities having a larger than mean contribution being used to describe it (Doise et al., 1993).

<sup>74</sup> Only factors with Eigenvalues more than 0.09 were retained for further analysis



in chapter 5. This is backed up by the data from the rating scales, as can be seen in section 4.4.4

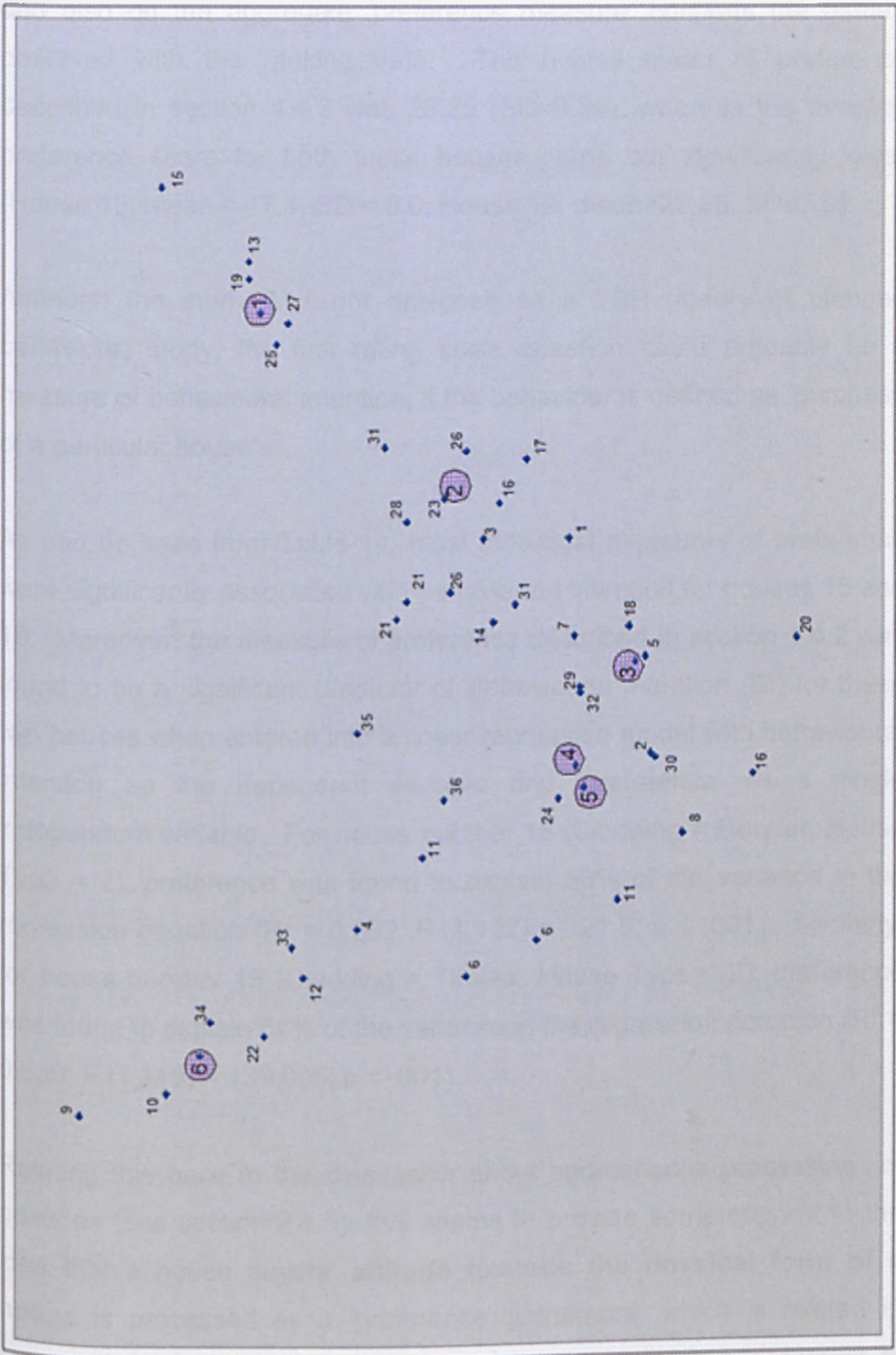


Figure 49 - Results of Correspondence Analysis for Combined Survey Results

#### 4.4.4 Detailed results for the most preferred houses

Looking at the scores of houses 15 and 19 on the individual rating scales and also on the aggregate 'preference measure' confirms the pattern observed with the ranking data. The overall mean of preference described in section 4.4.2 was 28.25 (SD=9.34), whereas the average preference score for both these houses came out significantly lower (House 15: mean = 17.4, SD = 6.0; House 19: mean=22.38, SD=7.9).

Although the study was not designed as a TBP (theory of planned behaviour) study, the first rating scale question could arguably be a measure of behavioural intention, if the behaviour is defined as 'purchase of a particular house'.

As can be seen from Table 14, most individual measures of preference were significantly associated with behavioural intention for houses 15 and 19. Moreover, the measure of preference described in section 4.4.2 was found to be a significant predictor of Behavioural Intention (BI) for these two houses when entered into a linear regression model with behavioural intention as the dependent variable and 'preference' as a single independent variable. For house number **15** (Cladding = Render, House Type = 2), preference was found to explain 53% of the variance in the regression equation ( $R^2 = 0.532$ ;  $F(1,107) = 121.5$ ,  $p < .001$ ). Similarly, for house number **19** (Cladding = Timber, House Type = 2), preference was found to explain 54% of the variance in the regression equation ( $R^2 = 0.539$ ;  $F(1,119) = 139.095$ ,  $p < .001$ ).

Relating this back to the discussion about spontaneous processing of attitudes (see section 2.4.5), this seems to provide some support to the idea that a house buyers' **attitude towards the physical form of a house** is processed as a 'preference' judgement, which is related in some way to **behavioural intention**, assuming that an assessment of behavioural intention is separately arrived at in relation to each house,



rather than a relative judgement<sup>75</sup>. These results will be discussed further in section 4.5.

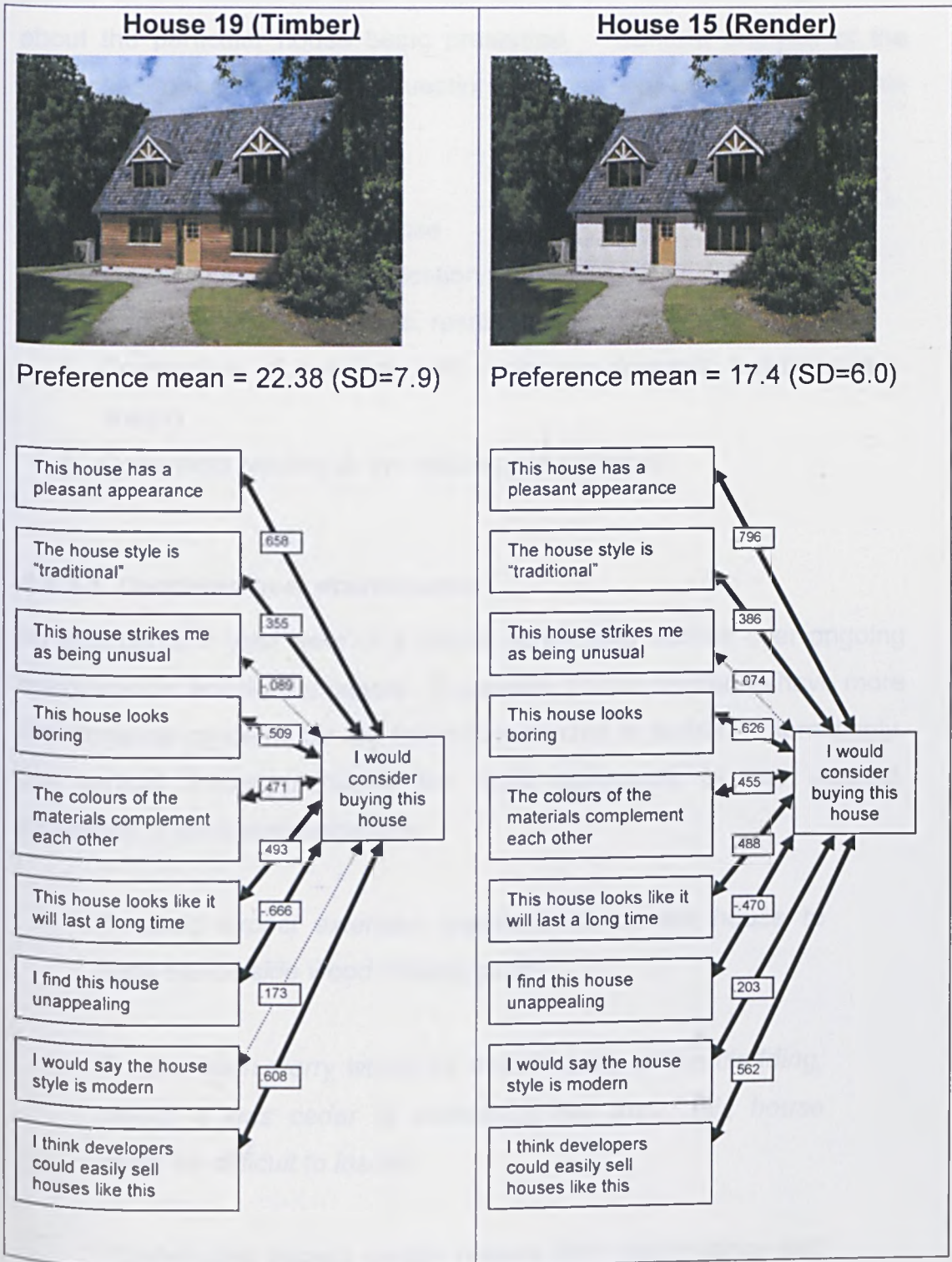


Table 14 - Correlations between individual preference measures and Behavioural intention for houses 15 and 19

<sup>75</sup> As noted earlier, each respondent did not respond to all of the houses (36) within this study, but to a selection of 6. Therefore, there is a possibility that the measure of behavioural intention might be made relative to the other 5 houses, rather than relative to all 36 houses.

#### 4.4.5 Qualitative Data

This section will consider the responses to the open ended question placed at the bottom of each image asking for “any other comments” about the particular house being presented. Content analysis of the responses to the open ended question revealed four main themes within the results. These were:

1. Concerns over maintenance
2. Comments about prefabrication/precast
3. Concerns about Mortgage, resale value, insurance, etc.
4. Comparison of buildings with other non-domestic buildings (e.g. sheds)
5. Comments relating to the naturalness of timber

##### 4.4.5.1 Concerns over maintenance

85 comments in total were of a nature concerning worries over ongoing maintenance, and similar issues. In general, people tended to have more maintenance concerns for the three houses clad in timber. Interestingly, the vertical timber produced the most comments in this respect.

Examples of such comments are:

*“I would expect extensive maintenance on the house to keep the outside wood looking good”*

*“.....the main worry would be maintenance of the cladding, unless it was cedar or something like that....this house might be difficult to insure”*

*“Timber clad houses usually require high maintenance and probably will not sell well”*

All the maintenance comments on the non-timber clad houses were in response to houses with the metal roof, which suggests that there were

no specific maintenance concerns over the other three cladding materials.

#### **4.4.5.2 Concerns about prefabrication/precast**

A total of 88 comments were made which mentioned the words “prefab”, “prefabricated”, or “precast”, all of which were made in a negative sense. It is interesting not only that the precast concrete house was rated poorly (as illustrated in previous sections), but also that many of the comments made about this cladding were related to words such as “prefab”, or “prefabricated”, suggesting a strong memory concerning the use of such technologies in housebuilding. Although there were several positive comments made about this cladding material, none of the comments referring to prefabrication were of a positive nature. Example comments were:

*“cheap nasty and “temporary” like a prefab built to last for short periods”*

*“it looks like a prefabricated house made out of aluminium or cardboard sorry, but that’s my opinion. A strong gust of wind might blow this place down”*

*“Looks large enough to be spacious and afford well-planned layout. Don’t really like the colours - and, is the outside prefabricated? If it is I’d run a mile before I knocked on the door!”*

*“looks like a prefab, and has all the connotations that goes with that”*

Again in a similar fashion as the above theme, all of the comments related to prefabrication which were not directed at the precast concrete cladding were made towards houses with metal roofs.

#### **4.4.5.3 Concerns about Mortgage, resale value, insurance, etc.**

Although there were nowhere near as many comments on this subject (15 in total), it is nevertheless interesting to note that houses clad in precast concrete yielded the greatest number of comments in this respect. Again, the comments for the brick and roughcast clad buildings were related to the metal roof, as opposed to the cladding. Example comments were:

*"the roofing material looks like it would render this house inmortgageable"*

*"prefab. makes it hard to get a mortgage and will be treated with suspicion i.e. can you sell it on easily?"*

*"knowledge that timber houses have trouble getting mortgages influences [my] views"*

*"have you ever tried to get a mortgage on a timber clad building?"*

#### **4.4.5.4 Comparison of buildings with other non-domestic buildings (e.g. sheds)**

A large number of comments made in this section (216 in total) involved some kind of comparison between the building being presented and some other kind of non-domestic building. In the case of timber cladding, such comparisons tended to be made for the single storey house (77% of the 184 comments related to the three timber claddings). Comments in this respect include:

*"it looks like a shed at the bottom of a garden"*

*"it gives the impression of being a shed or a garage"*

*“.....it looks too much like a potting shed”*

*“This house looks more like a cricket pavilion than a home”*

*“The colour would be my major objection – it looks too much like a scout hut”*

*“[The vertical timber house] was bad, but the change of colour scheme [to green] takes it right into POW camp territory. A real shed!”*

*“This house would be more suited to a boy scouts or bowling club headquarters”*

For the non timber-clad houses, such comments also tended to be towards the single storey house, but more often referring explicitly to the plainness of the design, with comparisons tending to be with garages or public toilets.

The tendency for people to refer to both scout huts or cricket pavilions was especially apparent for the painted green single storey houses. This is important insofar as it illustrates the importance in colour in influencing people's attitudes towards houses. That twice as many comments were made about the vertical timber cladding than the horizontal timber cladding is also an interesting finding, especially as most of the references to “potting sheds”, or “sheds at the bottom of the garden” were for the vertical timber cladding. This is interesting in demonstrating the importance of detailing, and also strange in many ways, as many garden sheds in reality are constructed with timber arranged horizontally. By and large, however, the horizontal timber cladding was generally judged to be a more quality finish .

#### **4.4.5.5 Comments relating to the naturalness of timber**

Although there were not a large number of comments on this subject (20 in total), it is an important finding in relation to this thesis, as it supports the idea that in part, the preference response to timber cladding is related to its perceived 'naturalness', which may well also relate to perceptions of 'sustainability', depending on how synonymous these two concepts are for different individuals. Example comments were:

*"The timber clad one looked much more attractive than the brick and would better appeal to more environmentally aware purchasers. There's not much difference between this style and a 50's dormer"*

*"I like the natural-ness of the materials used here. Don't know if wooden houses last a long time in this country though. It looks quite cute"*

*"I like the way that the wood has been kept natural – without painting"*

*"From the appearance, this house looks eco-friendly and may appeal to buyers on these terms"*

Even though the total number of such comments was fairly low, the fact that such responses were made at all suggests that it might be reasonable to hypothesise that house number 19 is more likely to be considered 'sustainable' than house number 15. This will be discussed further in Chapter 5.

## 4.5 Discussion and Conclusions

This study set out to examine the effect of **building materials** on **environmental perception** and **behavioural intention**. The results clearly demonstrate that the material used as cladding for house façades will significantly influence people's **attitudes** and **preferences** towards particular houses. Moreover, it has been shown that the effect of particular cladding materials is shaped to some degree by other contextual variables such as house-type or roofing material. In relation to **environmental perception**, this shows (see section 4.4.2.1) that the environment being perceived might not be best understood as a summation of the individual attributes that make up that environment, but rather as a more complex portfolio of environmental attributes, some of which act at times as mediating perceptual variables that work together to form the overall context of the perceptual experience. In other words, the way in which a person perceives any particular aspect of a building is dependent to some degree on what the other aspects look like. Preferences for particular attributes therefore need to be understood in the context that any preference judgement is made.

Overall, the results show that some of the anecdotal evidence given by developers and builders to the effect that house-buyers prefer 'traditional' cladding materials is now supported by empirical evidence. Furthermore, it seems that if there is any evidence for a latent collective memory for timber cladding coming through from the results, it is specific to horizontal timber cladding, which was rated as more traditional than the other two timber claddings, and also more worthy of purchase consideration. This is interesting insofar as house-builders specifying timber claddings for houses today would probably be more likely to opt for the vertical timber if the decision was based solely on technical considerations<sup>76</sup>. So arguably, specifying the technical optima in terms of timber cladding would be predicted to have an adverse impact on acceptability if the results of this study were generalized to the wider population.

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<sup>76</sup> Personal Communication with the steering group of the DTI/EPSC LINK Project.



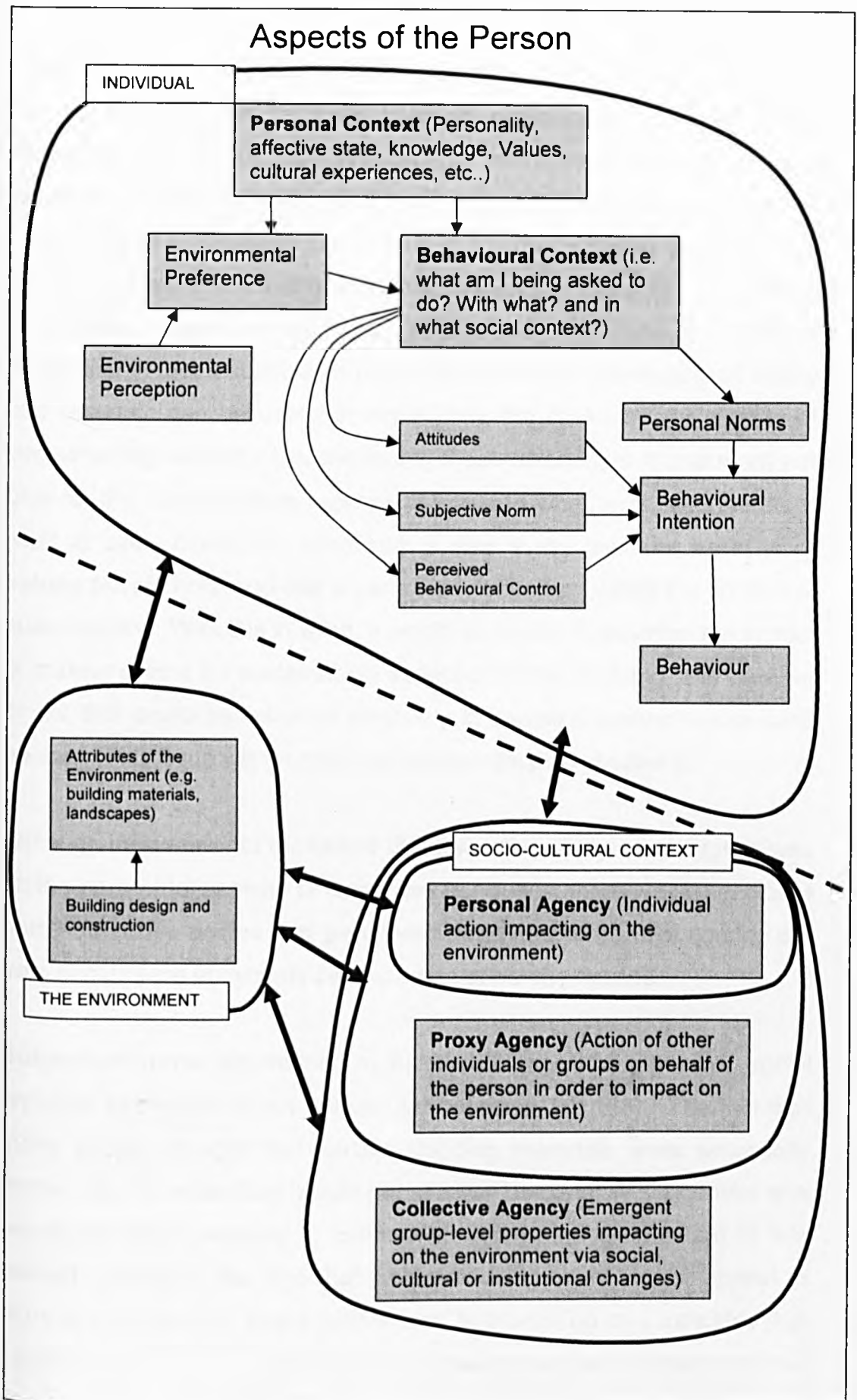


Figure 19 (repeated) - Conceptual model with expanded 'socio-cultural context' component



A closer look at the findings regarding **environmental preference** shows that there appears to be a link between **preference** and **behavioural intention**. The finding that respondents rated as more pleasant and worthy of purchase consideration those materials that were also rated as more traditional provides some support for the potential application of social representations theory to market research in housing, and possibly in a wider context to purchase considerations in general. This is interesting in that it suggests a possibility that social-psychological theory and research can be useful in highlighting the reasons for a variety of consumer behaviours. Understanding these behaviours is important not only for the more obvious reasons of knowing what sells, and therefore what to sell. Consumer behaviour is also a key indicator as to what **values** people hold, and this is particularly important within the context of sustainability. With this in mind, it would be useful to examine the impact of making salient the sustainability aspect of timber cladding, and whether or not this would be reflected positively in people's evaluations of such houses. This issue will be explored in more detail in chapter 5.

Although they were not measured directly in this study, as the focus was on the perceptual aspects of responses to houses, there was evidence of both **subjective norms** and **perceived behavioural control** coming out from some of the comments people made about the houses.

**Subjective norms** are defined by Ajzen (1991) as "*the perceived social pressure to perform or not perform [a] behaviour*" (p.188). The fact that many people thought that certain cladding materials were potentially problematic because they "*might not sell well*" is certainly suggestive of a perceived social pressure to conform to some kind of standard in this respect. Similarly, the idea that timber cladding might "*better appeal to more environmentally aware purchasers*" is interesting as it indicates that environmentally aware purchasers (howsoever they are defined) may not conform to the same normative pressures as non-environmentally aware purchasers.

**Perceived behavioural control** is defined by Ajzen (1991) as “*people’s perception of the ease or difficulty of performing the behaviour of interest*” (p.183). The fact that many people had concerns regarding the ability to “*get a mortgage*” on particular houses, based on the cladding material (especially timber), suggests that this is an important consideration for house-builders and insurers to take into account. Not only is it important to ensure that it is indeed technically possible to get a mortgage and insure houses, but is also important to realise that some people might perceive a product as ‘un-insurable’ based on visual appearance, and therefore might never become part of the ‘**behavioural context**’ for those particular people. In other words, if a house is considered to be practically impossible buy (even if one wanted to) then such consideration is unlikely to occur.

Again, although the socio-cultural component of the transactional whole was not directly studied in this case, it was touched upon to a certain extent by the comments made by people about the houses. There appears to be a link between agentic beliefs about **personal agency** and preferences regarding timber cladding. In particular, people who did not like the timber clad houses tended to be especially concerned about the ongoing maintenance of the cladding. These concerns could express concern over **personal agency** if the person expected to carry out such maintenance themselves, or **proxy agency** if they expected to appropriate the services of a company to provide a maintenance service to meet their requirements.

## **4.6 Methodological issues arising**

An important observation to emerge from the initial study of housing preferences (section 4.2.1) was the value of being able to standardise (as far as possible) the background of pictures presented to assess preference. This way, any background photographic material can be eliminated as a source of uncontrolled variation. While some studies have attempted to do this using some form of attribute-matching, or photomontage, these procedures are very time-consuming, and comparability of images is often open to criticism. Until recently, few studies (e.g. Davies, A. et al., 2002) have utilised computer-generated images for these kinds of studies, but with the rapid development of computer visualisation techniques (including desktop virtual reality) in recent years, such approaches are becoming increasingly utilised within psychology experiments, as the subjective responses to such simulations have been shown to be acceptable in terms of their ability to represent real environments (Rohrmann and Bishop, 2003; Blascovich et al., 2002).

