Investigating perceptions of manufacturers and retailers to inclusive design

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Abstract:

This paper describes a study into industry perceptions of barriers and drivers for inclusive design. The study investigated perceptions of manufacturers and retailers of consumer product in the United Kingdom (UK), and compared their perceptions with those of companies in the United States (US) and Japan. It was found that the perceptions of major drivers for inclusive design were similar for manufacturers and retailers in the UK, but the perceptions of barriers to inclusive design differed between manufacturers and retailers. Industry attitudes towards legislation or government regulations in the UK differed from those in the US and Japan. The study concluded that 'perception barriers' form the majority of the barriers and were the most significant, followed by 'technical barriers' and then 'organizational barriers.' Consequently strategies should focus on raising awareness to overcome perception barriers, and providing supportive tools to overcome technical barriers.

INTRODUCTION

The past twenty years have seen a worldwide movement towards design for inclusion, where, in most countries, ageing was identified as the key driver for change. Inclusive design is defined by the UK Government as a process whereby designers, manufacturers and service providers ensure that their products and services address the needs of the widest possible audience (DTI, 2000). In American and Japan the approach is referred to as 'universal design.'

Professor Sir Christopher Frayling (Chairman of the Design Council) pointed out that, the challenge of inclusive design was not just about offering equality of social opportunity, but also a huge business opportunity (Clarkson *et al*, 2003). In spite of research achievements, for example (Preiser and Ostroff, 2001; Clarkson *et al*, 2003; Keates and Clarkson, 2003;) and a few good examples (e.g. Figure 1), the widespread adoption of inclusive design in industry has been slow (Underwood and Metz, 2002; Keates *et al.*, 2000; Sims, 2003)
<Insert Figure 1 here>

A number of surveys have been conducted in several countries to understand industry perceptions of universal design. This paper describes an empirical study exploring the perceptions of UK manufacturers and retailers regarding inclusive design, and compares the findings with those from the US and Japan.

1. BACKGROUND

Universal design is a term that was first used in the United States by Ron Mace in 1985 (Preiser and Ostroff, 2001). Similar concepts around the world include 'design-for-all' (Hewer, 1995), 'inclusive design' (Clarkson *et al*, 2003), 'life span design' (Preiser and Ostroff, 2001), and 'transgenerational design' (Pirkl, 1994) *etc.* Early definitions of inclusive design focused on products and buildings, later inclusive design was extended to services, including communications. The context of inclusive design is set by the demographic, legal, and technological trends (Coleman, 2001).

Despite the social changes and emerging needs, the theory of universal design has not been adequately developed (D'souza, 2004). In practice, the movement from '*design for the disabled or aged population'* to '*design for all capabilities or ages*' has been slow. There is little research on industry barriers to the adoption of inclusive design in the UK. A couple of industry surveys in the US and in Japan that are most relevant to this study are described in the following paragraphs.

Several years ago, the American National Institute on Disability and Rehabilitation of the Department of Education funded a universal design research project. Telephone interviews were conducted to investigate why and how companies adopted universal design, and what factors were the most important in bringing this about (Vanderheiden and Tobias, 2000). A total of 26 manufacturers from six different industry sectors were selected.
It was found that:

- universal design was perceived by most companies as a special interest;
- common barriers to the adoption of universal design were the perception that it would slow down the time to market, and increase the costs of development;
- the key external driver for universal design was that of government regulations requiring the accessibility of products and services;
- other drivers included training and educational programs in universal design and development of market data.

A recent report revealed that universal design had not been widely acknowledged by large companies in the US (Mayerson, 2003). A consumer inquiry sent to 125 large companies (Fortune 500) asked: "*Do you offer universally designed products for older consumers or people with ability concerns?*" Only 12 out of the 125 responses made any reference to universality or accessibility. The study suggested that US industry still perceived universal design in terms of accessibility and mobility rather than being part of a broader design approach.

In 2000, the Ministry of International Trade and Industry of Japan commissioned a questionnaire survey about universal design, targeting 1000 businesses in Japan. Feedback was received from 307 companies in five different industry categories (HHRC, 2001). It was found that the major drivers for companies to be involved in universal design were:

- high demand from consumer and society needs;
- quality improvement/more consumer satisfaction;
- the development of a new and expanding market;
- differentiation of own products.