The internet-based delivery of the image-based survey used in this study proved to be an effective way of carrying out this kind of study. A large number of valuable lessons were learned regarding the process of putting together internet-based surveys, and this knowledge has proved useful in many studies undertaken by the author since (e.g. Edge and Craig, 2005; Edge et al., 2003). Importantly, the technical knowledge learned in this case study allowed the third study (chapter 5) to be designed and carried out in the way it was.

As well as the technical skills learned, there were a number of methodological issues arising from this study which should be of benefit for future studies. The first such issue encountered was the importance of having a single-entry URL, at the same time as being able to automatically randomise which survey was delivered. Whilst this is not technically difficult, it is a simple means by which the administration of

surveys like this can be carried out in the most efficient manner. A further methodological issue encountered was the importance of navigation within internet-based survey instruments. Simply placing a 'percentage complete' bar at the bottom of each page was found to increase respondents' motivation to continue with the survey, thereby reducing drop-out. A further methodological lesson learned from undertaking this study was the observation that, as with paper-based surveys, a great deal of care needs to be taken in the early stages of survey construction to avoid problems later. Simple issues like making sure that the structure of the database file exactly matched the SPSS file used for the paper based surveys meant that the degree of data reconfiguration was minimised. Similarly, thorough piloting ensured that potentially serious coding errors (which might cause problems only in certain web browsers) were eliminated, and that the usability issues noted above were picked up.

The most surprising methodological finding to emerge was the issue regarding the use of 'radio buttons'. Again, although the solution to this issue was not technically difficult, it is notable that the problem was not at the time widely recognised, as demonstrated by the difficulty in finding a solution. As to how potentially 'serious' this issue is, this must be left to speculation, but given the widespread use of radio buttons for online surveys, and other online tools, it is possible that a proportion of that which is labelled 'missing data' might well result from this seemingly minor usability issue.

These **two case studies** (Chapters 3 and 4) have been presented as an initial test of the ability of the conceptual model (i.e. the first aim of the PhD) to accommodate different kinds of related research findings. Following these two studies, a **third study** (Chapter 5) will now look at the factors influencing the likelihood of purchase consideration for 'sustainable housing'. This will be done by combining many of the issues discussed in the two previous case studies, by focussing on the sustainability aspects dealt with in these studies.

## **5 A Study of House Purchase Behaviour**

### ***5.1 Introduction***

This chapter will examine the relationship between the external appearance of housing and representations of sustainability. The case study presented in chapter 3 looked at the psychological aspects of a particular 'sustainable technology', and the case study presented in chapter 4 looked at the effect of building materials on environmental perception. The case study presented in this chapter will build on the findings of the two previous case studies, by again looking at the perception of external cladding materials, and how these perceptions relate to both representations of sustainability and behavioural intention regarding house purchases. The study will also examine the impact of providing information indicating the sustainability of a house, and how this interacts with symbolic indicators such as timber cladding (as discussed in chapter 4). The findings of this study are then presented and discussed in the context of the conceptual model outlined in section 2.4.7. Figure 50 highlights the components of the conceptual model that are particularly focussed on in this case study.

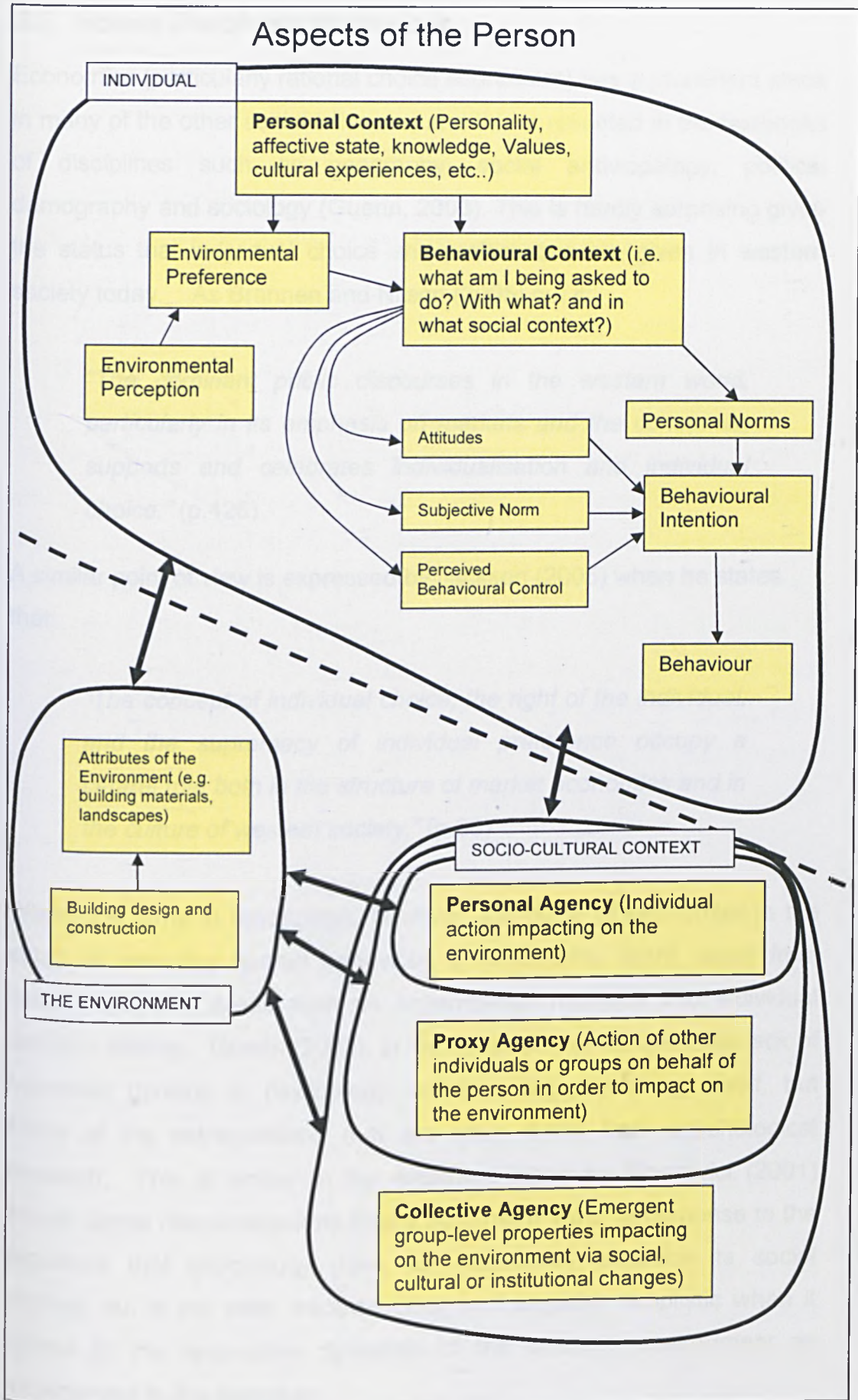


Figure 50 - Conceptual model with Case Study 3 foci highlighted



## 5.2 House Purchase Behaviour

Economics (particularly rational choice economics) has a prominent place in many of the other social sciences, and this is reflected in the textbooks of disciplines such as geography, social anthropology, politics, demography and sociology (Guerin, 2003). This is hardly surprising given the status that individual choice and preferences are given in western society today. As Brannen and Nilson (2005) put it:

*“The dominant public discourses in the western world, particularly in its emphasis on markets and the consumer, supports and celebrates individualisation and individual choice.”* (p.426)

A similar point of view is expressed by Jackson (2005) when he states that:

*“The concept of individual choice, the right of the individual, and the supremacy of individual preference occupy a central role both in the structure of market economies and in the culture of western society.”* (p.38)

When one turns to psychology, however, the place of economics in the study of everyday human behaviour is remarkably scant, apart from certain specialist areas such as experimental research into individual decision making. Guerin (2003), in his discussion of the seeming lack of economic thinking in psychology, criticises not psychology itself, but some of the extrapolations that are often made from psychological research. This is similar to the argument made by Moscovici (2001) whose Social Representations theory is, in many ways, a response to the argument that psychology does not adequately embrace its social context, but is too often inward-looking and arguably simplistic when it comes to the large-scale dynamics of the person-in-environment as experienced in the everyday.



The study of house purchase behaviour provides an interesting and informative insight into the various attitudes, values and motivators that guide both personal economic transactions, and people-environment transactions more generally. Given that the residential setting represents the largest financial and personal investment for most people (Freeman, 1993), it is hardly surprising that people generally care a great deal about the housing product, and that much research has been done looking at the financial aspects of house-purchase. As Thomas (1996) puts it: "*For many individuals in the UK, buying a house is the largest financial risk they will ever take*" (p.38). What is more surprising, however, is the general lack of direct involvement of final occupants in the 'product design' phase<sup>77</sup> of housing for sale. Although speculative developers clearly do carry out their own market research, most of this is generally considered commercially sensitive, and so in the absence of major changes in the housing product, developers might be accused of perpetuating the view that the public '*know what they like and like what they know*'. The house building industry is well known for being fairly conservative (Ball, 1996), and as such will most likely tend towards retroactive product changes as a response to perceived 'market transformations'.

Whilst there has been a shift in emphasis within the field of economics from the concentration on *production* towards a focus on *consumer behaviour*, this should not, as Guerin (2003) puts it "*...blind us to the fact that production still goes on*" (p.704). In the case of house purchase behaviour, in order for a consumer to decide whether or not to purchase a particular house, there needs to be a range of houses being produced and made available for purchase. It has been said that many professionals (e.g. architects) involved in the production of the built environment see the public as "*visually uneducated, conservative, knowing what they like and liking only what they know*" (see Uzzell and Jones, 2000, p.331), and that attempts to involve the public in design

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<sup>77</sup> It is interesting to note that end-users often get more recognition in other areas of commercial product development / design, such as the development of computer applications (Kyng, 1994).

decisions necessarily lead to pastiche. Uzzell (2001), in discussing aesthetic judgements about buildings, makes the point that

*"...Maybe we are not all experts or informed in an academic sense, but most people are not totally blind to stylistic issues" (p.282).*

He then goes on to say...

*"It may well be that we do not all agree about the nature of beauty, but the starting point surely is a discussion amongst all **consumers** as well as **producers** of our physical environment about our perceptions, preferences and priorities" (p.283)*

Although there are clearly differences in the dynamics of the markets for new housing and second-hand housing, at some level it seems reasonable to assume that prior to any given house being purchased, it was produced, and part of that production process involved a judgement concerning what that particular house should look like (i.e. an aesthetic judgement made on behalf of the final occupant). The realisation of this aesthetic judgement in material form (the house) is then reacted-to at the point a house-purchase decision is made, assuming of course that the external appearance of houses is important to people (c.f. Nasar, 2000; Herzog and Sheir, 2000; Sadalla and Sheets, 1993).

Although the economics of housing market dynamics are notoriously hard to predict (Thomas, 1996), there are some fairly general things that might be said of the market for new housing in the context of people-environment transactions.

Firstly, as noted above, the nature of the 'product' (i.e. mass housing built by speculative developers) is largely determined by consumer preferences which are assumed to be revealed through market

behaviour. In this way, housing consumers are seen simply as utility-maximising individuals, fitting a particular market-segment at a given time. There are clearly other determinants of house form apart from market dynamics – these include building regulations and other statutory obligations, local planning frameworks, including interpretations of ‘vernacular’, and technical constraints specific to a particular site.

Secondly, the nature of speculative house-building tends towards pursuing the lowest-risk option. In reality, this inevitably means building what has been built before if it was seen to sell well. Whilst there are many housebuilders that would like to build so-called ‘sustainable houses’<sup>78</sup>, most are unwilling to do so unless there is an established ‘market segment’, on whom they could rely to purchase these houses if built. Recent studies have shown however, that although there is thought to be an emerging ‘market segment’, and hence consumer demand for sustainable housing<sup>79</sup>, little response has yet come from private sector housebuilders (Lovell, 2005). This will be explored further in section 5.2.4.2.

### **5.2.1 The meaning of sustainable housing (revisited)**

Housing research has a tendency to see relations between humans and housing as being one-way and non-interactive (Lovell, 2005). A common approach to low energy housing for example is to promote passive acceptance, whereby people do not need to even be aware of the environmental benefits of a particular house. Sustainable housing was once the preserve of deep-green value advocates, but has recently been ‘re-framed’ as a potential solution to a wide range of policy problems such as climate change (Lovell, 2004). Hence, it is not really surprising that the terms ‘low energy housing’ and ‘sustainable housing’ are often used

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<sup>78</sup> Personal communication from members of the Aberdeenshire Design Forum, which includes several housebuilders in the region.

<sup>79</sup> This particular piece of research was specifically concerned with ‘low energy housing’

as if they were synonymous<sup>80</sup>. However, as noted in section 2.3, although energy issues are clearly an important defining aspect of sustainable housing, there are other aspects that also need to be considered if the holistic nature of sustainability is to be truly acknowledged.

For example, the materials presented in the two case studies described previously (Chapters 3 and 4) discuss the importance of both water and cladding materials as they relate to housing. Although there are energy implications related to the treatment of water, or the production of construction materials, focussing solely on technical energy issues might miss some of the important social aspects (Lovell, 2004) considered to be important for genuinely 'sustainable' housing.

This need to understand the links between the various facets of sustainability is especially important when considering the potential purchaser of that housing, as without this knowledge, it is unlikely that mass housebuilders will take the risks involved in building such houses, as they will quite simply not have an adequate understanding of their market.

### **5.2.2 Integrating environmental preferences within the theory of planned behaviour**

The conceptual model proposed in Chapter 2 (Figure 19) essentially synthesises a theory of environmental preferences (e.g. Nasar, 1994; Sugiyama, 2001) with the theory of planned behaviour (Ajzen, 1991). Importantly, the conceptual model proposed sees environmental preference and 'personal context' as antecedent to the definition of the behavioural context (i.e. what am I being asked to do? with what? and in what social context). Although Ajzen (1991, p.200) did note the possibility of distinguishing between affective and evaluative responses to a behaviour, as part of the attitude component of the theory of planned

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<sup>80</sup> Personal communication from members of the Aberdeenshire Design Forum, which includes several housebuilders in the region.

behaviour, it is assumed that the behaviour in question has been defined before a response is made. This only allows for the consideration of attitudes corresponding directly to the intended behavioural outcome, as opposed to the flow of seemingly unrelated perceptual and attitudinal responses. Such 'unrelated' responses, while not directly related to the intended behaviour, nevertheless clearly have an impact on attitude formation once the behaviour is defined.

However, before it is possible to have a response to a defined behaviour, it is argued that the object of that attitude needs first to be defined or processed<sup>81</sup> – not only as part of the behavioural context, but as the perceptual antecedents of the behavioural context. Thus, an aesthetic response (i.e. the result of affective, cognitive and connotative components of environmental preference) is considered to occur prior to any behavioural decision being made or even considered (as evidenced by aesthetic responses to colour for example). This allows for the possibility that people might quite rationally behave in ways that might seem counter to those predicted, by including environmental preference as a particular form of attitude. For example, someone might choose to purchase a house that they do not see as particularly pleasant in aesthetic terms, but consider other functional attributes (such as location) as being more influential in determining their behavioural decision. As Lee (1973) notes: "*The relationship between environmental preferences, attitudes and behaviour is not a simple one*" (p.121). In terms of the affective component of environmental preference for example, there is evidence that, counter to the strictly cognitive view (which views affect as arising from cognitive processes), feelings (affect) often precede thought, and these feelings then, in turn, are incorporated with cognitive processes to produce a post-cognition affective state (Ulrich, 1983). Indeed, the

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<sup>81</sup> As an example, a person who is looking to buy a house might well look through the details of many houses before narrowing down their selection to a manageable few. Although in this case the behavioural context has obviously been defined before this selection is made, it is nevertheless defined in a rather general way, as opposed to the specific way stipulated in the theory of planned behaviour. As it is necessary for both the behaviour and the attitude-object to be defined to satisfy the assumptions of the theory, in effect, the selection detailed above is seen not as part of the decision to buy a particular house, but as a separate decision entirely (i.e. the decision to select or not select a house for future consideration).

models of both Nasar (1994) and Sugiyama (2001) models acknowledge this distinction.

### 5.2.3 The issue of agency

A person's belief about the relationship between the self and the socio-cultural environment is considered to be an important part of the conceptual model presented in Chapter 2 (Figure 19). Effectively, agentic beliefs are seen to be on a spectrum from personal to collective (with 'social' being somewhere between the two). Indeed, research has shown that in general, "*members of independent and interdependent cultures vary, first in their perceptions of the way the individual relates to others in their social environment and, second, in their judgements of whether it is the individual or the group that plays the role of the doer or the recipient of actions*" (Hernandez and Iyengar, 2001, p.274). In order for cultural determinations of agentic functioning to operate effectively, it is clearly necessary for members of a particular culture or sub-culture to have a shared representation of the way in which individuals and 'the collective other' make things happen in that particular culture.

In a sense, the idea that the dominant social paradigm might embrace sustainability principles and become something resembling a 'new environmental paradigm' (Dunlap and Van Liere, 1978) has far-reaching implications in terms of the extent to which 'culture' would need to change (or evolve) to accommodate it. If (as discussed above) it is important for members of a particular culture to have a shared perception of human agency in order to get things done, then a paradigmatic shift away from egoistic values towards either socio-altruistic or so called 'bio-spheric' values is likely to also require individuals to become more collectively agentic (Hernandez and Iyengar, 2001) than is currently the case in cultures stressing the construct of individualism over collectivism (Triandis, 1995).

If indeed individuals in western society were to become more collectively agentic<sup>82</sup>, then it is likely that those professions and institutions charged with reflecting the values of a given society (of which architecture surely is an example) would also need to function in a more collectively oriented manner.

Whilst this might seem unlikely in present day western society, it is nevertheless arguable that the manner in which institutions function and communicate with members of the wider society is both an indication of the institution itself and also a reflection of the very society in which it is embedded. In this sense, the dynamics of the housing industry might be seen as a reflection of the society within which this industry operates.

However, this suggests something of a one-way passage, whereas in reality society does not only influence institutions and the various agencies necessary for society to meet its needs. Society is also influenced by these institutions, so the interaction is in both directions. Factoring the individual into such fairly simplistic arguments creates something of an academic conundrum however, as noted by Moscovici (1996). Indeed, it has even been said by some academics that any phenomenon that is explained by individual psychological causes must by definition be false (Moscovici, 1996). As Moscovici (1996) notes however, such accusations miss an important point – namely that individuals within any society are not merely passive recipients of that society's values, they are also fundamental in deliberating and shaping those values that experience throws into question in an everyday sense.

So, an individual house-purchase transaction therefore needs to be seen within the societal context within which it occurs. The conceptual model presented in chapter 2 sees the environment (e.g. a new house, or a landscape), the individual (e.g. a housebuyer), and the socio-cultural

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<sup>82</sup> This is arguably measurable at the level of the individual, insofar as it refers to a belief about collective functioning



context (e.g. the house-building industry) as being related in a pattern of triadic reciprocity (cf. Bandura, 1986).

## **5.2.4 Housing preferences, planned behaviour and culture**

### **5.2.4.1 Stated and revealed preferences**

Over the last four decades, the broad area of environmental economics has developed two main types of techniques for assessing individual valuations of non-market goods (Garrod and Willis, 1999). In summary, these are: Stated Preference (SP) techniques and Revealed Preference (RP) techniques. Although these techniques are not discussed in depth within this thesis, they are mentioned here because many of the techniques used within psychology have close parallels within the field of environmental economics in terms of the actual data collection methods utilised. Revealed preference techniques gather data about the use-value of particular goods by looking at attributes of chosen goods in an attempt to ascertain the 'use-value' of that particular good (see Garrod and Willis, 1999). Such techniques (e.g. hedonic pricing) have been used in the analysis of housing preferences (Leishman et al, 2004). Stated preference techniques, on the other hand, look at people's evaluative responses to particular attributes or goods by simply asking them self-report questions about the thing-in-question. A good example of such techniques being used in the examination of environmental preferences can be seen in Davies (2004). Indeed, many of the differences between psychology and environmental economics often appear to be found mainly in the selection of statistical tools used when interpreting the data.

### **5.2.4.2 The market determination of house form**

As noted in section 5.1, the nature of the 'product' (i.e. mass housing built by speculative developers) is largely determined by consumer preferences which are assumed to be revealed through market behaviour. As Asquith (2006) puts it:

*“Housing design in much of North America and Western Europe is, at the very least, predominantly in the hands of developers, with design being based at worst on the financial bottom line and at best on outdated ideas of what the consumer wants a home to provide” (p. 128)*

Notwithstanding the various criticisms of developer-led architecture, it is important to note that developers are working within a business model that treats the production and consumption of housing as very separate domains. Whilst it is arguable, indeed desirable to suggest, that working in partnership (developers and communities) creates a ‘unity of purpose’ necessary for the form of developer-led housing to truly “*reflect the needs of the communities that will ultimately dwell in these houses*” (Asquith, 2006, p.143), the entrenched conservatism within the housing industry (Ball, 1996) makes such dramatic change unlikely in the near future.

So, using the language of economics, one might say that speculative developers (by their use of ‘market knowledge’) are relying on the use of some kind of revealed preference techniques to find out about customer preferences. As Davies (2004) notes, however, such techniques fail to capture the ‘non-use’ values associated with environmental resources. Speculative developers are also likely to use a variety of market research techniques (possibly including stated preference techniques) in their determination of the future requirements of housing ‘consumers’. As noted in section 5.2.4.1 however, whilst stated preference techniques can arguably capture more of the ‘non-use’ values than revealed preference techniques, it is unlikely that most standard market research will go into such depth, given that the priority information is more likely to be driven by the potential of certain attributes to contribute to increased sales, than any interest in concerns about for example ‘existence value’.

This brief discussion shows that the approaches utilised within economics are used in the determination of house forms, and therefore are factors

that need to be taken into consideration by environmental psychologists discussing social-psychological influences on the built environment.

### **5.2.4.3 *The material culture of sustainability***

#### *5.2.4.3.1 The external appearance of houses - materials*

The results of the study presented in chapter 4 confirmed the hypothesis that the material used as cladding for house facades will significantly influence people's attitudes and preferences towards particular houses. Moreover, it is clear from the results that durable materials such as brick are generally more associated with the idea of 'tradition', than less durable materials such as timber. Given that the external façade of a house is the aspect most visibly apparent about the form of the house, then it is important to examine what, if any meanings are associated symbolically with any particular material or form. If for example, the appearance of brick is associated with tradition (as shown in chapter 4), does this mean that developers, in their use of structurally redundant 'brick skins' are simply reflecting these associations and meanings? This seems unlikely unless housing consumers' understandings of tradition are completely divorced from the local vernacular. In many cases, it is down to planning authorities to act as guardians of the local vernacular, but this is often done in a manner that in reality is unsympathetic to the true essence of what is important in a given locality. The fact that planners are often not educated in architectural issues (in the widest sense) is argued to lead planners to emphasise the obvious, most visible aspects of a design (Uzzell and Jones, 2000), rather than focussing on the ability of any given design to 'learn from the vernacular' (i.e. the local quality) and interpret this in ways appropriate to communities today.

Representing 'tradition' in house design is clearly problematic insofar as a consensual view of 'good design' is somewhat hard to find (Uzzell and Jones, 2000). Therefore, one could ask how architects or developers might go about representing something as complex as 'sustainability'?

#### 5.2.4.3.2 Other material facets

Previous research has shown that people tend to prefer 'natural' features of the environment over 'built' features (Ulrich, 1983; Wohlwill, 1976; Kaplan, 1983). One might expect then that seemingly 'natural' aspects of a built environment such as water, vegetation, and the use of 'natural' materials should always be more preferred over so-called 'modern' aspects. Intuitively however, this seems too simplistic. Clearly there will be cases where environments rich in 'natural' aspects might not be liked due to other aesthetic reasons. Indeed, individual material aspects are only one part of any overall design. The symbolic content of built-environment design must also be taken into account. Lang (1988) describes architectural symbolism as "*one of a set of nonverbal mechanisms that people use to communicate messages about themselves, their backgrounds, social statuses, and world views to others*" (p.15). It might be the case that the presence of certain features or aspects have, over time, come to symbolise the abstract notion of sustainability (Sugiyama, 2001;2002). Examples might include turf roofs, reed beds, windmills (symbolic of energy), or timber cladding. The point here is not whether these aspects actually contribute to the overall 'sustainability' of any particular environment, but whether or not they are seen to 'represent' sustainability in some way. In other words, does the physical manifestation of a 'sustainable house' fit with people's internalised knowledge structure or 'schema' of what that kind of house should be?

#### 5.2.5 Connotative meanings

As discussed in section 4.1.1, it has been shown that the materials from which houses are constructed convey more meaning to people than simply the physical properties of the materials. Previous studies have argued that building materials employed on exterior facades have a function in defining the social identity of home-owners (Sadalla and Sheets, 1993), as well as having functional utility in themselves. Indeed, Sadalla and Sheets (1993) showed that people who were able to infer the personality attributes associated with home-owners are able to infer

personality types based on the materials used in the construction of houses. Nasar (1989) also found that people were able to infer 'friendliness' of house owners from pictures of house style exteriors. Whether or not these judgements are accurate or not is a question that still remains to be answered (Wilson and Mackenzie, 2000), although so far most research studies on this topic have been restricted to interiors (Sadalla et al., 1987; Wilson and Mackenzie, 2000).

### **5.2.6 Aims of study**

The main aim of the study reported here is to examine both the antecedents to behavioural intentions concerning the purchase of sustainable-housing and also the extent to which housing preferences are determined by representations of sustainability. This will be examined in relation to the conceptual model outlined in Chapter 2 (Figure 19). As well as testing the applicability of the theory of planned behaviour for the study of sustainable housing preferences, the study also intends to test the assumption implied in chapter 4 – namely that the material timber is in some way representative of the 'sustainability' concept in the popular imagination.

## **5.3 Methodological Development**

### **5.3.1 Method Selection**

The research took the form of a quasi-experimental study, consisting of a self-completion questionnaire, administered over the internet. Methodologically, this study effectively embedded a theory of planned behaviour (TPB) questionnaire (Ajzen, 1991) into a quasi-experimental study with four experimental conditions. Given that the 'individual' component of the conceptual model is built around the theory of planned behaviour, it was decided that the present study should follow the methodological approach taken by the majority of previous research in this area. As such, a theory of planned behaviour (TPB) questionnaire was constructed using the guidelines provided by Francis et al. (2004) (this is discussed in section 5.3.2), and extended to include most of the other variables within the conceptual model outlined in chapter 2 (Figure 19).

It was decided that a quasi-experimental study (See Fife-Schaw, 1995) would be the best way to test the extent to which cladding materials moderate the influence of the standard TPB variables on behavioural intention. The alternative strategy would have been to only present a single cladding material, and ask participants about this explicitly, but it was considered that the hypothesised association between timber and sustainability might not be easily accessible and therefore verbalised (or written) by most participants. This decision not to ask about cladding material meant that a between-subjects design had to be used. Full details of the experimental design are provided in section 5.4.2.2.

In addition to the TPB components of the conceptual model, it was decided (see section 5.3.5) that semantic differentials be used to measure connotative meanings, as this is consistent with the measurements used by Sadalla and Sheets (1993). Whilst it is acknowledged that care needs to be taken over the use of semantic

differentials, due to the potential for response bias, it was thought to be appropriate in this case, as the construction and testing of the bipolar adjectives had previously been validated by Sadalla and Sheets (1993).

It was decided that this study be administered as an online survey, given the advantages previously described in section 4.3.3. In summary, there are various benefits from running surveys like this over the internet (see section 4.3.3. for more details). These include:

- Cost and time savings.
- The ability to randomise surveys
- The ability to capture all data direct to a database, thereby reducing the risk of data-transcription errors.
- The ability to change the survey at short notice, if any errors are noticed.

The final survey can be seen in Appendix 5.



### 5.3.2 Generating the elements of the Theory of Planned Behaviour component

The three main elements of the theory of planned behaviour antecedent to behavioural intention (attitude, subjective norm, and perceived behavioural control) were generated by way of a short elicitation study constructed as recommended by Frances et al. (2004). This questionnaire described the behaviour under investigation as follows:

Behaviour: Imagine you are in the process of looking for a new house and are considering buying a 'Sustainable House'

Nine questions were asked in this elicitation study in order to ensure that the questions in the main survey were relevant to the behaviour in question, and were determined through pre-study, rather than assumed by the research. Responses to this short questionnaire were obtained from a convenience sample of 20 respondents. This is consistent with Ajzen's (1991) suggestion that TPB surveys are constructed using a comparator population<sup>83</sup>.

The following list shows the questions asked in the study (content analysis of responses presented as a summary table below each question). The items mentioned by four or more people (i.e. 20% of respondents in the elicitation study) were taken forward into the main questionnaire are denoted by the corresponding code in the right hand column.

<sup>83</sup> It should be noted that the comparator population in this case were first year architecture students at the beginning of their degree course. Although this sample might be considered to hold a somewhat biased view of the built environment, it was considered acceptable due to the limited time which had passed in their professional training. Thus, it was assumed that these students still saw the built environment as most non-architects do.

1) In what way is a 'sustainable house' different from a 'conventional house'?

Energy Efficiency
Environmentally Friendly Materials
Last a lifetime
Solar Panels
Design
Philosophy
Passive Solar Design
more 'environmentally friendly'
built from wood

2) What do you believe are the advantages of you purchasing a 'sustainable house'?

Last a long time	<b>A2</b>
Lower Energy/Heating costs	<b>A4</b>
Cheap in the long run	
Protect Nature	
Better insulated house	
Doing something positive for the environment	<b>A1</b>
Feel good about myself (doing my bit)	

3) What do you believe are the disadvantages of you purchasing a 'sustainable house'?

More expensive in the short term	
Operating efficiency may vary	
might not 'work' in bad weather.	
lack of backup heating	
might not conform to building regulations	
consistency of energy supply	
Might be complicated to operate efficiently	<b>A3</b>

4) Is there anything else you associate with your own views about you purchasing a 'sustainable house'?

Convincing other people
-------------------------

5) Are there any individuals or groups who would approve of your decision to purchase a 'sustainable house'?

Government	<b>SN4</b>
Sustainable Housing Groups	
Greenpeace	
Environmental Groups	<b>SN1</b>

6) Are there any individuals or groups who would disapprove of your decision to purchase a 'sustainable house'?

Large Housing Developers	<b>SN2</b>
Electricity/Energy Providers	<b>SN3</b>
Housing Contractors	
Architects who may feel restricted over design issues	

7) Is there anything else you associate with other people's views about you purchasing a 'sustainable house'?

People might not like the look of it being seen as 'energy conscious' people might think I am obsessed with 'saving the earth' and take a stereotypical view of me.
---

8) What factors or circumstances would enable you to purchase a 'sustainable house'?

More sustainable housing developments over the uk	
increased advertising	
Research	
If the price was lower than a conventional house	
more information	
Location	
having loads of money	
if there were many currently for sale	<b>PBC3</b>
If government made it law	
If I built my own house	

9) What factors or circumstances would make it difficult for you to purchase a 'sustainable house'?

Very few sustainable developments	
Individual Architects Required	
Most housebuilders only make conventional houses	
Decision about heating system	
Costs more than average	<b>PBC1</b>
Few available in this area	<b>PBC2</b>

### 5.3.3 Results and final elements selected for further use

As can be seen from the content analysed results presented in section 5.3.1, many of the issues previously discussed did indeed emerge when people were asked to consider the behaviour 'purchase of a sustainable house'. For example, issues of durability, maintenance, aesthetics, and availability (or otherwise) were all mentioned, suggesting that, at least for the sample selected here, these issues were salient without requiring any necessary prompting. Following the content analyses described above<sup>84</sup>, the three components of the theory of planned behaviour were operationalised consistent with the theory described in section 2.4.4. As such, this component of the study assumed an expectancy-value approach to the formation of attitudes, subjective norms and perceived behavioural control (Ajzen, 1991). Therefore, attitudes ( $A_{obj}$ ) were seen to develop reasonably from the beliefs<sup>85</sup> ( $b_i$ ) people hold about the object of the attitude (in this case the 'purchase of a sustainable house'). The way in which each belief influences an attitude is determined by a person's evaluation ( $e_i$ ) of that belief (i.e. strength and direction). Put in equation form, the following is assumed:

$$A_{obj} \propto \sum_{i=1}^n b_i e_i$$

Each individual measure of Attitude is measured as follows:

$$A_1 = \sum_{i=1}^n b_{1i} e_{1i}$$

So, the combined measure of Attitude was:

$$A = A1 + A2 + A3 + A4$$

<sup>84</sup> In addition to the short questionnaire, a small survey was also carried out asking a selection of built-environment professionals the question 'what do you take the term sustainable housing to mean?' – fourteen responses were returned, and the results were very similar to the results of the questionnaire survey. The only notable difference was that the planners who responded tended to also mention more contextual aspects of housing, such as site layout, and urban drainage issues.

<sup>85</sup> It was assumed that belief based measures of all three components would be related to the theoretical construct (e.g. attitude) if it had been directly measured, given that research has shown strong correlations between direct measurement and indirect belief-based measures (e.g. Cheung et al., 1999). If the belief-based postulate of the theory (Ajzen, 1991) is correct, then it was assumed that such measures would be sufficient.

The attitudes to be measured in the main survey can be seen in Table 15.

		Question Number	Question
A <sub>1</sub>	b <sub>1</sub>	14	If I bought this house, I feel that I would be doing something positive for the environment
	e <sub>1</sub>	9	In general, doing something positive for the environment is desirable
A <sub>2</sub>	b <sub>2</sub>	15	If I bought this house, I think it would last a long time
	e <sub>2</sub>	8	In general, houses should be built to last a long time
A <sub>3</sub>	b <sub>3</sub>	16	If I bought this House, it might be complicated to operate efficiently
	e <sub>3</sub>	19	Houses should be easy to operate efficiently
A <sub>4</sub>	b <sub>4</sub>	23	If I buy this house, my energy bills will probably be lower
	e <sub>4</sub>	29	In general, lowering energy bills is desirable

**Table 15 - Attitudes to be measured in the main survey**

As noted in section 2.4.4.2, people are assumed to have normative beliefs ( $n_i$ ) (i.e. beliefs about what others will think) about a particular behaviour (in this case the 'purchase of a sustainable house'), especially concerning the likelihood of approval or disapproval. For each of these normative beliefs, a person will have a correspondent motivation to comply ( $m_i$ ) or otherwise with that particular salient referents belief (Ajzen, 1991). Put in equation form, the following is therefore assumed:

$$SN \propto \sum_{i=1}^n n_i m_i$$

Each individual measure of Subjective Norm is measured as follows:

$$SN_1 = \sum_{i=1}^n n_{1i} m_{1i}$$

So, the combined measure of Attitude was:

$$SN = SN1 + SN2 + SN3 + SN4$$

The subjective norms to be measured in the main survey can be seen in Table 16.

		Question Number	Question
SN <sub>1</sub>	n <sub>1</sub>	22	If I bought this house, environmental groups would approve of my decision
	m <sub>1</sub>	27	What environmental groups think is important to me in deciding what sort of house to buy
SN <sub>2</sub>	n <sub>2</sub>	26	I think most housing developers would disapprove of my decision to buy this house
	m <sub>2</sub>	28	What housing developers think is important to me in deciding what sort of houses to buy
SN <sub>3</sub>	n <sub>3</sub>	30	Energy providers would probably disapprove of my decision to buy this house
	m <sub>3</sub>	20	What energy providers think is important to me in deciding what sort of house to buy
SN <sub>4</sub>	n <sub>4</sub>	32	If I bought this house, the government would approve of my decision
	m <sub>4</sub>	17	What the government thinks is important to me in deciding what sort of house to buy

**Table 16 - Subjective Norms to be measured in the main survey**

Similarly, as noted in section 2.4.4.3, it is one thing to have an intention to carry out a behaviour, and another to actually be able to carry out that behaviour in reality. However, even assuming that it is actually possible to carry out a particular behaviour, it is also vital that the individuals believe that they have sufficient volitional control to carry out that behaviour. Thus, it may be physically possible for a person to carry out a particular behaviour, but they may not feel they have sufficient resources or opportunities to carry it out to their best ability (Ajzen, 1991). Perceived Behavioural Control (*PBC*) is seen to result from both control beliefs ( $c_i$ ) and the corresponding power of those beliefs ( $p_i$ ).

$$PBC \propto \sum_{i=1}^n c_i p_i$$

Each individual measure of PBC is measured as follows:

$$PBC_1 = \sum_{i=1}^n c_{1i} p_{1i}$$

So, the combined measure of PBC was:

$$PBC = PBC1 + PBC2 + PBC3$$

The perceived behavioural control items to be measured in the main survey can be seen in Table 17.

		Question Number	Question
PBC <sub>1</sub>	c <sub>1</sub>	24	This house probably costs more than an average house
	p <sub>1</sub>	10	If I wanted to buy this house, I think the price might be too high for me
PBC <sub>2</sub>	c <sub>2</sub>	7	There are very few houses like this available to buy in my area
	p <sub>2</sub>	21	If there were very few houses like this in my area, I would be much less likely to purchase one
PBC <sub>3</sub>	c <sub>3</sub>	25	Many housing developers currently sell houses like this
	p <sub>3</sub>	31	If I wanted to buy this house, it would be easy as there are many housing developers selling houses like this

**Table 17 - Perceived Behavioural Control items to be measured in the main survey**

In addition to the components of the theory of planned behaviour, the aesthetic response (i.e. the result of affective, cognitive and connotative components of environmental preference) was also measured using the same questions as used in chapter 4. These are shown in Table 18.

Question Number	Question
1	This house has a pleasant appearance
2	The house described here is very similar to the house that I currently live in
3	I find this house uninteresting
4	The house looks boring
5	I would say the house style is traditional
6	In terms of the appearance of this house, the materials complement each other well

**Table 18 - Items used to measure Environmental Preference**

### **5.3.4 Setting the scene**



The case study presented in chapter 4 showed that cladding has an effect on preference, and illustrated this with empirical data. However, whilst that study demonstrated a great deal about the complex relationship between the external appearance of housing, and environmental preferences, the idea that the material timber might in some way symbolise 'sustainability' in some cases was not explored to any great extent. Therefore the study also aimed to test the assumption implied in chapter 4 – namely that the material timber is in some way representative of the 'sustainability' concept in the popular imagination.

#### **5.3.4.1 Choice of houses**

Based on the results of the case study presented in chapter 4, two houses were chosen which were both ranked as the most preferred, and also came out as most preferred using the quantitative measures when compared with the other houses presented. Two houses that were often ranked as the most preferred option across the whole case study were house number 15 (one and a half storey house, roughcast façade, slate roof) and house number 19 (one and a half storey house, horizontal timber façade, slate roof). Table 19 shows the two chosen houses, along with the associated measures of preference<sup>86</sup>.

<sup>86</sup> It should be noted that House number 13 (one and a half storey house, brick façade, slate roof) would also have been an appropriate choice, based on these selection criteria, but the intention here was to include one



House	Question	Mean	S.D.
(15) N <sup>87</sup> =109 	2) I would consider buying this house <sup>88</sup>	2.45	1.36
	3) This house has a pleasant appearance	2.30	1.11
	4) The house style is traditional	2.49	1.15
	5) This house strikes me as being unusual	4.89	1.31
	6) This house looks boring	5.10	1.43
	7) The colours of the materials complement each other	2.38	1.04
	8) This house looks like it will last a long time	2.50	0.96
	9) I find this house unappealing	5.27	1.40
	10) I would say the house style is 'modern'	3.72	1.54
	11) I think developers could easily sell houses like this	2.17	0.91
	Preference score <sup>89</sup>	17.39	6.00
	(19) N=120 	2) I would consider buying this house	3.40
3) This house has a pleasant appearance		2.62	1.46
4) The house style is traditional		3.35	1.68
5) This house strikes me as being unusual		3.94	1.66
6) This house looks boring		4.85	1.58
7) The colours of the materials complement each other		2.94	1.64
8) This house looks like it will last a long time		3.98	1.53
9) I find this house unappealing		4.74	1.82
10) I would say the house style is 'modern'		4.05	1.52
11) I think developers could easily sell houses like this		3.39	1.61
Preference score		22.39	7.95

**Table 19 - The houses used in this study, along with the associated measures of preference from chapter 4.**

'traditional' looking house (which house number 15 was considered to be), and a house that might include aspects thought to represent 'sustainability' in some way. House number 19 was considered to fulfil this objective to a greater degree than house number 13 for the purposes of this study.

<sup>87</sup> N = Valid N (listwise) across all questions.

<sup>88</sup> Scores go from 1 (strongly agree) to 7 (strongly disagree)

<sup>89</sup> The mean of the preference scale is 28.25 (S.D. = 9.34). Only seven of the 36 houses had preference scores under 23, and of these only four houses were of the one-and-a-half-storey type. Of these houses (13, 15, 17 and 19), house 15 was by far the most preferred, and house 19 was deemed to be the most appropriate for the purposes of this study, as horizontal timber cladding (Timber 2) was rated as more pleasant (see Figure 40), and timber is the material hypothesised to symbolize 'sustainability'.

#### **5.3.4.2 Constructing the four scenarios**

In order to balance the design of the experiment (see section 5.4.2.2), four scenarios were created. As well as the cladding material being varied, it was decided to vary the description given, so that the hypothesis that timber somehow symbolises 'sustainability' could be checked. As such, two of the four scenarios did not describe the house as being sustainable. Although this means that the behaviour does not absolutely match that used in the elicitation survey, the behaviour is considered to be sufficiently similar (more generally 'considering buying a particular house', rather than specifically 'buying a sustainable house') to avoid any undue concern. Of slightly more concern is that the attitudes measured in this survey were constructed with a 'sustainable house' as the attitude object, so many of the attitudes as measured may not in fact be attitudes people hold about 'conventional' houses. Nevertheless, it was felt useful to include the non-sustainable-description version of the timber clad house to check whether or not an assumption of 'sustainability' is made, in the absence of any other information being given. In essence, the technically correct TPB survey consists of the two scenarios where the house description is described as being 'sustainable', whereas the other two scenarios provide a very useful comparison with the data from chapter 4.

#### **5.3.5 Measures of connotative meanings**

In order to provide a contrast with the finding of Sadalla and Sheets (1993), it was decided that personality attributes inferred from materials were examined. Those meanings in which came out in their (Sadalla and Sheets, 1993) study as very significant ( $p < 0.0005$ ) in eliciting personality stereotypes associated with particular building materials were measured in this study. As such, the following semantic differentials were used:

<i>Warm</i>	-	<i>Cold</i>
<i>Emotional</i>	-	<i>Unemotional</i>
<i>Artistic</i>	-	<i>Nonartistic</i>
<i>Individualist</i>	-	<i>Conformist</i>
<i>Formal</i>	-	<i>Informal</i>

Participants were given the following scenario, with a reminder of the house (along with the two images presented previously):

*Imagine that the house shown in the picture was bought by someone who was transferred into this area by their employer, who provides housing for all of their employees. When these houses were being constructed, the developer offered each employee a variety of houses, and this employee chose this house. They are now moving away from the area and are trying to sell this house.*

It is important to note that in this scenario, it was stressed that the person was given a choice of house, and actively selected this one. This is consistent with Sadalla and Sheets (1993) finding that personality attributes associated with particular materials are only attributed to homeowners if they are seen to have actively chosen that particular material<sup>90</sup>.

As noted previously, according to Festinger's (1954) well known theory of social comparison, people use other people as a basis of comparison for themselves, and tend to choose people similar to themselves as a basis for such comparison. Indeed, in the context of housing, Sadalla and Sheets (1993) demonstrated that, when asked to rate the personality characteristics of the owners of various houses, people tended to prefer those houses associated with personality characteristics similar to their own. As such, the following item was added to the 5 semantic differentials taken from Sadalla and Sheets (1993), in order to examine this:

*Similar to my personality* - *Not similar to my personality*

Given that the only information that respondents know about the hypothetical person described in the scenario is that they have purchased the house, they do not know anything about the personality apart from

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<sup>90</sup> Technically speaking, participants did not select the material, but rather the house. However, given the experimental design of this study, it was felt important not to draw attention to the cladding material, as this was one of the independent variables.

what they might infer from the environmental attributes (and the description of the house) they have been shown.

## 5.4 Methodology

### 5.4.1 Sample

108 subjects took part in the study. The demographic characteristics of the sample are presented in Table 20. As can be seen from the demographic breakdown, there were a slightly lower number of males (41.8%) than females (58.2%) participating in the study. There are therefore slightly more females in the sample than the gender split in the Scottish population (51.9% female<sup>91</sup>). The median age category of the total sample was 36-50.

The majority of the sample owned their own houses, either outright or with a mortgage (Combined=90%). This is higher than the average for Scotland (which is 63%<sup>92</sup>). Just less than half of all the respondents had lived in their homes for over 5 years (Combined=43%), with only 14% having moved within the last year. 71% of the sample lived in either houses or bungalows (compared with 64% for the Scottish population<sup>93</sup>) and 26% lived in flatted accommodation (compared with 36% for the Scottish population<sup>94</sup>). A total of 75% (compared to 82% for the Scottish population<sup>95</sup>) of the sample lived in households comprising 3 or less people. 76% of the sample had a university (includes undergraduate and postgraduate) degree, which is substantially higher than the figure for the Scottish population (19.5%<sup>96</sup>).

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<sup>91</sup> Taken from <http://www.scrol.gov.uk/>

<sup>92</sup> Taken from <http://www.scrol.gov.uk/>

<sup>93</sup> Taken from <http://www.scrol.gov.uk/>

<sup>94</sup> Taken from <http://www.scrol.gov.uk/>

<sup>95</sup> Taken from <http://www.scrol.gov.uk/>

<sup>96</sup> Taken from <http://www.scrol.gov.uk/>

Socio-economic characteristics <sup>97</sup>	Categories		
		Total	
		Frequency	%
Gender	Male	41	41.8
	Female	57	58.2
How long lived in present home	< 1 year	14	14.3
	1-2 years	13	13.3
	2-5 years	29	29.6
	5-10 years	18	18.4
	>10 years	24	24.5
Age Band	Under 18	0	0.0
	18-25	5	5.1
	26-35	29	29.6
	36-50	43	43.9
	51-65	21	21.4
	>65	0	0.0
How many people live in household	1	13	13.3
	2	44	44.9
	3	16	16.3
	4	14	14.3
	5	10	10.2
	>5	1	1.0
Tenure	Owned outright	16	16.3
	Owned with mortgage	72	73.5
	Part owned	1	1.0
	Rented	8	8.2
	Other	1	1.0
Type of Property	Flat	25	25.5
	House (Terraced)	6	6.1
	House (Semi detached)	27	27.6
	House (Detached)	29	29.6
	Bungalow	8	8.2
	Other	3	3.1

**Table 20 - Socio-economic characteristics of the sample for the attitudes towards house purchase study**

<sup>97</sup> Missing data are excluded from the results, and are not reported here.



## 5.4.2 The Survey

### 5.4.2.1 Measures

All of the measures (e.g. Attitudes, Subjective Norms, and Perceived Behavioural Control) documented in section 5.2 were included in the final survey. In addition to these, three questions were added which briefly assessed normative influences on behaviour, as discussed in section 2.4.3.