Government drivers for the adoption of universal design included:

- guidelines;
- regulation of data measurements;
- preparation of fundamental techniques (such as human factor databases);
- evaluation of awareness of universal design among the consumers;
- information about universal design.

Barriers facing the involvement in universal design included:

- technical complexity and lack of cost-effectiveness;
- lack of knowledge and techniques;
- lack of guidelines.

The results showed that most of the notions of universal design were widely known among all industries in Japan, but the tendency to introduce the idea into its own products varies from sector to sector.

In the UK, the Design Council organized a workshop in 1999 to assess the level of industry awareness of the needs of the disabled and elderly communities and their openness to universal design. There were over 150 participants with representatives from a wide range of companies, including British Telecom, Virgin Atlantic Airways, Omron Corporation, NatWest Bank and Tesco. The initial stance of most of the industrial participants was that they were willing to implement universal design providing that it was either easy to do, or that a consultancy would do it for them, and providing that it did not increase the cost of the product or service. There did not appear to be widespread acceptance of the need for universal design training programs for designers or an appreciation of the potential increased market for more accessible products. The concept of 'undue-burden' appeared to be anything that would cost more than the able-bodied version. In addition to this, stereotyping was also a very common problem: for example, designing for universal accessibility was perceived as a code-word for designing for the elderly and disabled only (Keates *et al*, 2000).

In order to assess the current state of design knowledge and practice with respect to 'design for all' in the UK, Sims (2003) conducted a telephone survey of 29 design professionals. It was found that 'design for all' was widely known or understood but was not widely practised by design professionals. Lack of time, lack of client backing, lack of money and lack of awareness of the possible market were reasons given for this.

The surveys carried out in the US and Japan identified some barriers and drivers for inclusive design. However, the surveys did not yield statistically significant results. Moreover, the US surveys did not differentiate conclusions between various industry sectors. The Japanese survey included five industry categories but did not differentiate between manufacturers and retailers' perceptions. Hence the findings were too general to guide specific strategies for facilitating the adoption of inclusive design in different industry sectors or for different parts of the supply chain. In addition, as the research was based in the US and Japan, the relevance of those findings to the UK was unclear. The two investigations (Keates, 2002; Sims, 2003) in

the UK revealed that inclusive design was not widely practised by large corporations or professional designers.

2. EMPIRICAL STUDIES

From the literature review, a need to understand why inclusive design is not widely practised in the UK emerged. A previous study with design professionals (Sims, 2003) showed that there was a lack of client backing for inclusive design, therefore it is important to identify the barriers to the adoption of inclusive design for manufacturers and retailers. Hence this study was proposed to:

- identify barriers and drivers for inclusive design to manufacturers and retailers in the UK;
- compare perceptions between UK manufacturers and retailers;
- compare perceptions of UK industry with those of the US and Japan.

A pilot study was carried out with eight design consultancies that had participated in an inclusive design competition. Since design consultancies provide services to different clients, they are in a good position to comment on clients' perceptions. The face-to-face interviews with eight design consultancies suggested that a major barrier to inclusive design was the lack of inclusivity requirement from clients, and there seemed to be a lack of awareness of inclusive design across UK industry. In particular, manufacturers were found reluctant to adopt more inclusive solutions, for example, a couple of design consultancies had tried hard to find manufacturing partners for their inclusive solutions but both failed (Dong *et al.*, 2002). Lack of time and money was also frequently mentioned barriers to the practice of inclusive design. These findings were consistent with Sims' findings from the survey of design professionals.

Two hypotheses were developed from the literature review and the pilot study, namely:
Hypothesis 1. Drivers (including tools and methods) for inclusive design can help raise industry awareness and encourage the adoption of inclusive design practice.
Hypothesis 2. Barriers to inclusive design may differ for manufacturers and retailers.

The further study, a large-scale survey of manufacturers and retailers in the UK, was carried out to identify barriers and drivers for inclusive design. The remainder of this section describes the procedures of the survey.

2.1 SAMPLING

The survey targeted consumer product manufacturers and retailers rather than many different industry categories. A number of industry directories, such as *Kompass*, *Applegate*, *Kelly*, *Yellow Pages* and the *DTI Company Index* were searched, using the Simple Random Sample Strategy (Breakwell *et al*, 1995). Initially 200 companies were selected. After telephone inquiries about the willingness of participation, 148 companies were finally chosen.