The questions asked were as follows:

<b>Personal Norm</b> (PN)	<i>In general I try and live my life in a way which is not harmful to the environment</i>
<b>Awareness of Consequences</b> (AC)	<i>The decisions we make in our lives often have a large impact on the environment</i>
<b>Ascription of Responsibility</b> (AR)	<i>I believe we have a moral responsibility to protect the environment for the sake of future generations</i>

In Schwartz's (1977) theory, **Personal Norms** are made up of two antecedent components: **Awareness of Consequences** and **Ascription of Responsibility**, the strength of which mediate the link between personal norms and behaviour.

Demographic information was also collected in the questionnaire. A summary of the demographic make up of the sample can be seen in Table 20.

Consistent with the issues of agency presented in section 5.2.3, three further questions were asked concerning beliefs about the socio-cultural context in which the behaviour under study would occur. These were:

Personal Agency	36	I think that in order to find my ideal home, I would probably have to be involved in its design
Social Agency	34	House builders tend to build houses that will be most likely to sell easily
Collective Agency	35	If enough people bought 'sustainable houses' then house builders would be more likely to build them

Beliefs about socio-cultural context are thus seen as ranging from beliefs about a fairly direct person-environment interaction (active involvement in the design process) to beliefs about some form of collective power to produce wider social changes (Bandura, 2001). It should be noted here that it is individual agentic *beliefs* that are being measured rather than any attempt to document the commonality of these beliefs that might occur in reality.



#### 5.4.2.2 Experimental Design

The behavioural intention of interest was defined as being 'considering buying a particular house'. This was measured by two statements (One worded in the positive, and one in the negative), as shown in Table 21. The final score for behavioural intention was calculated in such a way that a high score meant that a respondent would *consider buying a particular house* to a greater extent, using the following equation:

$$BI = [BI_1 + (8 - BI_2)]$$

Scores measured ranges from 2 to 14, and are normally distributed (N=108, mean=8.13, S.D. = 3.09).

	Question Number	Question
BI <sub>1</sub> (+ve)	33	When I come to buying my next house, I would consider buying this house, or a house very much like it.
BI <sub>2</sub> (-ve)	18	When I buy my next house, I do not intend to buy a house like this.

**Table 21 - Measures of behavioural intention used in the survey**

A 2 X 2 factorial design was used to test the extent to which physical environmental variables moderate the influence of antecedents to behavioural intention (e.g. TPB variables). The effect of describing a house as 'sustainable' or otherwise was also tested, by varying the description of the house presented, so in the 'conventional' description, any mention of 'sustainability' was omitted. Therefore, the text in blue<sup>98</sup> was only present in the 'sustainable description' conditions. After seeing two images of the house (one from the front, and one from the side), participants were given the following information:

<sup>98</sup> Note: The text was not in blue in the survey itself. There was no added emphasis given to the manipulated text.

For the purposes of this survey, imagine you are in the process of looking for a new house and are considering buying a detached house. The house shown above is currently on the market. The house is described in the marketing materials in the following paragraph. Please read this carefully and then press the 'continue' button

*This house is an extremely attractive four bedroom house [with many sustainability features such as water saving devices]<sup>99</sup>. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

The number of the survey was recorded direct to an online database so that the experimental condition each subject was assigned to was recorded prior to the survey having been filled in. This allowed for the observation of survey drop-out to take place, to see if any particular survey was not being filled in more than others. The experimental design can be seen in tabular format in Table 22.





A between subjects design was used, so participants only saw one of the four experimental conditions, and were not aware of the other conditions at the time of commencing the study<sup>100</sup>.

Participants were randomly assigned to one of the four conditions (this was automated, as the survey was delivered online), and the relevant image (and associated description) was presented at the top of each page of the survey, as a reminder of the attitude-object.

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<sup>99</sup> This section (in blue) was omitted in the 'conventional' description.

<sup>100</sup> Participants who requested more information about the study were sent a summary of the experimental design, and the research questions by email

<p style="text-align: center;"><b><u>Survey 1</u></b></p>  <p>Cladding = Timber 'Sustainable' Description</p>	<p style="text-align: center;"><b><u>Survey 2</u></b></p>  <p>Cladding = Roughcast 'Sustainable' Description</p>
<p style="text-align: center;"><b><u>Survey 3</u></b></p>  <p>Cladding = Timber 'Conventional' Description</p>	<p style="text-align: center;"><b><u>Survey 4</u></b></p>  <p>Cladding = Roughcast 'Conventional' Description</p>

**Table 22 - Experimental design used (Cladding X Description)**

### ***Internet Delivery***

Consistent with the guidelines of Hewson (2003), participants were also timed (by measuring start and end time) to detect any unusually short response times. Information about participants' computer connection (e.g. browser type<sup>101</sup>, IP address, date and time of response) was also gathered in order to detect multiple submissions. Participants were also made aware that they could withdraw at any time. This was done by including a link at the bottom of each page saying 'I would like to withdraw from this study'. The final survey can be seen in Appendix 5.

<sup>101</sup> 89.9% of participants in this study were recorded as using a version of Microsoft Internet Explorer. The remainder used either Safari (3.7%), Firefox (3.7%) or Netscape (2.7%).

### 5.4.3 Procedure

The study was advertised by sending out emails to various mailing lists asking for participation in the study. The study was sent out on a Friday afternoon, as it was noticed in the study in chapter 4 that this time yielded a higher response than other times in the week. Information necessary to calculate a response rate was not possible to obtain, as it is necessary to know not only how many people are on a particular mailing list, but how many people actually read a particular message. Given that some people automatically filter out non-urgent mail, such as that from mailing lists, it is very hard to accurately calculate a response rate for samples selected in this manner. Although the randomisation of the experimental condition was done automatically, there were slightly fewer participants in one particular condition, so at that point the randomisation was simply switched off, and the lower response condition made to be the default<sup>102</sup>.

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<sup>102</sup> It should be noted that the lower response condition in this case was survey 4 (standard description, cladding=render). Examination of the raw data shows that part of the reason for the lower response rate here actually stems from a slightly higher respondent drop-out. Given the relatively small sample, the effect might well be down to chance, but it is possible that the slightly higher drop-out rate is due to the mismatch (in survey 3 and 4) between the attitude-object presented in the study and the attitude object from which the questions were constructed.

## 5.5 Results

### 5.5.1 Demographic and socioeconomic variables

The socioeconomic characteristics of the total sample can be seen in Table 20. The only significant impact of demographic origin found was in Survey 1 (timber cladding, sustainable description), where there was a difference in behavioural intention ( $t(24) = -2.162, p < .05$ ) between males and females (mean difference = -2.07), with female respondents showing a greater likelihood of purchase consideration than males for this particular house.

### 5.5.2 Individual Item Statistics

Descriptive statistics were produced for each of the individual items within the survey. Examinations of these descriptive statistics and frequency distributions showed that apart from some questions being slightly skewed (see section 5.5.3), the data from most of the rating scales approximated a normal distribution. The full table of descriptive statistics is included in Appendix 6.

### 5.5.3 Re-coding the TPB variables

Using the procedure outlined in section 5.3.3, the raw data was re-coded, such that (in the example of attitudes), the beliefs and evaluations were multiplied to create individual attitude scores, and then these individual attitude scores were added together to form a composite score for further analysis. Descriptive statistics for these scores were then analysed to check for skewness and kurtosis. It was found that the inclusion of attitude 3 (*house might be complicated to operate*) caused the overall attitude score to be positively skewed. Z-scores for the measure of skewness were first calculated using the following equation:

$$Z_{skewness} = \frac{S-0}{SE_{skewness}}$$

These z-scores were then compared using the rule of thumb that for small samples, "a value above 2.58 is considered significantly different

from chance to be problematic" (Field, 2000, p.41). The results for this analysis are shown in Table 23.

A[1,2,3,4]	Skewness (S)	= 0.772	Mean = 23.04
	SE skewness	= 0.233	S.D. = 9.26
	$\therefore Z_{skewness}$	= 3.31	N = 108
A[1,2,4]	Skewness (S)	= 0.572	Mean = 14.44
	SE skewness	= 0.233	S.D. = 6.88
	$\therefore Z_{skewness}$	= 2.45	N = 108

**Table 23 - Skewness analysis for attitude score with and without attitude 3**

Similar analyses were carried out for all of the other component scores, and none were found to be significantly skewed or kurtotic. Therefore, the measures for attitudes (excluding measure 3), subjective norms, perceived behavioural control and behavioural intention were taken to sufficiently approximate a normal distribution for further analyses to proceed.

#### **5.5.4 Predicting behavioural intention using the TPB**

The relationships between the recoded TPB variables discussed in section 5.5.3 were examined by looking at the correlations between these variables, and also by regressing the three hypothetical antecedents (with cladding as a categorical predictor) onto the variable behavioural intention for both the 'standard description' and the 'sustainable description' versions of the survey.

##### **5.5.4.1 Correlations**

Examination of the correlations for the four separate surveys (see Table 24) showed that attitudes were significantly correlated with behavioural intention in Survey one (timber cladding, description = sustainable), Survey two (cladding = render, description = sustainable), and Survey three (cladding = timber, description = standard). In the remaining survey (cladding = render, description = standard), none of the individual belief-



based attitudes (i.e. b X e products) were significant predictors of behavioural intention, therefore unsurprisingly the combined score was not significant either. In the case of Survey two (cladding = render, description = sustainable), subjective norms (SN) were found to be significantly associated with behavioural intention, in addition to attitudes.

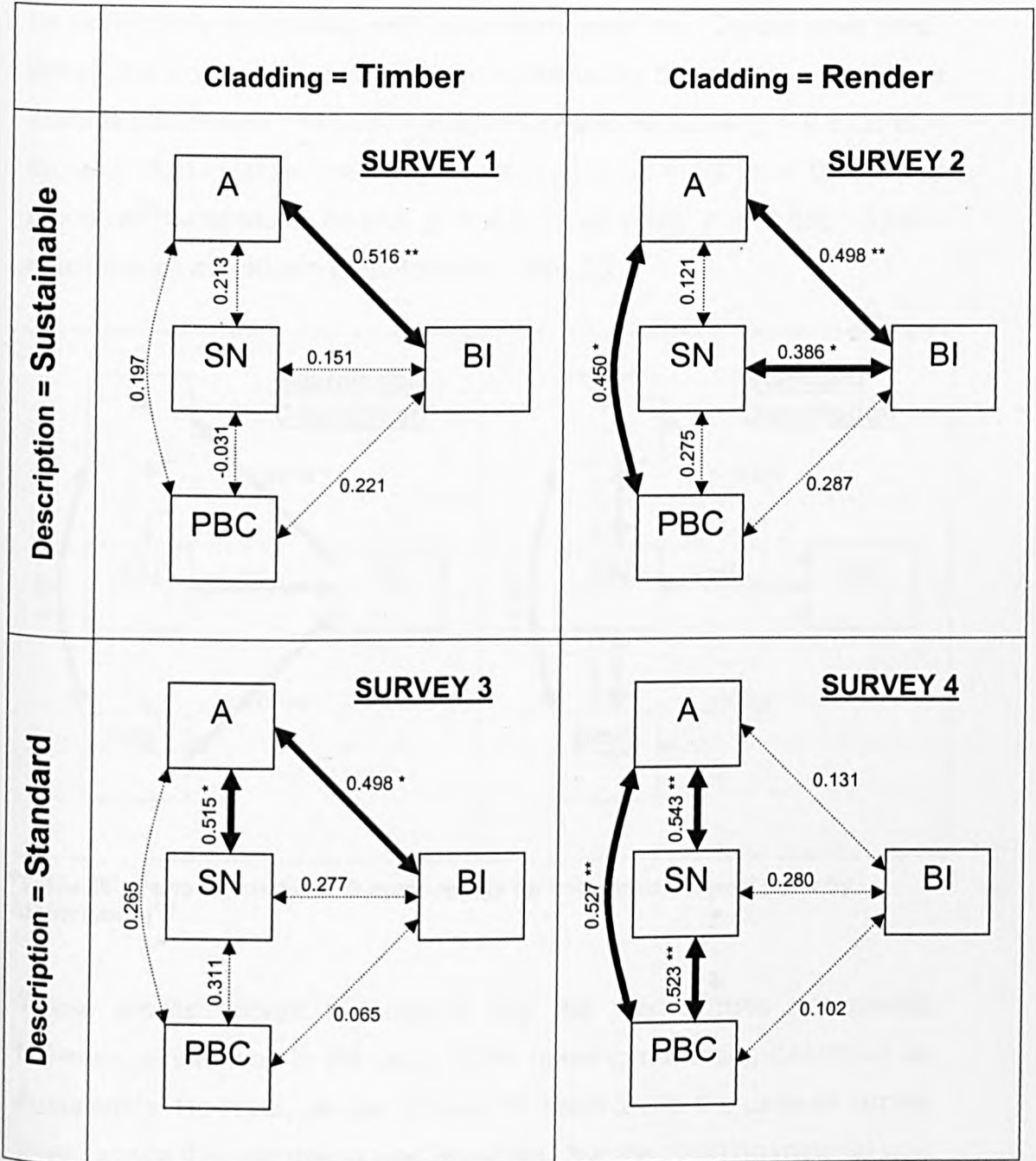
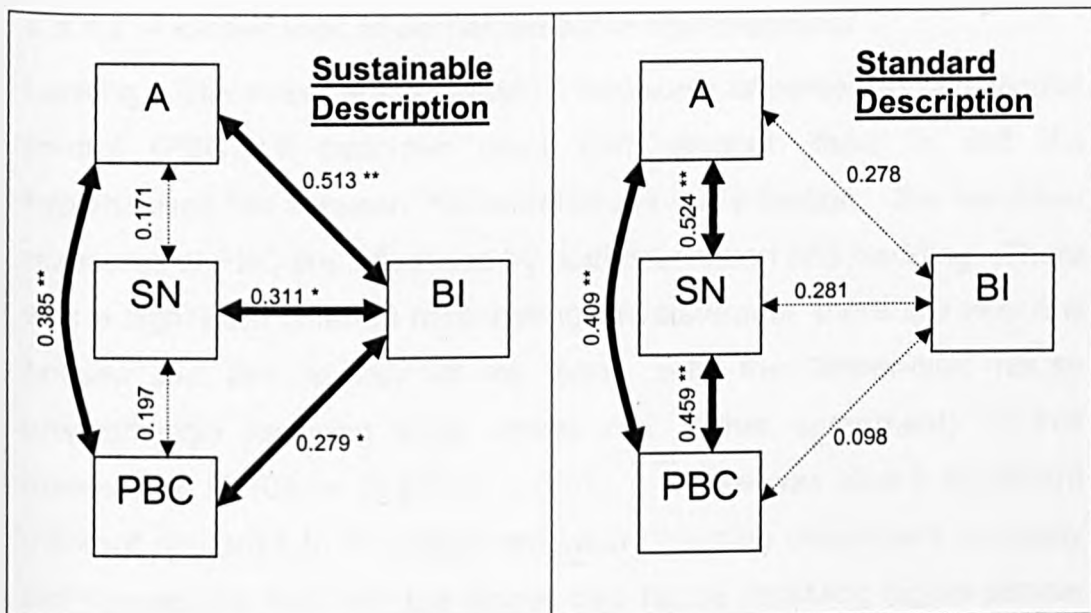


Table 24 - Correlations of TPB components for all four surveys<sup>103</sup>

<sup>103</sup> Bold lines denote statistically significant associations (\*\*p = 0.01, \* p = 0.05)

When the correlation matrix for the 'standard description' and the 'sustainable description' version of the surveys was examined (i.e. not taking into account the influence of cladding material), it became clear that in the case of the 'standard description', neither attitudes ( $r = 0.278$ ,  $df = 48$ ,  $p > 0.05$ ), subjective norms ( $r = 0.281$ ,  $df = 48$ ,  $p > 0.05$ ) or perceived behavioural control ( $r = 0.098$ ,  $df = 48$ ,  $p > 0.05$ ) were found to be significantly associated with behavioural intention. On the other hand, where the house was described as sustainable, there was a significant association between behavioural intention and attitudes ( $r = 0.513$ ,  $df = 60$ ,  $p < 0.01$ ), subjective norms ( $r = 0.311$ ,  $df = 60$ ,  $p < 0.05$ ), and perceived behavioural control ( $r = 0.279$ ,  $df = 60$ ,  $p < 0.05$ ). These relationships are shown graphically in Table 25.



**Table 25 - Correlations for TPB components for combined surveys (split by description)<sup>104</sup>**

These results appear to suggest that the theory does not predict behavioural intention in the case of the housing not being described as sustainable. However, as can be seen in Table 24, in the case of Survey three, where the description was 'standard', but the cladding material was timber, attitudes were in fact significantly associated with behavioural intention, possibly suggesting that the cladding material acts as a form of

<sup>104</sup> Bold lines denote statistically significant associations (\*\* $p = 0.01$ , \*  $p = 0.05$ )



description of the attitude object in the absence of any other information being provided.

What these results might show is that the theory of planned behaviour is very sensitive to subtle changes in the definition of the attitude object. Thus, it may be that if the attitude object does not match exactly the attitude object used in the construction of the attitude measures, then the theory fails to predict behavioural intention. Indeed, this demonstrates how sensitive the theory is to measurement error, and as such, the focus of most of the remaining analysis will be on Surveys 1 and 2 (where the description was of a 'sustainable house', which exactly matches the definition used in the survey construction).

#### **5.5.4.2 A closer look at perceived behavioural control**

Looking a little closer at the individual measures of perceived behavioural control (PBC), it becomes clear that although there is not the hypothesised link between PBC and behavioural intention, the individual measures of PBC are influenced by both description and cladding. There was a significant different response to the statement '*there are very few houses like this to buy in my area*', with the timber-clad house unsurprisingly receiving lower scores (i.e. higher agreement) on this measure ( $F(1,104) = 10.648, p < 0.01$ ). There was also a significant different response to the statement '*many housing developers currently sell houses like this*' with the timber clad house receiving higher scores (i.e. lower agreement) on this measure ( $F(1,104) = 8.9930, p < 0.01$ ). A significant interaction was also noted for this statement, with the main difference in response due to '*description*' being for the render-clad house. Whilst there was little difference in the response to this statement to the two claddings for the house described as 'sustainable', there was a marked difference for the house described as 'standard' ( $F_{\text{description} \times \text{cladding}}(1,104) = 4.324, p < 0.05$ ).

### 5.5.4.3 Regressions

In order to ascertain the extent to which attitudes, perceived behavioural control and subjective norms could be said to predict behavioural intention, a multiple regression analysis was carried out with cladding being entered into the regression equation as a categorical predictor. The regression model for the surveys with a 'standard' (i.e. not sustainable) description was checked, and the results confirm what was found in the correlations discussed in section 5.5.4.1. None of the predictors in the equation were found to be significant predictors of behavioural intention, and in combination, the percentage of variance explained by the regression equation was 11.0%, which was non-significant (see Table 26).

	<i>R</i>	0.332			
	<i>R</i> <sup>2</sup>	0.110			
	Adjusted <i>R</i> <sup>2</sup>	0.027			
	F (4,43)	1.328	<b>Sig = 0.275</b>		
	Predictor	<i>β</i>	SE <i>β</i>	Standardized <i>β</i>	Sig
	<b>Attitude</b>	0.085	0.073	.204	0.248
	<b>Subjective Norm</b>	0.025	0.021	.214	0.235
	<b>Perceived Behavioural Control</b>	-0.019	0.035	-.095	0.581
	<b>Cladding</b>	-0.324	0.902	-0.053	0.721

**Table 26 - Multiple regression analysis with Behavioural Intention as the dependent variable for the 'standard description' surveys.**

However, the result for the 'sustainable description' was that 31.8% of the variance was significantly explained by the complete regression equation (F (4,55) = 6.426, *p* < .001), with attitude being the most significant predictor, and with subjective norms also contributing (approaching significance at *p* = 0.06).

<i>R</i>	0.564			
<i>R</i> <sup>2</sup>	<b>0.318</b>			
Adjusted <i>R</i> <sup>2</sup>	0.269			
F (4,55)	6.426	<b>Sig = 0.000</b>		
Predictor	<i>β</i>	<i>SE β</i>	Standardized <i>β</i>	Sig
<b>Attitude</b>	0.215	0.058	0.449	<b>0.001</b>
<b>Subjective Norm</b>	0.023	0.012	0.218	0.062
<b>Perceived Behavioural Control</b>	0.011	0.024	0.058	0.637
<b>Cladding</b>	-0.182	0.699	-0.030	0.795

**Table 27 - Multiple regression analysis with Behavioural Intention as the dependent variable for the 'sustainable description' surveys.**

What these results show is that in the 'sustainable description' versions of the study, the three components of the theory of planned behaviour, along with the variable 'cladding', were able to explain just over 31% of the variance.

### **5.5.5 The influence of personal norms**

Personal Norms were not found to be significantly associated with behavioural intention for any of the four experimental conditions. However, the hypothetical antecedents to PN (Awareness of Consequences and Ascription of Responsibility) were generally found to be significantly associated with PN, as shown in Table 28. Personal Norms were also found to be significantly associated with Attitudes in all four surveys, suggesting that the link between Personal Norms and Behavioural Intention is mediated by Attitudes. Multiple regression analysis for each survey confirmed that AR and AC can be treated as significant predictors of PN in all cases. These results are summarised in Table 29.

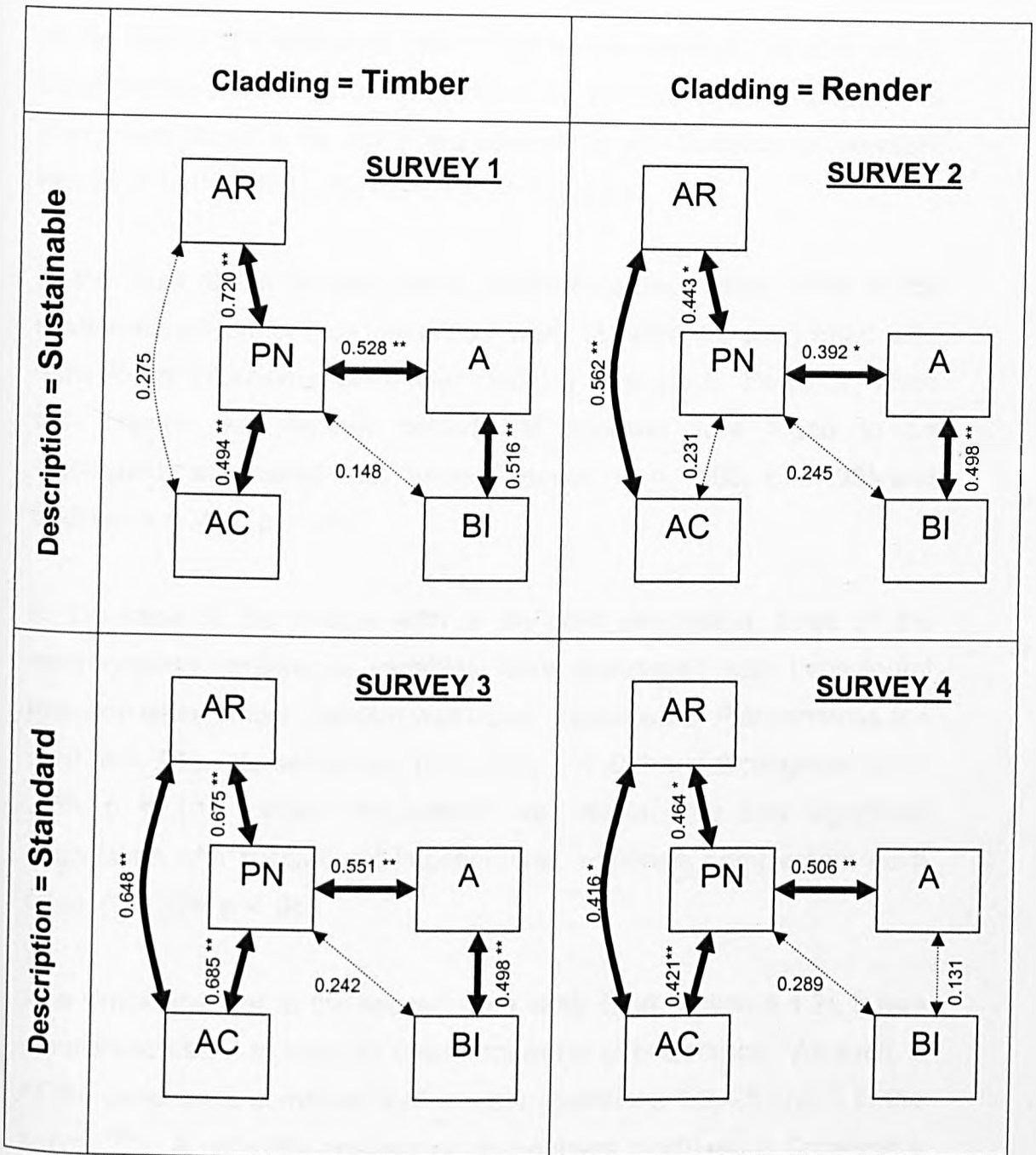


Table 28 - Correlations of AR, AC and PN for all four surveys

Survey 1 ( $R=.783$ ; $R^2 = .613$ ; $F [2,26]=20.58$ ; $p < .001$ )
Survey 2 ( $R=.443$ ; $R^2 = .197$ ; $F [2,28]=3.43$ ; $p < .05$ )
Survey 3 ( $R=.749$ ; $R^2 = .561$ ; $F [2,19]=12.14$ ; $p < .001$ )
Survey 4 ( $R=.528$ ; $R^2 = .278$ ; $F [2,23]=4.44$ ; $p < .05$ )

Table 29 - Multiple regression results for AC and AR with PN as dependent variable

### 5.5.6 The place of aesthetic preference

In the results of the second case study (see in particular section 4.4.4), most measures of aesthetic preference for the two houses used in this study were found to be significant associated with behavioural intention. However, in this study, the results were equivocal.

In the case of the houses with a *sustainable* description, none of the environmental preference measures were significantly associated with behavioural intention when timber cladding was used. However, when the exterior was render, behavioural intention was found to be significantly associated with 'interestingness' ( $r = -.406$ ,  $p < .05$ ) and tradition ( $r = .462$ ,  $p < .01$ )

In the case of the houses with a *standard* description, three of the environmental preference variables were associated with behavioural intention when timber cladding was used. These were: Pleasantness ( $r = .610$ ,  $p < .01$ ); Interestingness ( $r = -.624$ ,  $p < .01$ ) and Boringness ( $r = -.455$ ,  $p < .01$ ). When the exterior was render, the only significant association with behavioural intention was 'materials complement each other' ( $r = .398$ ,  $p < .05$ ).

In a similar manner to the second case study (see section 4.4.2), it was considered useful to have an overall measure of preference. As such, 5 of the items were combined into a scale (questions 1,3,4,5 and 6 in the survey<sup>105</sup>). A reliability analysis on these items produced a Cronbach's alpha of 0.66 and was taken to be an acceptable measure of preference<sup>106</sup>. Including this measure of preference as an additional predictor in the multiple regression analyses yielded interesting results. The effect of including preference within the regression model for the 'sustainable description' surveys was to increase the percentage of variation explained by a further 3% (see Table 30), but preference did not

<sup>105</sup> Items 3 and 4 were recoded as (8-score) as they were worded in the negative.

<sup>106</sup> It should however be noted that 0.66 is on the low end of the generally accepted threshold for Alpha scores, where scores below 0.7 are sometimes considered unacceptable. However, some researchers take 0.6 to be the threshold of acceptability (e.g. Baars et al., 2005).

come out to be a significant predictor. However, the effect of including preference within the regression model for the 'standard description' surveys increased the percentage of variance explained by a further 22%, as shown in Table 31. There were no significant differences in the overall preference measure due to cladding material ( $t(106) = -0.778, p > 0.1$ ), which suggests that although the two materials are rated as similar in terms of preference, the psychological processes which follow such preference judgements may well depend to a large degree on the information used to provide the behavioural context in question.

<i>R</i>	0.588			
<i>R</i> <sup>2</sup>	<b>0.346</b>			
Adjusted <i>R</i> <sup>2</sup>	0.285			
F (5,54)	5.713	<b>Sig = 0.000</b>		
Predictor	<i>β</i>	<i>SE β</i>	Standardized <i>β</i>	Sig
<b>Attitude</b>	0.176	0.063	0.367	<b>0.007</b>
<b>Subjective Norm</b>	0.027	0.012	0.255	<b>0.032</b>
<b>Perceived Behavioural Control</b>	0.005	0.024	0.028	0.818
<b>Cladding</b>	-0.260	0.693	-0.042	0.709
<b>Preference</b>	0.109	0.072	0.191	0.138

Table 30 - Multiple regression analysis with Behavioural Intention as the dependent variable, including 'preference' as an IV for the 'sustainable description' surveys.

<i>R</i>	0.573			
<i>R</i> <sup>2</sup>	<b>0.328</b>			
Adjusted <i>R</i> <sup>2</sup>	0.248			
F (5,42)	4.100	<b>Sig = 0.004</b>		Sig
Predictor	<i>β</i>	<i>SE β</i>	Standardized <i>β</i>	
<b>Attitude</b>	0.039	0.065	0.094	0.550
<b>Subjective Norm</b>	0.025	0.018	0.213	0.181
<b>Perceived Behavioural Control</b>	-0.018	0.031	-0.085	0.572
<b>Cladding</b>	-0.828	0.805	-0.136	0.310
<b>Preference</b>	0.293	0.079	0.486	<b>0.001</b>

Table 31 - Multiple regression analysis with Behavioural Intention as the dependent variable, including 'preference' as an IV for the 'standard description' surveys.

### 5.5.7 Connotative meanings and personality judgements

None of the measures of inferred personality were found to be significantly associated with behavioural intention for the two 'standard' description surveys, apart from question 42 (Similar to my personality - - - - - Not similar to my personality), which showed a positive correlation for both surveys 3 ( $r = 0.605$ ,  $df = 22$ ,  $p > 0.01$ ) and 4 ( $r = 0.585$ ,  $df = 26$ ,  $p > 0.01$ ). Indeed, question 42 was also significantly associated with behavioural intention for surveys 1 ( $r = 0.696$ ,  $df = 29$ ,  $p > 0.01$ ) and 2 ( $r = 0.584$ ,  $df = 31$ ,  $p > 0.01$ ). This suggests that this is a particularly important part of the decision making process when it comes to house purchase decisions (i.e. am I like the kind of people who live in houses like this?).

Both question 39 (artistic) and question 40 (individualistic) were significantly associated with behavioural intention for the two 'sustainable' description surveys (Survey 1 :  $r = 0.374$ ,  $df = 29$ ,  $p > 0.05$ , Survey 2:  $r = 0.440$ ,  $df = 31$ ,  $p > 0.05$ ), suggesting that people associate 'sustainability' with these personality characteristics<sup>107</sup>.

In addition, for Survey 2 (*sustainable* description + cladding=*render*), two further personality characteristics were found to be significantly associated with behavioural intention. These were: *warmth* ( $r = 0.549$ ,  $df = 31$ ,  $p > 0.01$ ) and *emotional* ( $r = 0.480$ ,  $df = 31$ ,  $p > 0.01$ ).

The fact that more inferred personality characteristics are significantly associated with behavioural intention for Survey 2 is interesting. Given that subjective norms (see section 5.5.4.1) appear to be more important when 'sustainability features'<sup>108</sup> are not visually present, it might be more important to people to assume that other people will approve of their house purchase decision, and will infer particular personality

<sup>107</sup> In this case, this suggests that people who buy 'sustainable houses' are thought to be more 'artistic' and 'individualistic', and if this personality type corresponds with a person's own personality, then purchase-consideration is more likely.

<sup>108</sup> In this case, timber cladding is assumed to be visually representative of 'sustainability features'.

characteristics based on whatever information is available. This is partially confirmed by the data, as shown in Figure 51 and Figure 52.

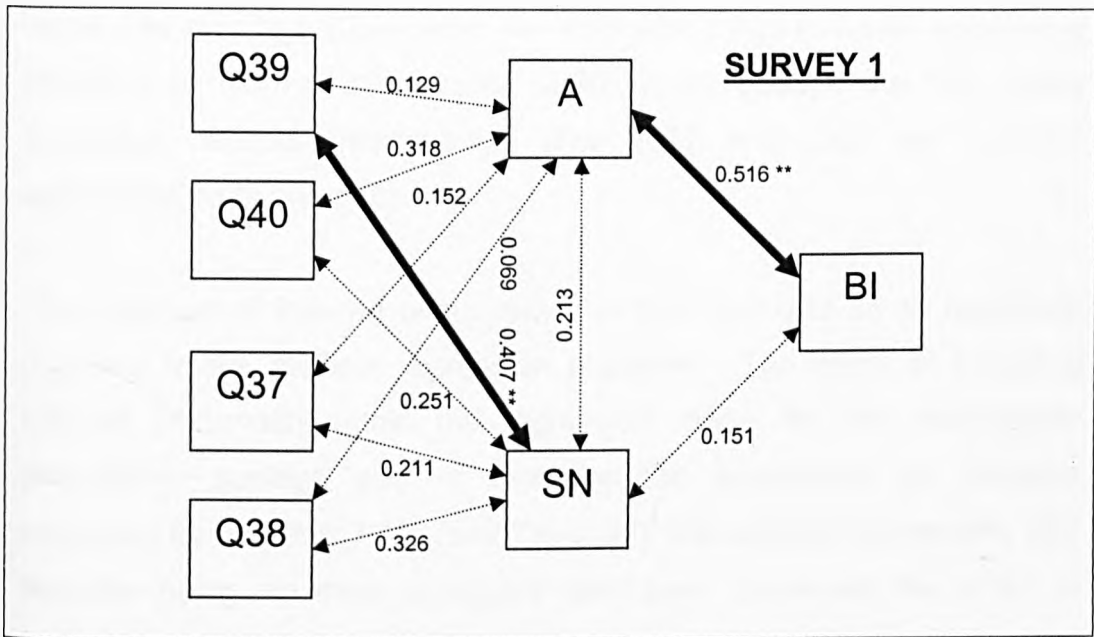


Figure 51 - Correlations between inferred personality characteristics, attitudes, and subjective norms for survey 1

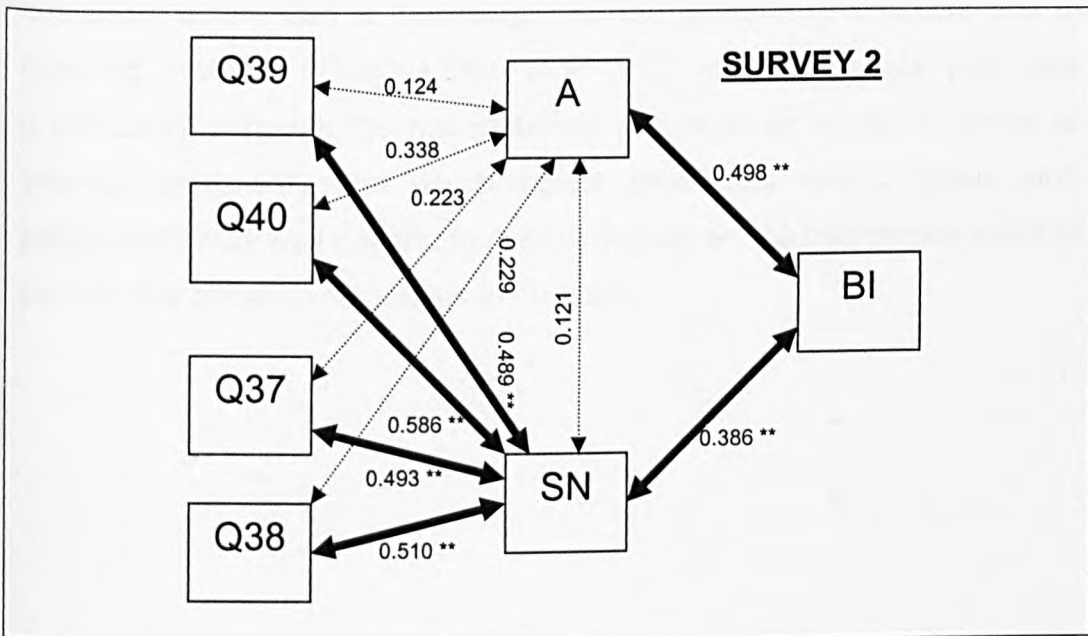


Figure 52 - Correlations between inferred personality characteristics, attitudes, and subjective norms for survey 2



In order to assess the combined influence of the measures of inferred personality, questions 37, 38, 39 and 40 were examined to see if they were highly correlated with each other. Cronbach's alpha for these four items was very high (0.91), and was therefore taken to be an acceptable measure of *inferred personality*, which encompasses the two highly correlated aspects 'interpersonal style' (q37 and q38) and 'creative expression' (q39 and q40).

This measure of inferred personality was then included as an additional predictor in the multiple regression analyses. The effect of including inferred personality within the regression model for the '*sustainable description*' surveys was to increase the percentage of variation explained by a further 7.4% (see Table 32), with inferred personality and attitudes being the most significant predictors. However, the effect of including inferred personality within the regression model for the '*standard description*' surveys only increased the percentage of variance explained by a further 0.6%, as shown in Table 33. There were no significant differences in the overall inferred personality measure due to cladding material ( $t(106)=1.540$ ,  $p > 0.1$ ), which suggests that (like preference), although the two materials are rated as similar in terms of inferred personality, the psychological processes which follow such judgements may well depend to a large degree on the information used to provide the behavioural context in question.

<i>R</i>	0.648			
<i>R</i> <sup>2</sup>	<b>0.420</b>			
Adjusted <i>R</i> <sup>2</sup>	0.354			
F (6,53)	6.397	<b>Sig = 0.000</b>		
Predictor	<i>β</i>	<i>SE β</i>	Standardized <i>β</i>	Sig
<b>Attitude</b>	0.167	0.060	0.349	<b>0.008</b>
<b>Subjective Norm</b>	0.011	0.013	0.105	0.404
<b>Perceived Behavioural Control</b>	-0.000	0.023	0.007	0.994
<b>Cladding</b>	-0.196	0.659	-0.032	0.768
<b>Preference</b>	0.082	0.070	0.143	0.246
<b>Inferred Personality</b>	0.163	0.063	0.322	<b>0.012</b>

**Table 32 - Multiple regression analysis with Behavioural Intention as the dependent variable, including 'inferred personality' as an IV for the 'sustainable description' surveys.**

<i>R</i>	0.578			
<i>R</i> <sup>2</sup>	<b>0.334</b>			
Adjusted <i>R</i> <sup>2</sup>	0.237			
F (6,41)	3.428	<b>Sig = 0.008</b>		
Predictor	<i>β</i>	<i>SE β</i>	Standardized <i>β</i>	Sig
<b>Attitude</b>	0.051	0.068	0.122	0.461
<b>Subjective Norm</b>	0.029	0.020	0.252	0.146
<b>Perceived Behavioural Control</b>	-0.022	0.032	-0.108	0.491
<b>Cladding</b>	-0.985	0.850	-0.161	0.254
<b>Preference</b>	0.311	0.085	0.515	<b>0.001</b>
<b>Inferred Personality</b>	-0.056	0.092	-0.102	0.543

**Table 33 - Multiple regression analysis with Behavioural Intention as the dependent variable, including 'preference' as an IV for the 'standard description' surveys.**

### 5.5.8 Beliefs about socio-cultural context

No significant correlations were found between the measure of **Personal agency beliefs** and any other measures. **Social agency beliefs** were found to be positively correlated with attitudes for the '*standard description*' surveys ( $r = 0.385$ ,  $df = 48$ ,  $p < 0.01$ ), and negatively correlated with preference for the '*sustainable description*' surveys ( $r = -0.282$ ,  $df = 60$ ,  $p < 0.05$ ). **Collective agency beliefs** were found to be positively correlated with subjective norms ( $r = 0.412$ ,  $df = 48$ ,  $p < 0.01$ ) and attitudes ( $r = 0.287$ ,  $df = 48$ ,  $p < 0.01$ ) for the '*standard description*' surveys, and also positively correlated with behavioural intention ( $r = -0.287$ ,  $df = 60$ ,  $p < 0.05$ ) and attitude ( $r = 0.429$ ,  $df = 60$ ,  $p < 0.01$ ) for the '*sustainable description*' surveys.

## 5.6 Discussion

This study set out to examine the factors influencing the likelihood of purchase consideration for 'sustainable housing' by combining the material presented in the two case studies and comparing the findings with the conceptual model outlined in chapter 2 based on a comprehensive review of the literature. This conceptual model is shown in Figure 19 as a reminder. The results of this case study suggest that the 'individual' component of this conceptual model might need altering slightly in order to accommodate some of the findings from this third study.

The only significant influence of demographic origin found was in survey 1 (timber cladding, sustainable description), where there was a difference in behavioural intention between males and females, with female respondents showing a greater likelihood of purchase consideration than males for this particular house. Although not entirely comparable, it is interesting to note that Nasar (1989) found a similar gender difference, with females judging the 'farm-type' as more desirable than males judged that particular house type. Insofar as this relates to the conceptual model, it is evidence of the link between **personal context** and **environmental preference**.

As expected, **attitudes** were found to be a significant predictor of **behavioural intention** for the survey where the house was described as sustainable. Interestingly, there were differences within the 'sustainable description' surveys which were related to the cladding material, with **subjective norms** being more strongly associated with **behavioural intention** when render was the cladding material. These findings demonstrate that subtle changes in the attitude target (as opposed to the behavioural attitude) can alter the relative contributions of the theory of planned behaviour (TPB), which is concerned specifically with attitudes towards specific behaviours.

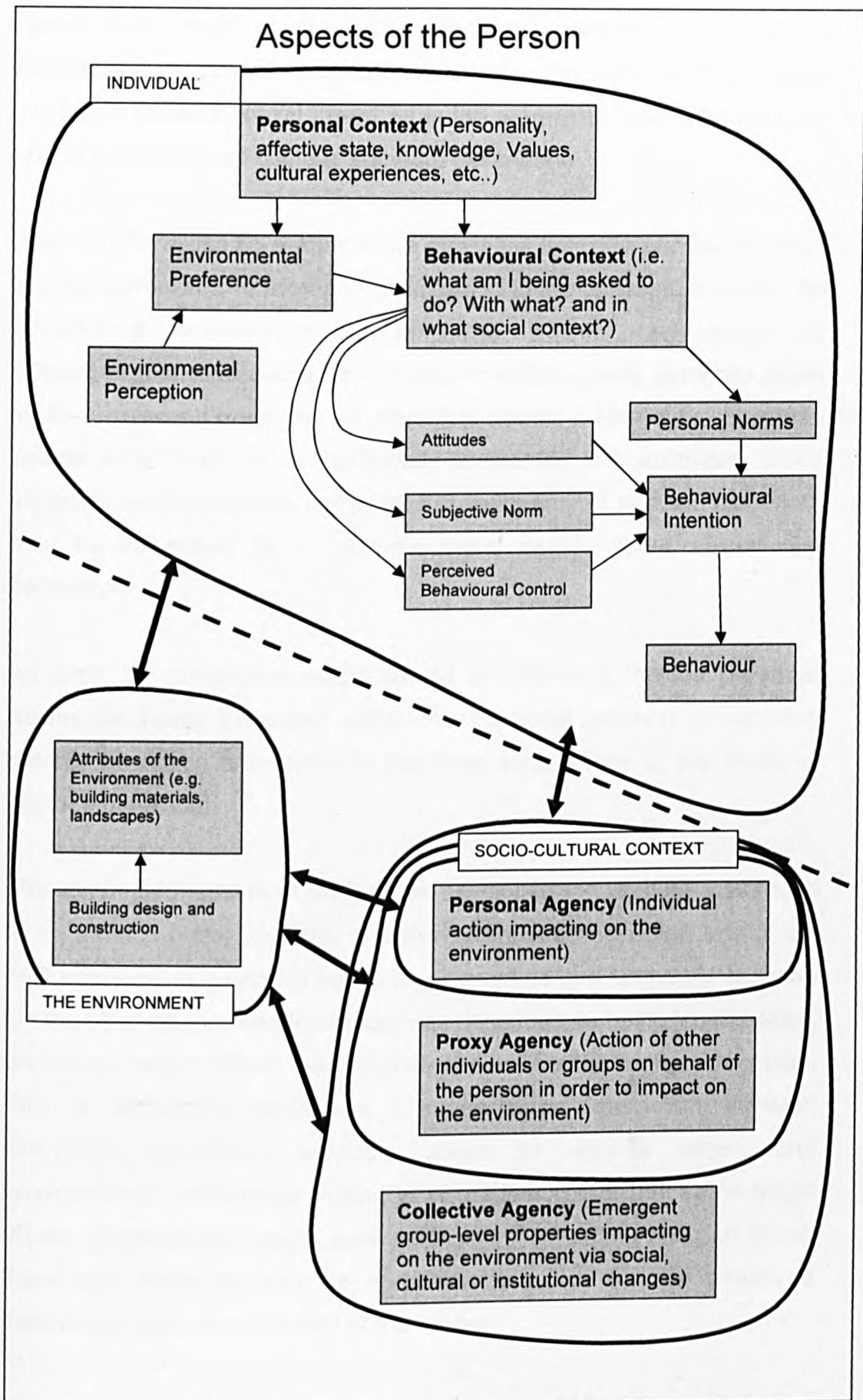


Figure 19 (repeated) - Conceptual model with expanded 'socio-cultural context' component

Furthermore, none of the TPB components (**attitudes**, **subjective norms**, and **perceived behavioural control**) were found to be significant predictors of **behavioural intention** in the regression analyses when the house was described using a 'standard description'.

Although there was no evidence of a direct link between **personal norms** and **behavioural intention** as hypothesised in the conceptual model, the hypothetical antecedents to **personal norms** (**awareness of consequences** and **ascription of responsibility**) were generally found to be significant predictors of personal norms. Moreover, **personal norms** were found to be significantly associated with **attitudes**, which suggests that the attitude component of the theory of planned behaviour may be influenced by a person's moral beliefs about a particular behaviour.

As such, the conceptual model should be altered to include **personal norms** as being integrated within the **personal context** component, thereby becoming antecedent to the three components of the theory of planned behaviour.

The combined measure of **preference** developed in this study was found to be a much better predictor of **behavioural intention** than any of the TPB components when the house was described in a 'standard' manner. On the other hand, when the house was described as being 'sustainable', preference added little to the explanatory power of the regression model. This is interesting insofar as it suggests an interaction between descriptive information available about an attitude target, and environmental preferences related to visual features of that same target object. Although the results were inconsistent regarding such an effect, there was some evidence of such an interaction for the perceived behavioural control component of the model.

Interestingly, the contribution of '*inferred personality*' to the prediction of behavioural intention was in the opposite direction with respect to

'description'. In this case, the measure of *'inferred personality'* was found to contribute significantly to the regression equation for the house described as 'sustainable', but not for the house described as 'standard'. Given that the measures of **'inferred personality'** and **subjective norm** are significantly correlated, it seems likely that these two theoretical constructs are related in some way, although it is not possible to ascertain the direction of causality from the results of this study. However, symbolic interactionist models suggest that meaning of building materials arise from social interaction as opposed to some form of 'intrinsic meaning' (Sadalla and Sheets, 1993). Taken within this framework, one would expect that the **inferred personality** meanings associated with materials would be closely related to the **subjective norms** considered to be antecedent to behavioural intention concerning such objects / materials.

One possibility suggested is that when 'sustainability features' such as timber cladding are not visually present, it might be more important for people to assume that other people will approve of their house purchase decision, and will *infer* particular personality characteristics based on whatever information is available. Indeed, this would suggest that while it may be true that (to some degree) personality characteristics of occupants can be inferred from building materials (as was also shown by Sadalla and Sheets, 1993), the effects that such inferences have on a person's behaviour are quite subtle and mediated by various other factors or constructs, which are in turn shaped by these inferences. As such, **inferred personality** in this case is thought to function as a mediator variable between **environmental perception** and **subjective norms**. However, further studies would clearly be required to further explore this hypothetical relationship.

Overall, the results of this study appear to suggest that physical properties of housing (in this case cladding materials) can provide people with additional socially meaningful information about the house. This information influences the way in which the 'social meaning' of a

particular house is 'decoded' (see Ritterfeld, 2002). However, the relationship between visual information (cladding material) and descriptive information (sustainable or standard description) does not appear to be simple. Rather, it seems that the two variables interact with each other. So, in the case of the timber clad house described as being 'sustainable', the results suggest that there is a clear association between that information which is decodable from the physical environment, and that information which is provided in a descriptive form. It might therefore be hypothesized that only in this case does heuristic processing occur, as the social meaning is both decodable and consistent (see Ritterfeld, 2002, p372).

However, where there is no such perceived 'fit' between decoded social meaning and descriptive information, the pattern of results is slightly different. In both cases where the house was described as being 'sustainable' (whether the cladding was timber or render), attitudes were found to predict behavioural intention. However, when the house was not described as being 'sustainable', this association between attitudes and behavioural intention was only found for the house clad in timber. It is therefore possible to argue that there is *some* decodable social meaning in timber cladding, although further studies would be required to document the content of this social meaning. Nevertheless, it seems likely from these results that (at least for the sample studied), an important facet of the social meaning of timber cladding is the concept of sustainability. This is not to say that timber would always signify sustainability, but rather that it is possible for such abstract concepts to gain social meaning through their assumed expression in the physical environment. In other words, houses (and indeed any part of the build environment) might be considered as encoding cognitive schemata (Rapoport, 1980), which are then 'decoded' and hopefully understood by future users, passers-by, and anyone observing that particular house.

The literature on symbolic communications would suggest that people choose houses that they assume express similar personality



characteristics as themselves (see Sadalla and Sheets, 1993). This would suggest that there is a shared understanding of such symbolic representations, as it is important to trust that the recipient of any communication understands the message being communicated. That is to say, it is important that there is a shared 'language'. Kaiser and Fuhrer (1996) make this point in their article on the hidden language of 'dwelling':

*"At first glance, dwelling and speaking seem to differ noticeably from one another. In speaking, information is communicated symbolically through the meanings of words and sentences. In dwelling, however, information is transmitted first and foremost through the material attributes of objects. Thus, it is not only signs with warnings such as 'Beware of Dog' or 'Trespassing Forbidden' that obstruct entry to the house, but real dogs, fences, and walls to keep people out" (p.227).*

They then go on to argue that:

*"Objects are emotionally experienced by people the same way as other people are..... the emotional significance of material things can change from dweller to dweller although they may live in the same physical surrounding" (p.231).*

In a sense then, material objects (such as a house, a car, a newspaper, etc.) might be thought of as serving two related social functions. A material object (in this case a house) can be used to symbolically communicate aspects of the self to others, and also to confirm a social category or group. For example, a person who emphasises 'environmental' or 'green' environmental attitudes as part of their identity may well be more likely to look for visual expressions of this identity in the form of (for example) certain material objects. So for example, a person who uses a cycle trailer to transport their children may be doing this for

both functional and symbolic reasons. Thus, whilst such a choice may have health benefits, and potential long-term financial benefits, it is arguable that such a choice also provides a means of expression of a more complex set of values and attitudes. In other words, it might translate as: "*I am the kind of person who has chosen to transport my children in this manner rather than drive a car*". As discussed earlier in section 2.2.4, individual choice of material objects might be interpreted as the means by which people strive to achieve a positive social identity (Augoustinos and Walker, 1995; Dittmar, 1992). Social Identity Theory (Hogg and Abrams, 1988) tells us that people's need to strive for a positive social identity provides a very strong motivation to act in ways consistent with a particular social schema or group prototype. Included in the set of possible actions available to people is the acquisition of material objects, including in some cases objects with a large physical presence such as cars or houses.

The study reported on here has illustrated that when *timber* is presented as the cladding material for the exterior façade of houses, this not only conveys a partial stereotype consistent with the notion of a 'sustainable house', but also conveys decodable information about the **inferred personality** associated with such a material choice. In this case, *timber*, when used as an exterior cladding material, has associated symbolic properties related to the notion of sustainability.

### **5.6.1 Methodological issues arising**

Consistent with the approach taken in the case study presented in chapter 4, the data collection for this study was administered over the internet. Given the need for studies like this to display high quality colour images (determined after randomisation of experimental condition) to a sample of respondents, the main advantages of the internet based survey were the time and cost savings inherent in the method, as well as the obvious (albeit minimal) resource savings in terms of high quality paper and coloured ink. The internet-based approach also makes

randomisation of surveys much more efficient to administer, and allows the researcher the ability to alter the randomisation procedure if necessary. When the number of responses to one of the four conditions was found to be too low, the automatic randomisation was simply turned off, and the condition in question set to be the default. Although it is notoriously difficult to assess response rates, and drop-out rates for internet samples, it is interesting to note that there was a noticeable difference in the rate of respondent drop-out in the condition where the number of responses was initially deemed to be too low. The data are not available to draw meaningful conclusions from this, but it is worth noting insofar as future research might investigate the relationship between respondent drop out and response rates for internet samples.

## 6 Overall Discussion and Conclusions

### 6.1 Introduction

This thesis has demonstrated the utility of adopting a transactional approach for the study of sustainable housing. This approach, which is often affirmed by environmental psychologists, was found to be compatible with both qualitative and quantitative approaches to data collection and analysis. Rather than adopting a fixed methodological approach suggested by any particular theory, the focus here was to consider and comprehend individual actions as they occur within a larger dynamic of people-environment transactions.

Kurt Lewin once famously remarked that "*there is nothing so practical as a good theory*" (Lewin, 1951, p.169). Whilst these words still ring true today, it is arguable that the usefulness of any comprehensive theory should be judged not only on its immediate practical utility<sup>109</sup>, but also on its ability to accommodate data and findings from a wide range of sources and methods. The research presented within this thesis clearly demonstrates that the transactional approach provides a useful and contextually grounded framework within which conceptual models can be built. Moreover, this approach has been shown to be useful, both in designing psychological studies, and in interpreting the findings that emerge from these studies. The transactional approach (and the resulting theoretical framework) was used here as a kind of window through which to view and interpret the data collected from studies about different aspects of 'sustainable housing', using a variety of methods. The two main aims of this thesis, as stated in Chapter 1 were:

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<sup>109</sup> It should be noted that Lewin's well known quote has sometimes been misinterpreted as somehow implying that only those theories which are of immediate practical use are 'good'. Rather, Lewin saw no contradiction between theory and practice, but held that practice should, where possible, be grounded in theory. See Marrow (1969) for an interesting reflection on the life and work of Kurt Lewin.

- To outline a theoretical framework for conceptualising the person-in-environment relationship with respect to sustainable housing.
- To provide empirical evidence to support this theoretical framework and illustrate the importance of considering the individual, the socio-cultural context, and the environmental aspects of sustainable housing.

This chapter will discuss the main contributions made by this thesis as they relate to these two aims. The limitations of the research will also be discussed, along with suggestions for future research. For clarity, the main findings of the thesis are subdivided first by the two overall aims, and then by the wider contributions made by the thesis within each of these aims.

## **6.2 Contributions of the Thesis**

### **6.2.1 The Theoretical Framework**

The first aim of the thesis was to build up an appropriate theoretical framework from published literature, for conceptualising the person-in-environment with regard to sustainable housing. This aim was explored theoretically, initially by combining Wapner's (1995) six aspects of the person-in-environment with Bandura's (1986) concept of 'Triadic Reciprocity'. Essentially, the person-in-environment was re-conceptualised as comprising the **individual**, the **environment**, and the **socio-cultural context**, each of which influence each other in a reciprocal manner.

Following a review of the literature about the psycho-social aspect of sustainable housing, the individual component of the conceptual model was then expanded to include explanatory approaches from the literature that were relevant to the study of individual actions, and how these relate to sustainable housing. Such approaches included aspects of environmental perception and preference, the theory of planned behaviour, and the influence of personal norms. It was noted that feedback between behaviour (or aesthetic response) and the processes that go into producing those environmental attributes that people react to, is implicit in many models of environmental preference. However, this thesis has argued that this feedback link, which varies considerably in terms of the magnitude of spatial and temporal separation, should always be made explicit, and fully acknowledged when considering the transactional whole.

Whilst it was not the intention of the thesis to document all possible relationships occurring within the defined 'person-environment transaction', an important contribution of the thesis was in considering the psycho-social aspect of the 'sustainable housing' phenomenon as a whole, and then exploring particular aspects, whilst still keeping the

'transactional whole' in mind. One such aspect of the 'transactional whole' that was argued to be important was the 'socio-cultural context' in which any individual actions occur. Although the case studies within the thesis did not directly study the socio-cultural context, the utility of expanding the focus to include such non-observed phenomena (consistent with the transactional approach) was argued as being crucial to gaining a fuller understanding of the 'transactional whole'. This view is supported by Lawrence (1990) who argues that "*an important prerequisite for considering any example as a whole is the definition and comprehension of the component parts and the reciprocal relations between them*" (p.255). The advantage in taking such an approach is that a fuller appreciation can be gained regarding what has, and what has not been achieved in the wider context. Indeed, an appreciation of what has not been shown by a study is often more valuable in terms of determining future research endeavours than knowing what has been shown. As will be discussed in section 6.4, more work needs to be done which focuses in particular on the socio-cultural context of sustainable housing. Such studies however, would need to be similarly contextualised to take into account both the individual and the physical environment, and the reciprocal relations between them.

Although the conceptual model was built up with the person-in-environment aspect of 'sustainable housing' in mind, in many ways, the emphasis within this thesis was mainly focussed on the environmental perception aspects of the 'transactional whole'. The relationship between aspects of the environment and any behavioural response is seen as being mediated by environmental perception. The extent to which environmental perception influences the relationships between behavioural-evaluations (e.g. attitudes towards a particular behaviour) and intended behaviour is thought to be shaped by the personal context of each individual. This personal context includes factors such as personality, knowledge, values, cultural experiences, and past behaviours.

Overall, the first aim of the thesis was met initially by building up this theoretical framework from the literature. This was done in such a way that the 'transactional whole' was elaborated in much more detail than would normally be the case for a closely defined study of environmental attitudes or aesthetic preference. In this way, any studies carried out within the realm of the phenomena being investigated (in this case 'sustainable housing') can be designed and analysed with a larger number of explanatory variables in mind. The empirical data used to evaluate the utility of the theoretical framework provided much support for this approach. However, as the next section (6.2.2) will discuss, there were some potentially important amendments that should arguably be made to the theoretical framework. The suggested amendments emerged from the creative process of trying to interpret the empirical data gathered here, with reference to the theoretical framework.

## **6.2.2 Contributions from the Empirical Data**

The second aim of the thesis was to provide empirical evidence to support the theoretical framework. Initially this was tackled through two case studies, each of which had been previously documented as being potential facets of 'sustainable housing' – namely domestic water and wastewater systems (see Chapter 3), and exterior cladding materials (see Chapter 4). These first two case studies acted as an initial test of the theoretical framework's ability to accommodate different kinds of related research findings. The third case study (Chapter 5) then looked at factors influencing the likelihood of purchase consideration for 'sustainable housing', building on the material presented in the first two case studies.

### **6.2.2.1 *Substantive contributions towards the study of water and wastewater systems***

The results from the study of sustainable domestic water and wastewater management systems described in Chapter 3 showed that, greywater and rainwater recycling systems are generally considered by the public to



be fairly acceptable as a concept, although there were some concerns over the safety of such systems. It was found that people could be categorised as having different degrees of 'water friendliness', and although no significant patterns were found relating to this categorisation, it is interesting insofar as it demonstrates that such attitudes towards relatively well defined targets (in this case sustainable water management) show a degree of consistency often not found in general environmental attitudes. Indeed, the last decade has seen something of a shift in focus for psychologists looking at pro-environmental behaviour, with emphasis moving away from *general environmental concern* towards a focus on *specific environmentally relevant behaviours* (Matthies, 2003).

When the technical solution moved closer to source (beginning-of-pipe) however, as in the case of compost toilets, the responses were not so accepting. This is not surprising in many ways, as such systems have not been experienced by most people and as such, are likely to be treated with suspicion, much like any other technological innovation takes time to become accepted (cf. Lovell, 2005). However, although people did have concerns about these systems, there was a great deal of interest generated from the study. So, whilst people were not necessarily keen to actually have such systems installed, there seems to be an argument for installing such systems in non-domestic buildings initially (as is the case currently in some National Trust Properties), so that people can experience such systems working in practice. Opportunities to experience sustainable technologies in this way are likely be more effective in helping such technologies gain acceptance than any number of assurances from ecological engineers (who might for example state that there are 'no odour problems' with a properly installed system). Put simply, people would rather see (or smell) for themselves whether or not there are any particular problems with these systems.

Related to this idea that 'experience' shapes the way in which technologies might be accepted, there was some evidence that people living near to a decentralised sewage treatment system (a reedbed) were

more aware of both the positive and negative aspects of such technologies. Indeed, the perceptions of odour problems noted above were also found here in the case of an actual working system, demonstrating the importance of understanding ecological wastewater treatment systems not only from a technical and ecological standpoint, but also from a social and psychological one.

Although not all of the individual aspects of the theoretical framework were directly studied in this case study, it was possible to interpret the results of the study within this framework. As such, the intention to provide an 'initial test' of the ability of the framework was judged to be successful.

#### **6.2.2.2 *Substantive contributions towards the study of cladding materials***

The results from the study of cladding materials (Chapter 4) confirm the findings of previous research which has shown that the external cladding materials of a house (e.g. timber or brick) differ not only in terms of physical performance, but also in terms of evaluative image or aesthetic response (Nasar, 1994,2000; Herzog and Shier, 2000; Reis, 2001). Brick and Roughcast were generally rated as being the most pleasant materials, and this was found to be related to ideas about tradition and durability.

The results of the cladding study also confirmed the hypothesis that the material used as cladding for house façades significantly influences people's attitudes and preferences towards particular houses. This influence was also found to be shaped by other contextual variables such as house-type or roofing material.

The empirical results described within this thesis were also found to support the anecdotal claims of some developers and house-builders that house-buyers prefer 'traditional' cladding materials such as brick or

render. Interestingly, horizontal timber cladding also turned out to be a preferred cladding material, suggesting that people are sometimes willing to consider materials not considered to be 'traditional' (by developers), provided that they are perceived as being visually appropriate.

There was also support in the cladding study for the idea that timber cladding might be seen to represent 'sustainability' due to its perceived 'naturalness'. Moreover, there was a suggestion that such symbolic representations of sustainability might lead such building attributes to appeal in particular to those people who already hold environmental attitudes. This provides empirical evidence of a socially shared schema (or representation) of 'sustainable housing', which includes timber cladding as part of its knowledge structure.

As with the first test case study, it was possible to interpret the results of the study within the theoretical framework proposed in chapter 2. As such, the intention to provide a further 'initial test' of the ability of the framework was judged to be successful.

### ***6.2.2.3 Substantive contributions towards the study of sustainable housing within the theoretical framework proposed***

Having shown that the proposed theoretical framework could accommodate data from different kinds of research study, it was considered useful to carry out a more robust test of the theoretical framework through an experimental study. The study looking at house-purchase decisions was designed with this aim in mind. The factors influencing the likelihood of purchase consideration were studied by isolating two variables:

- The information provided about the house – specifically, whether the house was described as having 'sustainability features such as water saving devices' or not.
- The material used as cladding for the house (timber / render)

Results of this research provide additional evidence concerning the importance of studying the physical aspect of housing beyond technical considerations. Both of the independent variables manipulated in the experimental design were found to alter the relative contributions of the theory of planned behaviour (TPB) in predicting behavioural intention (likelihood of purchase consideration).

When the house was described as having sustainability features, the three components of the theory of planned behaviour (attitudes, subjective norms and perceived behavioural control) were found to be significantly associated with behavioural intention. However, when the house was described without such mention of sustainability features, none of the TPB components were significantly associated with behavioural intention. This finding is particularly important within the context of this thesis, as it not only demonstrates the sensitivity of the theory of planned behaviour (a key component of the theoretical framework) to subtle changes in the attitude-target, but also indicates the importance of non-visual information in evaluating houses, and in particular 'sustainable houses'. This is consistent with the finding of Cheung et al. (1999), who showed that the relative importance of the three TPB components were moderated by factors such as subjective knowledge or social information.

It seems likely that when a house is described as sustainable, then the available information is compared mentally with a person's 'schema' of a 'sustainable house'. The research presented here provides support for the implicit hypothesis that a socially-shared schema (or social representation) does indeed exist for 'sustainable housing', and that this schema includes expectations regarding the external appearance of housing.

In agreement with previous research (e.g. Raats et al., 1995; Kaiser and Scheuthle, 2003), the research reported here found that the influence of

personal norms on behavioural intention was mediated by attitudes. As such, personal norms are not considered as being directly related to behavioural intention, as was initially described in the theoretical framework. The theoretical framework should therefore be amended based on this finding, such that personal norms are considered as part of the 'personal context', as they do not appear to act at the situational level (where the theory of planned behaviour operates), but influence behaviour instead from a more stable enduring orientation, as found at the contextual level of motivation (Hagger et al., 2006), which in turn, of course, takes into account the socio-cultural context in which any decision is taken.

The influence of aesthetic preference on behavioural intention was not found to be as clear as originally thought. Indeed, aesthetic preference was found to have a much greater influence when there was less information provided about houses. Extrapolating somewhat from this would suggest that (not surprisingly) people rely to a much greater extent the non-visual aspects of housing when there is little other information to base judgements on. In this case, describing the house as sustainable appeared to lead to an overall drop in the influence of aesthetic preference on behavioural intention. However, as noted previously, there was still a suggestion within the results for the 'sustainable house' that the timber-clad house was closer in terms of its match to the socially-shared schema of a 'sustainable house'.

This finding that 'environmental preference' is not related in a simple way to behavioural intention is important in terms of how the results of environmental preference studies are interpreted. It would be easy to assume that positive environmental preferences would be significantly associated with any related behavioural response. However, this thesis has demonstrated the importance of separately considering people's attitudes towards a target object (e.g. environmental preferences relating to houses) and their attitudes toward any behaviour associated with that object. Thus, environmental preference studies might not be able to

claim that trends in preference will influence action in a predictable way. This is not to say that preference never influences behaviour, but rather that the results of this thesis demonstrate that link between the two is often mediated by other factors.

The findings of Sadalla and Sheets (1993) concerning the ability of people to infer personality characteristics from building materials were supported by the empirical results of this thesis. Moreover, it was found that, like preference, the influence of inferred-personality on behavioural intention varied depending on the information (i.e. sustainable or not) provided on or about the house.

Many valuable studies have previously been carried out which have focussed predominantly on the technical aspects of sustainable housing (e.g. Marsh, 1997), with the aim of optimising the physical product. Similarly, many studies have focussed predominantly on the psychological aspects of sustainability, by considering such factors as beliefs, norms and attitudes (e.g. Stern, 2000), with the aim of understanding the psychological determinants of pro-environmental behaviour.

Overall, this study (along with the other two case studies) has demonstrated the utility of considering both the physical aspect of sustainable housing and the psychological aspect. Moreover, it has been shown that experimental studies can be designed that study the interaction between the two aspects in some detail. Although the socio-cultural context that the links between these occur in was not investigated to any great degree within this study, it was acknowledged as being important, and further research should focus more on this aspect of the person-in-environment, as will be discussed in section 6.4.

As previously noted, the individual component of the model was amended to take two changes into account. Firstly, personal norms were included within the personal context, and as such are now not considered to have

a direct influence on behavioral intention. Rather, the influence of personal norms is considered as being mediated by both environmental preference and behavioural context. In addition to this change, the finding that environmental preference predicts behavioural intention in some circumstances (after having taken all other TBP factors into account), is now reflected in the conceptual model by the blue dashed line connecting environmental preference to behavioural intention. The amended conceptual model can be seen in Figure 53

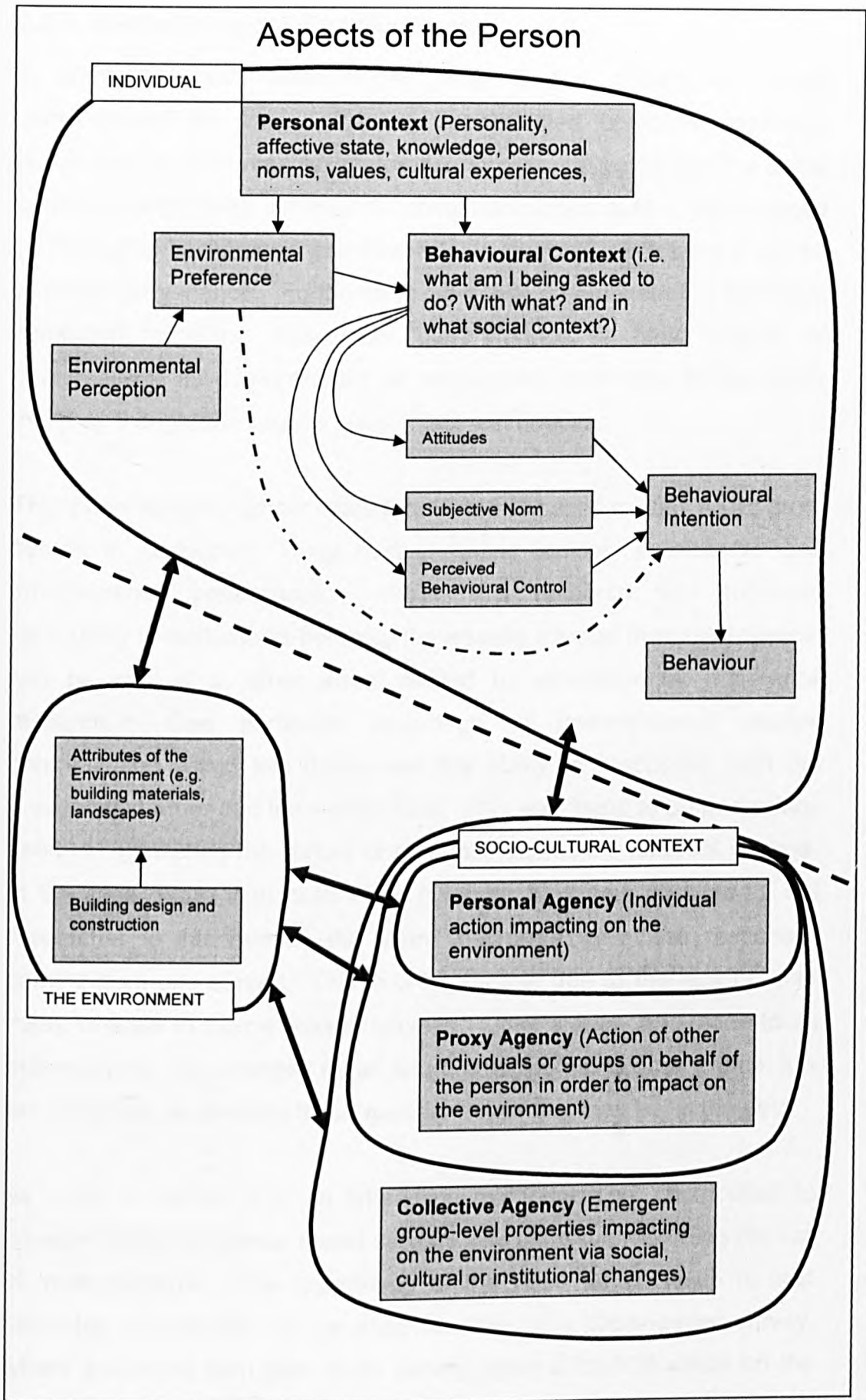


Figure 53 - Amended Conceptual Model



### 6.2.3 Methodological Contributions

In agreement with other studies (e.g. Davies, 2004), this thesis demonstrated the value of using sophisticated computer modelling techniques in environmental preference studies. In particular, the ability to superimpose three dimensional computer models onto a standardised photographic background was beneficial in terms of minimising a source of response variance. Furthermore, this thesis demonstrated that such computer modelling techniques can produce a high degree of photorealism, as demonstrated by respondent comments to the effect that they thought the houses were in fact real houses.

This thesis has also demonstrated that internet-based studies are of great benefit in conducting image-based studies looking at attitudes and environmental preferences. Whilst this research was focussed particularly in sustainable housing, the lessons learned from the research can be applied in other areas related to environmental preference research. One particular advantage of internet-based studies demonstrated within this thesis was the ability to randomise both the presentation order and the survey itself. This was found to be particularly useful in monitoring the spread of response across the different surveys. In the case of the third case study (Chapter 5), it was possible for the researcher to intervene in the event that there were less responses coming from one survey. This is only possible due to the lack of time-delay inherent in internet-based surveys. Once a change is made to an online survey, it is changed for all future participants. In other words, it is not necessary to consider those questionnaires that may be 'in the post'.

As noted in section 4.6, an interesting methodological contribution to emerge related to internet-based surveys was the issue regarding the use of 'radio buttons'. The importance of the radio button issue is best illustrated by example. If one imagines filling in a paper-based survey, where tick-boxes form part of the survey, once a mark is made on the paper by pen (or pencil), it would be unusual to give it another thought.

This is, in many ways what may potentially happen in the radio button situation, where someone may click on the button using the mouse, but not give it another thought (and not notice that the button has not been checked). Although the solution to this issue was not technically difficult, it is notable that the problem was not at the time widely recognised, as demonstrated by the difficulty in finding a solution. As to how potentially 'serious' this issue is, this must be left to speculation, but given the widespread use of radio buttons for online surveys, and other online tools, it is possible that a proportion of that which is labelled 'missing data' might well result from this seemingly minor usability issue.

### **6.3 Limitations of the Research**

It is acknowledged that there are some areas where the research carried out within this thesis might have been improved.

One such limitation was that there was no shared attitude object between the first case study (wastewater) and the second case study (cladding), so it is hard to generalise beyond each individual case study – although this provided a good test of the ability of the theoretical framework to accommodate diverse data, it would arguably have been good to have a higher degree of crossover between the studies (this was for practical and funding reasons as noted in section 1.4). Having said that, the third study does make a link between the two, by using 'water saving devices' as the main descriptive material for the 'sustainable condition' house.

In addition to this, as is the case with many studies looking at the attitude behaviour link, no actual behaviour was studied. Although previous studies have shown a high correlation between behavioural intention and actual behaviour (as high as 95% in some cases – e.g. Kaiser et al., 2005), it would have been interesting to study people in the process of making actual house purchase decisions, as the psychological processes are likely to be very different to those apparent from a hypothetical house purchase decision.

The sensitivity of the survey in the third case study to the change in the attitude target meant that there is a possibility that the reason for any differences might be due to measurement error. This is particularly true in the case of the house with a render façade, which was described in a standard manner. Questions relating to the sustainability of the house might have been confusing for respondents, as they were not provided with sufficient information to make such judgements. It is interesting to note however, that no respondents reported any such confusion for either of the two surveys depicting timber clad houses – again supporting the idea that 'timber cladding' is in some way seen to represent sustainability.

Another limitation of the third case study was that the measures of personal norms (along with awareness of consequences and ascription of responsibility) were based on single-item responses. This was mainly due to the inevitable trade-off all researchers must make between questionnaire length and respondent fatigue (i.e. usability). Although other studies do use single item measures of personal norm (e.g. Nordlund and Garvill, 2003), it would be interesting to see what effect the use of longer scales to measure personal norms (e.g. Garcia-Mira et al., 2002) would have on the findings of this study. A similar point can be made about the measures of individual agentic beliefs, which were also measured using single item measures. Again, it would be interesting to examine the effect that using longer scales would have had on the research findings. In the case of agentic beliefs, however, it would be important to ensure that any such scales were built up with the issue being investigated in mind.

As mentioned in the discussion relating to the advantages and disadvantages of internet-based surveys (section 4.3.3), there are a few inherent disadvantages with fixed-URL<sup>110</sup> internet based surveys such as those used in this thesis. Most notable in this case is the issue of self-selection. Whilst every effort was made to advertise the survey to a wide sample of potential respondents (using local press releases, and emailing relevant lists), it is arguable that the sample might not be as representative of the population of potential house-purchasers as might have been desired. For example, a much larger proportion of the sample in the third study was university educated than is the case for the Scottish population. Future studies would benefit from considering such issues to a greater extent when working out methods for recruiting an internet-based sample.

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<sup>110</sup> Fixed-url in this context simply means a single url (uniform resource locator). There are methods of varying the url, such that response rates can be measured from a target sample, but these techniques were not used within this thesis.

All of the reported studies within this thesis rely on using constructs (measured using rating scales) which might arguably not represent constructs within any given participant's 'range of convenience', which "*comprises all those things to which the user would find its application usefu*" (Kelly, 1955, p.5). Whilst the third case study did use an elicitation survey prior to the main study, this was based on the assumption that the attitudes represented came from a 'comparable population', and the individuals from whom the constructs were elicited did not participate in the main study. Indeed, there is much evidence to support the idea that research which uses people's own constructs provides more valid results (Kelly, 1955). A recent study by Wilson and Mackenzie (2000) demonstrated the utility of eliciting participants own constructs about the phenomenon under investigation, by looking at perceptions of domestic interiors. It would be interesting to follow a similar approach looking at perceptions of sustainable housing, both from an interior and an exterior viewpoint.

In addition to these suggestions, the following section will go into more detail about some of the potential avenues for research which are worth pursuing in the future.

## **6.4 Suggestions for further research**

Overall, the work carried out within this thesis has demonstrated that the transactional approach provides a useful framework for looking at sustainable housing. However, whilst many issues were explored, and many questions answered, there are many questions raised which indicate potential areas of future research.

In particular, it would be useful for further research to examine more closely the behaviour defined within the third case study presented here: namely, 'the purchase of a sustainable house'. By examining the physical environment in relation to such 'sustainable behaviours', lessons can be learned which benefit both theory and practice. It was noted in chapter 2 that while there is evidence of a growing demand for 'sustainable houses', this increase in demand has yet to receive a full response in production terms. Although research is beginning to look at the potential 'consumer' (e.g. Lovell, 2005) of sustainable housing, there is still much research to be done in the area, particularly within the realm of housing economics. Moreover, it would be instructive to carry out such studies within the transactional framework suggested within this thesis.

It would be interesting to look in more detail at the factors which make up the popular definition of a 'sustainable house', and use this knowledge to identify those issues which might benefit from being made more salient either by information provision or design. Effectively what is needed is a better understanding about what makes up the social representation of 'sustainable housing'. This thesis has gone some way in beginning to identify some aspects that may contribute to this, but clearly there are many other facets that need to be explored, such as energy saving technologies, solid waste separation facilities (within the house), and domestic consumption that takes place within the house.

It would be worthwhile to look in more detail at how recent developments in methods for assessing 'design quality' (see e.g. Gann et al., 2003)

might go about including some of the contextual issues raised by the sustainable development agenda. By providing a portfolio of quality indicators, it has been argued that such approaches encourage greater debate about the importance of design quality, as have the various design value studies recently carried out by CABI (2003;2004). Insofar as these techniques generate debate, this is welcome, but the extent to which these approaches influence practice of the notably conservative house-building industry can yet not be assessed. Most studies that have looked at issues of design quality in housing have, to date, looked at houses built-for-sale by private developers. Given the extent to which developments consisting of houses of arguably poor design value are being increasingly noted as problematic by planners (Stirling, 2005), it is certainly timely to look at ways in which symbolic indicators of sustainability (as discussed within this thesis) might be seen to enhance or detract from any measure of 'design quality'.

Related to this, it would be interesting to examine the influence of familiarity on perceptions of timber cladding. Davies, I. et al., (2002) note that "*house-buyers are often resistant to timber cladding since they perceive timber-clad and timber-framed homes to be somehow inferior to 'traditional' masonry-clad timber-framed homes*" (p.7). Indeed, the widespread use of timber cladding in Scandinavia is notable, where any negative associations regarding issues of maintenance evident within the UK, are interestingly seen as a positive opportunity to 'freshen up' house exteriors (Davies, I. et al, 2002). It would be particularly interesting to compare two samples drawn from places where timber cladding is either the rule (as in Scandinavia), or the exception (as in the UK), especially in terms of how much this natural material is seen to be a physical representation of sustainability. It is likely that this is less likely to be the case in Scandinavia, but further research would be needed to examine this.

Future work should also consider the extent to which professional socialisation (see Wilson, 1996) is responsible for sustainable thinking in

architects, and how the education of architects has changed over the period of time following the publication of the Brundtland Report (UN, 1987). It seems that some schools appear to provide much more 'sustainability' training than others, and it would be interesting to see if the designs that come out of these 'more sustainable schools' reflect this.

In addition to these suggested avenues for further research, it would be interesting to use a similar transactional approach to other phenomena concerning behaviour-in-context (e.g. behaviours related to sustainable transport, or sustainable consumption). While the theory of planned behaviour acknowledges the importance of contextual specificity, it is arguable that many studies have focussed more on specifying the social aspects of context, and not considered the physical aspect of this context to the same extent. So whilst it is true, as Lewin (1951) said, that "*the social aspect of the psychological situation is.....as important as the physical [aspect]*" (p.241), this should not lead researchers to neglect the physical aspect of psychological phenomenon. On the contrary, environmental psychology needs more "*theories, methods, concepts and research which address the environment in environmental psychology*" (Sime, 1999, p.205).



## **6.5 Concluding remarks**

This thesis has suggested that although there is not some kind of 'platonic perfect' form of sustainable housing, the essence of 'sustainability' as understood in the public imagination might not be sufficiently captured in the product-driven nature of developer-led house building.

It seems that those intuitively desirable, hidden or end-of pipe solutions to sustainability problems are not necessarily always the best way to achieve acceptance. Moreover, it seems that the often elusive link between attitudes and behaviour is more likely to occur if the circumstances are such that the 'solution' or 'change' in question is in some way 'visible'. In the absence of such visible solutions, other factors seem to play a larger role. Thus, hiding the solutions to sustainability problems behind a veneer of unobtrusiveness is not necessarily the optimum solution. Indeed, some of the findings within the research reported here suggest that the opposite might sometimes be the case.

The utility of adopting a transactional perspective has been clearly demonstrated within this thesis, both in terms of defining the domain of investigation, and in interpreting the results from empirical studies. Furthermore, sustainable housing has been shown to be a phenomenon which can be studied in a holistic manner by defining it as a triadically reciprocal interaction between individuals, the socio-cultural context, and the physical environment.

It is suggested that the conceptual model resulting from this thesis provides a useful starting point for future studies looking at those behaviours which include a physical-environmental component. Many previous studies carried out in the tradition of theory of planned behaviour (Ajzen, 1991) would benefit from being replicated to examine the effects of both physical environmental and socio-cultural factors on the three TPB components antecedent to behavioural intention. As mentioned

previously, example study foci might include those which look at factors influencing sustainable transport, sustainable consumption, engagement in healthy activities, and participation in planning. Taking sustainable transport as an example, research should look not only at attitudes, subjective norms and perceived behavioural control, but should also look at the physical environmental context in which any transportation choice or activity occurs, as well as placing such decisions in the socio-cultural context in which they are made. If there are symbolic meanings that have come to be associated with particular forms of transport (for example, in the economic boom of the 1980's, buses were considered by some to be a symbol of low socioeconomic status), then these associations need to be first documented, and the possibility of alternative associations emerging examined.

This thesis has provided empirical evidence which validates the use of the proposed conceptual model for looking at sustainable housing. However, notwithstanding the above mentioned need to explore the validity of the model in different contexts, it is also necessary to continue studying its implications for studying behaviours related to sustainable housing. House purchase behaviour is but one of many other behaviours related to the house which have the potential to feed into the goals of sustainable development. Those other behaviours (e.g. composting, home maintenance, recycling, gardening) should be investigated using the conceptual model proposed within this thesis.

On a broader note, the study of the 'meaning' associated with particular building materials is potentially of great use to architects and built environment professionals. The finding that timber is seen to be a physical manifestation of a social representation of 'sustainability', is closely tied to both notions of vernacular architecture, and also of the close association between 'natural' and 'sustainable' within the popular imagination. A future built on the principles of sustainability in this sense requires both physical and social changes. More specifically, such a future is very dependent on the ability of any social representation of

sustainability to make concrete this complex and multifaceted concept. The results of this research suggest that this might have already begun.

## 7 References

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## 8 Publications resulting from this research

### 8.1 Journal Articles

Burkhard, R., Deletic, A. and **Craig, A.**,(2000), Techniques for Water and Wastewater Management: A Review of Techniques and their Integration in Planning, *Urban Water*,2(3),197-221.

### 8.2 Book Chapters/Conference Proceedings

**Craig, A.**, Abbott, L., Laing, R., & Edge, M. (2005). Assessing the acceptability of alternative cladding materials in housing: theoretical and methodological challenges. In R. Garcíá-Mira, D. Uzzell, J. Real & J. Romay (Eds.), *Housing, Space and Quality of Life* (pp. 59-69). Aldershot: Ashgate.

Edge, M., & **Craig, A.** (2005). Internet Methodologies in Housing Research. In D. U. Vestbro, N. Wilkinson & Y. Hurol (Eds.), *Methodologies in Housing Research* (pp. 272-285). Gateshead: Urban International Press.

**Craig, A.**,(2002), Overcoming Expertocracy Through Sustainable Development : The Case of Wastewater, in: G. Moser, E. Pol, Y. Bernard, M. Bonnes, J. Corraliza & V. Giuliani (Eds.) *Places, People & Sustainability* (pp. 270-279), Göttingen, Germany: Hogrefe & Huber.

### 8.3 Conference Presentations

**Craig, A.**, Abbott, L., Laing, R. and Edge, M. (2002), Assessing the acceptability of alternative cladding materials in housing: theoretical and methodological challenges, Paper presented at the 17th Conference of the International Association for People-Environment Studies, La Coruna, Spain, 24th-27th July.

Abbott, L. and **Craig, A.** (2002), The functional and symbolic aspects of building materials: a socio-psychological perspective, Paper presented at the British Psychological Society Social Psychology Section Annual Conference, University of Huddersfield, September 2002.

Edge, M. & **Craig, A.**, (2002), Change and Innovation in Housing Design: Investment Characteristics of New Forms of Owner-Occupied Housing, *Proceedings of the ENHR 2002 Conference 'Housing Cultures - Convergence and Diversity'*, Vienna, 1-5 July.

Laing, R. and **Craig, A.**,(2001), The Holistic Value Assessment of Prefabricated Housing: Evolving Technologies and Methodologies, Paper Presented at the 32nd conference of the Environmental Design Research Association (EDRA)

- Craig, A.** and Laing, R.,(2001), Prefabrication and Standardisation in Housing: Old Dreams Revisited, Paper presented at the 32nd conference of the Environmental Design Research Association (EDRA)
- Laing, R., **Craig, A.** and Edge, M.,(2001), Prefabricated Housing: An Assessment of Cost, Value and Quality., Paper presented on the 19th June at the International Conference on Construction, Hong Kong
- Craig, A.**, Laing, R. & Edge, M. ,(2000), The Social Acceptability of Prefabrication and Standardisation in New Housing, Paper presented at the 16th Conference of the International Association for People-Environment Studies, Paris, 4th-7th July
- Burkhard, R., **Craig, A.** and Deletic, A.,(2001), A Review of Rainwater Management Techniques and their Integration in Planning, Paper presented at the RIAS Convention in Dundee on May 17th - 19th 2001. Laying Siege to Toytown
- Craig, A.**,(2001), Selling Green - will the public buy it?, Developing Sustainability: North East. Seminar of the Aberdeen Sustainability Research Trust. 5th Dec, 2001
- Burkhard, R., Deletic, A. & **Craig, A.** ,(1999), Evaluation of Holistic Water and Wastewater Management Strategies for New Housing Developments: A Review, Paper presented at the 4th SANHYGA99 conference in Piestany, Slovak Republic.

## Appendices



***Appendix 1: Water and Wastewater Study***

## SECTION 1

Over the past few years, water pollution and water shortage have become important issues in both Scotland and Britain as a whole. Water in our taps is treated to extremely high standards (to make it safe to drink), and it is this water that we use to flush our toilets with. At the moment, over a third of the total mains water we use goes on flushing the toilet. It has been suggested that we can reduce many of these problems by using water in a more environmentally friendly way.

This would mean using less water in general, and also possibly re-using some of the water that we presently drain away down the plughole. This recycled water is **not** suitable for drinking, but if treated could be used to flush toilets or water the garden. This water would be treated to a safe standard, but would be slightly cloudy in appearance. Only water from baths, showers and hand basins would be used in such systems.

Another way of using less mains water would be to use rainwater collected from roofs. The technology to collect, store, and use this water is fairly straightforward, and has the potential for large water savings.

Listed below are some statements made by people about water issues. Could you please read each one carefully and indicate the amount you personally agree with each one by placing a tick in the appropriate box.

1) *It rains all the time in this country, so we don't need to worry about saving water.*

- Strongly Agree  
 Agree  
 Neither Agree or Disagree  
 Disagree  
 Strongly Disagree

3) *I would be willing to use recycled water to water the garden with.*

- Strongly Agree  
 Agree  
 Neither Agree or Disagree  
 Disagree  
 Strongly Disagree

2) *I would be willing to re-use water from baths or showers to flush my toilet with.*

- Strongly Agree  
 Agree  
 Neither Agree or Disagree  
 Disagree  
 Strongly Disagree

4) *Recycling water in this way is good for the environment*

- Strongly Agree  
 Agree  
 Neither Agree or Disagree  
 Disagree  
 Strongly Disagree

5) Using rain water makes a lot of sense given that it rains so much here.

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

8) Things that make people more aware of the amount of water they use are a good idea.

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

6) We should value water more than we do.

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

9) I would be willing to use recycled water to water a vegetable patch with.

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

7) Water companies should do more to stop drought's happening

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

10) If the water from baths and showers was called "Greywater", this would put me off using such a system.

- Strongly Agree
- Agree
- Neither Agree or Disagree
- Disagree
- Strongly Disagree

11) These "GREYWATER" systems need maintaining about once a year (about the same effort as changing a tap washer) would this bother you at all?

- Yes
- No
- Not Sure

11b) Have you ever come across GREYWATER systems before?

- Yes
- No

12) If you think there might be any problems with using GREYWATER to flush toilets or water the garden, please list them here:

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13) If you think there might be any problems with using RAINWATER for flushing toilets or watering gardens, please list them here:

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14) Have you ever come across RAINWATER systems before? Yes

No

15) As with any home improvement, these systems cost money. Baring this in mind, would you be willing to pay to have a water recycling system installed in your property if it meant that you paid £50 a year less on council tax.

Yes

No  → Go to Question 17

16) How much would you be prepared to pay to have a water recycling system installed in your property?

£0  (Only if it was free)

less than £50  £200

£100  £300

£150  more than £300

17) Who do you think should pay for installing systems like this? \_\_\_\_\_

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18) Why is this? \_\_\_\_\_

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**SECTION 2**

As was described above, using rainwater and re-using water from our baths, showers, etc. would cut down dramatically on the amount of mains water used. However, some argue that to be truly environmentally friendly, it would be better to reduce the need to flush so much water down the toilet. This would mean using a different kind of toilet which does not have a water flush. While this can seem like a strange idea, it is now seen as a good solution to a serious environmental problem. In fact, the National Trust have started installing them at many of their sites around the UK. These new toilets either have no water in them, or use very small amounts of water. This not only saves wasting water, but also provides a useful compost which can be used for agricultural purposes. A lot of work has gone into designing these toilets, so they are hygienic and odour free.

19) Would you ever consider having such a toilet put in your house?

- Yes
- No
- Not Sure

20) Please list any concerns you might have about such a toilet:

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21) As with any home improvement, these systems cost money. Baring this in mind, would you be willing to pay to have a composting toilet installed in your property if it meant that you paid £50 a year less on council tax.

- Yes  → Go to Question 22
- No  → Go to Question 23

22) How much would you be prepared to pay to have a composting toilet installed in your property?

- £0  (Only if it was free)
- less than £50  £200
- £100  £300
- £150  more than £300

23) Do you know where sewage from your house gets treated?

- Yes  → Where is it treated? \_\_\_\_\_
- No  \_\_\_\_\_

24) Do you know what the water authority in this region is called?

- Yes  → What is it called? \_\_\_\_\_
- No

25) What is your opinion about the use of WATER METERS to charge people for the amount of water they use?

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Thank you very much for taking the time to complete this questionnaire. Please write in any comments or suggestions you have regarding the questionnaire here:

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Please now fill in the back page and return the questionnaire in the FREEPOST envelope provided.

**SECTION 3 Background Information**

It would be useful for the purposes of this study, if you could provide some background details about yourself. If you would prefer not to fill out this part, then leave it blank. We would still be interested in your responses to the rest of the questionnaire.

Sex Male   
 Female

Which of the following age bands do you fall into? Less than 20

21-30

How long have you lived in your present home ?

31-40

Less than one year

41-50

1 - 5 Years

51-60

Over 5 Years

over 60

Do you know what year your house was built in?

Yes  → What year (approx.)

No  → Approximately how old would you say your house was? \_\_\_\_\_  
 \_\_\_\_\_

How many people live in your household (including yourself)?

One  Two  Three

Four  Five  Six

More than six -----

Is your home: Rented

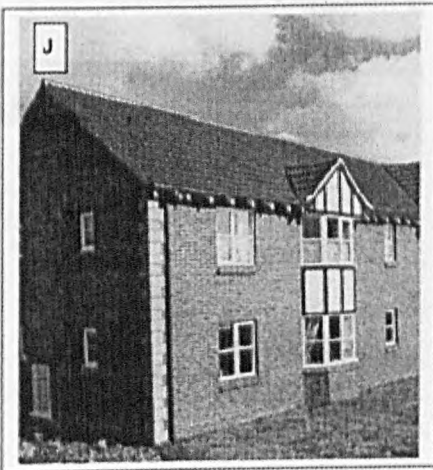
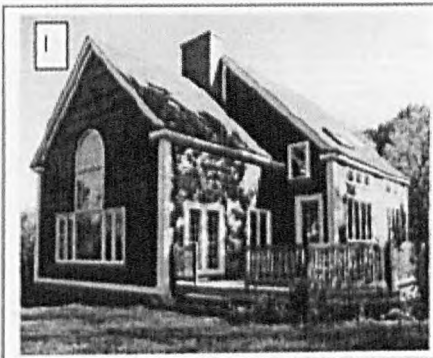
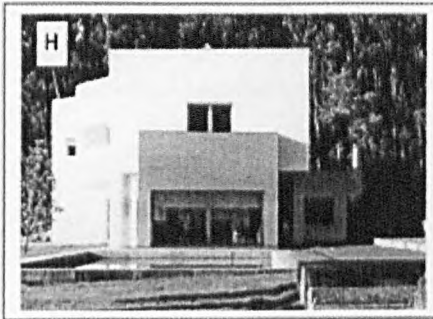
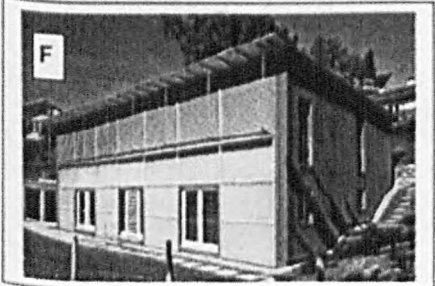
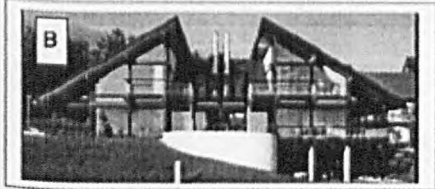
Owned

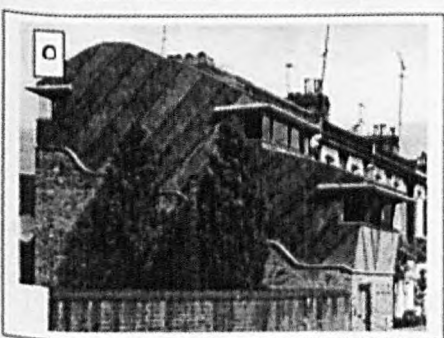
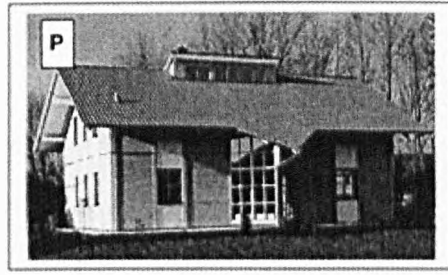
Other (Please Specify)  \_\_\_\_\_  
 \_\_\_\_\_

**THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE**



***Appendix 2: Houses presented in study of attitudes towards various house types***





### ***Appendix 3: Surveys for study of cladding materials***



THE  
ROBERT GORDON  
UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

Research Centre for:

Scott Sutherland School

Garthdee Road

Aberdeen

AB10 7QB

United Kingdom

*Tel: 01224 263544*

*Fax: 01224 263737*

We are doing a research project at the Robert Gordon University looking into innovative methods of constructing new houses, including the use of different wall and roof materials. We would be grateful if a member of your household could take the time to fill in the attached questionnaire.

The purpose of this survey is to collect information about the attitudes people have toward the use of various wall and roof materials.

In order to study this, we have modelled the houses on a computer, and placed them in a photograph of a real place, so as to create a realistic impression of each house. You will notice that the background doesn't change when the pictures do. This is because we are interested only in your opinions about the houses themselves.

Anonymity of responses is assured.

On behalf of the project team, I would like to thank you for taking part in this project.

Sincerely,

Anthony Craig.

# RESEARCH SURVEY

On each of the following pages, you will be presented with two views of a particular house, followed by a series of questions about that house. Please answer as many questions as possible, leaving blank any that are unclear. Remember that there are no right or wrong answers, and that all opinions are taken seriously.

All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:



A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
2. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
24.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
46. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:



Strongly Agree  
Agree  
Slightly Agree  
Neither Agree  
nor Disagree  
Slightly Disagree  
Disagree  
Strongly Disagree

1 2 3 4 5 6 7

- 57. I would consider buying this house  1  2  3  4  5  6  7
- 58. This house has a pleasant appearance  1  2  3  4  5  6  7
- 59. The house style is "traditional"  1  2  3  4  5  6  7
- 60. This house strikes me as being unusual  1  2  3  4  5  6  7
- 61. This house looks boring  1  2  3  4  5  6  7
- 62. The colours of the materials complement each other  1  2  3  4  5  6  7
- 63. This house looks like it will last a long time  1  2  3  4  5  6  7
- 64. I find this house unappealing  1  2  3  4  5  6  7
- 65. I would say the house style is "modern"  1  2  3  4  5  6  7
- 66. I think developers could easily sell houses like this  1  2  3  4  5  6  7

67. If you have any other comments you would like to make about the appearance of this house, then please write them in here

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.



**1**

2832



THE  
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UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

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On behalf of the project team, I would like to thank you for taking part in this project.

Sincerely,

Anthony Craig.

# RESEARCH SURVEY

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A



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3.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
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13.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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20.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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22.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
24. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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28. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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33. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
46. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In regard to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
57.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.

**2**

2833



THE  
ROBERT GORDON  
UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

Research Centre for:  
Scott Sutherland School  
Garthdee Road  
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*Tel: 01224 263544*

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We are doing a research project at the Robert Gordon University looking into innovative methods of constructing new houses, including the use of different wall and roof materials. We would be grateful if a member of your household could take the time to fill in the attached questionnaire.

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In order to study this, we have modelled the houses on a computer, and placed them in a photograph of a real place, so as to create a realistic impression of each house. You will notice that the background doesn't change when the pictures do. This is because we are interested only in your opinions about the houses themselves.

Anonymity of responses is assured.

On behalf of the project team, I would like to thank you for taking part in this project.

Sincerely,

Anthony Craig.



# RESEARCH SURVEY

On each of the following pages, you will be presented with two views of a particular house, followed by a series of questions about that house. Please answer as many questions as possible, leaving blank any that are unclear. Remember that there are no right or wrong answers, and that all opinions are taken seriously.

All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:



A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
2. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
24.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
46. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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49. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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52. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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*In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:*

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
57. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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67. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  
 Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  
 16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  
 One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  
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 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  
 Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  
 Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.

**3**

2834



THE  
ROBERT GORDON  
UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

Research Centre for:

Scott Sutherland School  
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AB10 7QB  
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*Tel: 01224 263544*

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Anonymity of responses is assured.

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Sincerely,

Anthony Craig.



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All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:



A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
2. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
24.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:



	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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**E**



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
46.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:



Strongly Agree  
Agree  
Slightly Agree  
Neither Agree nor Disagree  
Slightly Disagree  
Disagree  
Strongly Disagree

1 2 3 4 5 6 7

- 57. I would consider buying this house  1  2  3  4  5  6  7
- 58. This house has a pleasant appearance  1  2  3  4  5  6  7
- 59. The house style is "traditional"  1  2  3  4  5  6  7
- 60. This house strikes me as being unusual  1  2  3  4  5  6  7
- 61. This house looks boring  1  2  3  4  5  6  7
- 62. The colours of the materials complement each other  1  2  3  4  5  6  7
- 63. This house looks like it will last a long time  1  2  3  4  5  6  7
- 64. I find this house unappealing  1  2  3  4  5  6  7
- 65. I would say the house style is "modern"  1  2  3  4  5  6  7
- 66. I think developers could easily sell houses like this  1  2  3  4  5  6  7

67.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.

**4**

2835



THE  
ROBERT GORDON  
UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

Research Centre for:  
Scott Sutherland School  
Garthdee Road  
Aberdeen  
AB10 7QB  
United Kingdom

*Tel: 01224 263544*

*Fax: 01224 263737*

We are doing a research project at the Robert Gordon University looking into innovative methods of constructing new houses, including the use of different wall and roof materials. We would be grateful if a member of your household could take the time to fill in the attached questionnaire.

The purpose of this survey is to collect information about the attitudes people have toward the use of various wall and roof materials.

In order to study this, we have modelled the houses on a computer, and placed them in a photograph of a real place, so as to create a realistic impression of each house. You will notice that the background doesn't change when the pictures do. This is because we are interested only in your opinions about the houses themselves.

Anonymity of responses is assured.

On behalf of the project team, I would like to thank you for taking part in this project.

Sincerely,

Anthony Craig.



# RESEARCH SURVEY

On each of the following pages, you will be presented with two views of a particular house, followed by a series of questions about that house. Please answer as many questions as possible, leaving blank any that are unclear. Remember that there are no right or wrong answers, and that all opinions are taken seriously.

All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:



A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
2.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
24. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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# E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
46.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
57.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.

**5**

2236



THE  
ROBERT GORDON  
UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

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Garthdee Road  
Aberdeen  
AB10 7QB  
United Kingdom

*Tel: 01224 263544*

*Fax: 01224 263737*

We are doing a research project at the Robert Gordon University looking into innovative methods of constructing new houses, including the use of different wall and roof materials. We would be grateful if a member of your household could take the time to fill in the attached questionnaire.

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On behalf of the project team, I would like to thank you for taking part in this project.

Sincerely,

Anthony Craig.



# RESEARCH SURVEY

On each of the following pages, you will be presented with two views of a particular house, followed by a series of questions about that house. Please answer as many questions as possible, leaving blank any that are unclear. Remember that there are no right or wrong answers, and that all opinions are taken seriously.

All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:

A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
2. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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\_\_\_\_\_





In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
24.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	1	2	3	4	5	6	7
	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
46. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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55. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
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57. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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67.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
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77. **Is your home:**  Owned outright  
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78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.

**6**

2837





THE  
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UNIVERSITY  
ABERDEEN

FACULTY OF DESIGN

SEARCH

Research Centre for:

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AB10 7QB

United Kingdom

*Tel: 01224 263544*

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Sincerely,

Anthony Craig.

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All of the houses presented in this survey are built using timber frames. If you have any opinions about the use of timber frame construction in house-building, please write them in the following box:

A



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
2. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
13. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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C



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

		Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
		1	2	3	4	5	6	7
24.	I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33.	I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
35. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. If you have any other comments you would like to make about the appearance of this house, then please write them in here

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E



In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
46. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

56.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	Strongly Agree	Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Disagree	Strongly Disagree
	1	2	3	4	5	6	7
57. I would consider buying this house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. This house has a pleasant appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. The house style is "traditional"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. This house strikes me as being unusual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. This house looks boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. The colours of the materials complement each other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. This house looks like it will last a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. I find this house unappealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. I would say the house style is "modern"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. I think developers could easily sell houses like this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

67.

If you have any other comments you would like to make about the appearance of this house, then please write them in here

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It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

73. **Sex**  Male  
 Female

74. **How long have you lived in your present home?**  Less than 1 year  
 1-5 Years  
 5-10 years  
 Over 10 Years

75. **Which of the following age bands do you fall into?**  16-20  
 21-30  
 31-40  
 41-50  
 51-60  
 Over 60

76. **How many people live in your household (including yourself)?**  One  Four  
 Two  Five  
 Three  More than 5

77. **Is your home:**  Owned outright  
 Owned with mortgage  
 Part owned  
 Rented  
 Other

78. **What type of property is your home?**  House  
 Bungalow  
 Flat  
 Maisonette  
 Other

79. **Approximately, when was your house built?**  Pre 1900  1960-1990  
 1900-1939  Post 1990  
 1940-1959

80. **Would you consider buying a house in a new housing development?**  Yes  Maybe  
 No

Many thanks for taking the time to complete this. Please now return the survey using the freepost envelope provided.



**7**  
2838

**Appendix 4: Detailed results of the correspondence analysis for the combined data of the cladding survey**

Note: '1-36' simply means.... Survey 1, House Number 36

	INR	Factor 1 Co-Ord	Rco	CTR	Factor 2 Co-Ord	Rco	CTR
1-36		-0.27	0.56	0.01	0.01	0.00	0
1-29		-0.02	0.01	0	-0.24	0.91	0.01
1-1		0.32	0.39	0.01	-0.22	0.18	0.01
1-15		1.12	0.82	0.10	0.53	0.18	0.07
1-22		-0.8	0.82	0.05	0.34	0.15	0.03
1-8		-0.35	0.35	0.01	-0.43	0.54	0.05
2-2		-0.17	0.08	0.00	-0.37	0.41	0.03
2-16		0.4	0.76	0.01	-0.09	0.04	0.00
2-9		-0.98	0.65	0.08	0.68	0.31	0.12
2-23		0.41	0.97	0.01	0.01	0.00	0
2-30		-0.18	0.15	0.00	-0.38	0.69	0.04
2-31		0.53	0.76	0.02	0.12	0.04	0.00
3-10		-0.93	0.75	0.07	0.52	0.24	0.07
3-24		-0.27	0.53	0.01	-0.2	0.31	0.01
3-17		0.5	0.65	0.02	-0.14	0.05	0.01
3-31		0.17	0.38	0.00	-0.12	0.17	0.00
3-26		0.2	0.77	0.00	0	0	0
3-3		0.32	0.60	0.01	-0.06	0.02	0.00
4-18		0.12	0.08	0.00	-0.33	0.58	0.03
4-32		-0.03	0.01	0.00	-0.24	0.40	0.01
4-11		-0.4	0.79	0.01	0.05	0.01	0.00
4-21		0.14	0.57	0.00	0.1	0.26	0.00
4-25		0.76	0.66	0.05	0.32	0.11	0.02
4-4		-0.56	0.73	0.03	0.17	0.07	0.01
5-19		0.91	0.84	0.07	0.37	0.14	0.03
5-16		-0.22	0.12	0.00	-0.56	0.80	0.08
5-5		0.05	0.01	0.00	-0.36	0.54	0.03
5-33		-0.6	0.67	0.03	0.29	0.16	0.02
5-12		-0.67	0.83	0.04	0.27	0.14	0.02
5-26		0.52	0.84	0.02	-0.03	0.00	0.00
6-6		-0.59	0.73	0.03	-0.16	0.05	0.01
6-11		-0.5	0.58	0.02	-0.31	0.23	0.03
6-20		0.09	0.01	0.00	-0.64	0.61	0.11
6-34		-0.77	0.72	0.05	0.44	0.24	0.05
6-27		0.81	0.82	0.06	0.3	0.11	0.02
6-13		0.95	0.83	0.08	0.37	0.13	0.04
7-28		0.36	0.75	0.01	0.08	0.04	0.00
7-6		-0.67	0.92	0.04	-0.03	0.00	0.00
7-21		0.18	0.48	0.00	0.08	0.09	0.00
7-35		-0.12	0.18	0.00	0.17	0.39	0.01
7-14		0.13	0.12	0.00	-0.08	0.04	0.00
7-7		0.1	0.14	0.00	-0.23	0.70	0.01

	INR	Factor 1 Co-Ord	Rco	CTR	Factor 2 Co-Ord	Rco	CTR
1		0.83	0.82	0.41	0.35	0.14	0.22
2		0.41	0.62	0.10	0.01	0.00	0.00
3		0.04	0.1	0.00	-0.34	0.65	0.21
4		-0.20	0.28	0.02	-0.23	0.39	0.09
5		-0.25	0.25	0.04	-0.25	0.25	0.11
6		-0.85	0.77	0.42	0.46	0.23	0.37

***Appendix 5: Survey for study of house purchase behaviour***

## Survey



I am carrying out a research project at the Robert Gordon University looking at what people think about different types of new houses. I would be grateful if a member of your household could take the time to fill in this internet questionnaire.

The purpose of this survey is to collect information about the what kinds of things are important to people when making decisions about houses.

All responses will be treated in confidence, and anonymity is assured. You are free to withdraw from this study at any time.

I would like to thank you for taking the time to participate in this research.

Sincerely,

Tony Craig

I agree to take part in this study...

Survey - Page 1



For the purposes of this survey, imagine you are in the process of looking for a new house and are considering buying a detached house. The house shown above is currently on the market. The house is described in the marketing materials in the following paragraph. Please read this carefully and then press the 'continue' button

*This house is an extremely attractive four bedroom house. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

Continue ---->

[I would like to withdraw from this study](#)





Description:

*This house is an extremely attractive four bedroom house. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

In relation to the house pictured, please indicate the extent to which you agree or disagree with the following statements:

	strongly agree	agree	slightly agree	neither agree nor disagree	slightly disagree	disagree	strongly disagree
1. This House has a pleasant appearance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. The house described here is very similar to the house that I currently live in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I find this house uninteresting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. This house looks boring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I would say the house style is traditional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. In terms of the appearance of this house, the materials complement each other well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. There are very few houses like this available to buy in my area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	strongly agree	agree	slightly agree	neither agree nor disagree	slightly disagree	disagree	strongly disagree
8. In general houses should be built to last a long time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. In general, doing something positive for the environment is desirable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. If I wanted to buy this house, I think the price might be too high for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Continue ---->](#)

[I would like to withdraw from this study](#)

Page 3 of 6



Reminder of description:

*This house is an extremely attractive four bedroom house. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

Please indicate the extent to which you agree or disagree with the following statements:

	strongly agree	agree	slightly agree	neither agree nor disagree	slightly disagree	disagree	strongly disagree
11. I believe we have a moral responsibility to protect the environment for the sake of future generations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. In general I try to live my life in a way which is not harmful to the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. The decisions we make in our lives often have a large impact on the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	strongly agree	agree	slightly agree	neither agree nor disagree	slightly disagree	disagree	strongly disagree
14. If I bought this house, I feel that I would be doing something positive for the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. If I bought this house, I think it would last a long time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. If I bought this house, it might be complicated to operate efficiently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- |   | strongly agree        | agree                 | slightly agree        | neither agree nor disagree | slightly disagree     | disagree              | strongly disagree     |
|---|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| 17. What the government thinks is important to me in deciding what sort of house to buy             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 18. When I buy my next house, I do not intend to buy a house like this                              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 19. Houses should be easy to operate efficiently  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|   | strongly agree        | agree                 | slightly agree        | neither agree nor disagree | slightly disagree     | disagree              | strongly disagree     |
| 20. What energy providers think is important to me in deciding what sort of house to buy            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 21. If there were very few houses like this in my area, I would be much less likely to purchase one | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 22. If I bought this house, environmental groups would approve of my decision                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Continue ---->

[I would like to withdraw from this study](#)





Reminder of description:

*This house is an extremely attractive four bedroom house. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

Please indicate the extent to which you agree or disagree with the following statements:

	strongly agree	agree	slightly agree	neither agree nor disagree	slightly disagree	disagree	strongly disagree
23. If I buy this house, my energy bills will probably be lower	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. This house probably costs more than an average house	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. Many housing developers currently sell houses like this	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I think most housing developers would disapprove of my decision to buy this house	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. What environmental groups think is important to me in deciding what sort of house to buy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. What housing developers think is important to me in deciding what sort of house to buy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



- |  | strongly agree        | agree                 | slightly agree        | neither agree nor disagree | slightly disagree     | disagree              | strongly disagree     |
|--|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| 29. In general, lowering energy bills is desirable   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 30. Energy providers would probably disapprove of my decision to buy this house                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 31. If I wanted to buy this house it would be easy as there are many housing developers selling houses like this | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 32. If I bought this house, the government would approve of my decision  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 33. When I come to buying my next house, I would consider buying this house, or a house very much like it        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 34. House builders tend to build houses that will be most likely to sell easily                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 35. If enough people bought 'sustainable houses', then house builders would be more likely to build them         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 36. I think that in order for my home to be ideal, I would probably have to be involved in its design            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If you have any further comments you would like to make about the house described in this study, please type them here:

Page 4 of 4

Please read the following before answering the questions below:

Whilst the data shown in the picture was provided by someone who was interviewed and this was by their own choice, it is not possible to verify the accuracy of the data. The developer of the software that was used to collect the data is not responsible for the accuracy of the data. The data is not being used for any other purpose.

Continue ---->

[I would like to withdraw from this study](#)

Page 5 of 6

Please read the following before answering the questions below:



Imagine that the house shown in the picture was previously bought by someone who was transferred into this area by their employer, who provides housing for all of their employees. When these houses were being constructed, the developer offered each employee a variety of houses, and this particular employee chose this house. They are now moving away from the area and are trying to sell this house.

*Reminder of description:*

*This house is an extremely attractive four bedroom house. The lounge with connecting dining room provides ample space for entertaining or relaxing with the family. There is a ground floor bedroom which could easily be used as a study. Three generously sized bedrooms are located upstairs, together with the family bathroom and en-suite to the main bedroom.*

Using the following scales, please indicate what kind of personality you think **the person selling this house** is likely to have:

warm        cold

emotional        unemotional

artistic        non artistic

individualistic        conformist

formal        informal

similar to my personality        not at all similar to my personality

Continue ---->

[I would like to withdraw from this study](#)

## Page 6 of 6

It would be useful if you could provide some background details about yourself. If you would prefer not to fill out this part, just leave it blank. We would still be interested in your responses to the rest of the survey.

Gender	Male <input type="radio"/> Female <input type="radio"/>
How long have you lived in your current home?	Less than a Year <input type="radio"/> 1-2 Years <input type="radio"/> 2-5 years <input type="radio"/> 5-10 Years <input type="radio"/> More than 10 years <input type="radio"/>
Which of the following age bands do you fall into?	Under 18 <input type="radio"/> 18-25 <input type="radio"/> 26-35 <input type="radio"/> 36-50 <input type="radio"/> 51-65 <input type="radio"/> Over 65 <input type="radio"/>
How many people live in your household (including yourself)?	One <input type="radio"/> Two <input type="radio"/> Three <input type="radio"/> Four <input type="radio"/> Five <input type="radio"/> More than five <input type="radio"/>
Is your home:	Owned (outright) <input type="radio"/> Owned (with mortgage) <input type="radio"/> Part/shared ownership <input checked="" type="radio"/> Rented <input type="radio"/> Other <input type="radio"/>
What type of home do you currently live in?	Flat <input type="radio"/> House (terraced) <input type="radio"/> House (semi-detached / end terraced) <input type="radio"/> House (detached) <input type="radio"/> Bungalow <input type="radio"/> Other <input type="radio"/>
What is the highest level of education you have obtained?	Postgraduate Degree <input type="radio"/> Degree or equivalent <input type="radio"/> Higher education qualification (below degree level) <input type="radio"/> Higher or A level <input type="radio"/> Standard/O Grade or GCSE <input type="radio"/> Other qualification <input type="radio"/>



No qualification

What is your gross annual income?

- Less than £5,200 (less than £100 per week)
- £5,200 - £7,799 (£100.00 - £149.99 per week)
- £7,800 - £12,999 (£150.00 - £294.99 per week)
- £13,000 - £18,199 (£250.00 - £349.99 per week)
- £18,200 - £23,399 (£350.00 - £449.99 per week)
- £23,400 - £31,199 (£450.00 - £599.99 per week)
- £31,200 - £38,999 (£600.00 - £749.99 per week)
- £39,000 or more (£750 or more per week)

If you would like to hear more about this research study, then please enter your email address here:

(leave blank if preferred. This information will be removed from the research data set as soon as your details are added to a separate database of people wanting more information about this study, so full privacy and anonymity of responses remains assured)

Continue ---->

[I would like to withdraw from this study](#)



## Appendix 6: Descriptive Statistics for study of house-purchase behaviour

Descriptive Statistics

	N	Mean	Std. Deviation
Pleasant	108	2.69	1.483
Similar to current house	108	5.79	1.697
Uninteresting	108	4.48	1.759
Boring	108	4.35	1.753
Traditional	108	3.71	1.675
Materials Complement each other	108	3.02	1.414
Few available to buy	108	2.73	1.817
Houses should be built to last	108	1.39	.667
pos env = desirable	108	1.44	.702
price prob. too high	108	2.94	1.582
AR (Env)	108	1.56	.752
PN (Env)	108	2.11	.900
AC (Env)	108	1.94	1.061
If buy, then doing something env.	108	3.41	1.504
If buy, then will last long time	108	3.29	1.492
If buy, then poss. comp. to op.	108	4.42	1.402
what gov. think. imp.	108	5.23	1.759
I do not intend to buy this house should be easy to op.	108	3.53	1.677
what energy pr. think. imp.	108	1.89	.921
if few hou. then less lik. to buy	108	4.42	1.752
if buy, env. gp. would approv.	108	4.25	1.708
if buy, energy bills prob. lower	108	3.56	1.178
house prob. costs more than av.	108	3.21	1.529
many dev. cur. sell.hs. lk. ths.	108	2.96	1.427
most hs. dev. would disprv. of dec.	108	4.47	1.867
wht. env. grps thk. is import.	108	3.78	1.561
wht. hs. dev. thk. is import.	108	4.20	1.858
in general, low. energ. is desir.	108	5.19	1.993
eng. prov. prob. dissap. of dec.	108	1.44	.688
if wntd to by, thr. are mny. HD's sling	108	3.97	1.649
if buy, gvnmt wld approv.	108	4.60	1.914
I would consider buying this	108	3.27	1.330
House Builders tend to build houses that will be most likely to sell easily	108	3.66	1.953
If enough people bought 'sustainable houses', then house builders would be more likely to build them	108	1.47	.814
I think that in order for my home to be ideal, I would probably have to be involved in its design	108	1.98	1.184
warm - cold	108	1.86	1.343
emotional - unemotional	108	2.69	1.425
artistic - unartistic	108	2.94	1.536
individualistic - conformist	108	3.41	1.793
formal - informal	108	3.18	1.797
similar to me - dissimilar to me	108	3.96	1.854
Valid N (listwise)	108	3.65	1.831