2.2 QUESTIONNAIRE DESIGN

The initial survey questionnaire was designed with reference to the instructions of the US telephone survey (UDRP, 2000) and the result of the pilot study. The draft questionnaire was reviewed by two experts of inclusive design, one from the Helen Hamlyn Research Centre and the other from the Design Council. Prior to distribution, the revised questionnaire was pilot-tested with ten acknowledged experts of inclusive design who had publication in the field.

The final questionnaire, in addition to requests for background information about the company, included:

- a list of 18 potential drivers with a 1-7 Likert type scale, a commonly used rating scale (refer to Table 2 and 3, with '1' representing 'least effective,' and '7' representing 'most effective') ;
- a list of 26 potential barriers with a 1-7 Likert type scale (refer to Table 4-6, with '1' representing 'least significant,' '7' representing 'most significant');
- a space to add additional drivers and barriers; and
- questions asking participants whether they would consider further involvement in the research.

2.3 DISTRIBUTION OF QUESTIONNAIRE

The questionnaire was sent to individuals at middle management level or higher (design directors or managing directors), together with a covering letter to explain the research aims, a pre-paid and self-addressed envelope for returning the feedback. To maximize the response rate, reminders and repeat questionnaires were sent to non-respondents six weeks after the initial distribution.

2.4 METHOD OF ANALYSIS

Responses to the questionnaire were initially analysed using descriptive statistics. Average scores (means) were calculated for each question to allow direct comparisons of perceptions of manufacturers and retailers. Inferential statistics were employed to test the significance of the observed correlation or difference. For example, the Pearson Product-moment Correlation

Coefficient (Howitt and Cramer, 2003) was used to test the significance of correlation between the perceptions of manufacturers and retailers, and the *t*-test used for testing the differences between the perceptions of manufacturers and retailers.

It was thought not only important to identify the individual drivers or barriers, but also to classify the types of drivers or barriers. Therefore a coding scheme of drivers and barriers was generated. The 18 drivers were divided into two groups, namely:

- 'financial drivers' (drivers that project the likely financial results, e.g. potential market for those currently excluded); and
- 'non-financial drivers' (drivers that relate to other business consequences rather than monetary results, e.g. chances of improving brand image).

The 26 barriers were grouped into:

- 'perception barriers' (barriers that are due to assumptions, e.g. perception that inclusive design is more expensive);
- 'technical barriers' (barriers relating to practical difficulties or hindrance of implementation, e.g. lack of time to learn); and
- 'organizational barriers' (barriers relating to the nature or culture of the organization, e.g. lack of risk-taking).

The subjectivity of the grouping was tested by asking a colleague to classify the drivers and barriers independently. A kappa test (Breakwell *et al.*, 1995) was carried out on the two classifications, giving rise to a consensus rate of 87% for drivers and 96% for barriers.

3. RESULTS

Altogether 53 responses (36%) of the total sample were received from the questionnaire. Of these, 33 (23%) was useful feedback. The rate of response was reasonably good for mail surveys, of which the general respond rate was 10% (Dillma, 1978). The good response rate was probably due to the effort made in pre-contacting the potential respondents and reminding the non-respondents during the distribution of the questionnaire.

Among the 20 companies that returned incomplete questionnaires, 14 explained why they could not answer the questionnaire. The reasons are summarised as follows:

- the questionnaire was thought not relevant to the company (8 companies);
- no time to respond because of the pressure of work (1 company);
- no resources to respond with the amount of details that was required (4 companies); and
- could not provide information that was commercially sensitive (1 company).

Among the 33 completed feedback forms, 18 were from manufacturers and 15 were from retailers. Table 1 shows the types and the sizes of the companies.
<Insert Table 1 here>

3.1 PERCEIVED DRIVERS

The perceptions of drivers from the 18 manufacturers and 15 retailers, computed as the average scores (i.e. means) on the 1-7 Likert type scale, are shown in Table 2 ('financial drivers') and Table 3 ('non-financial drivers'). Standard deviations (SD) are also given.
<Insert Tables 2 and 3 here>

The respondents were provided with an opportunity to identify additional drivers, however, none were added.

It was found that the top five drivers were similar between those perceived by manufacturers and retailers. Thus it was assumed that there might be a correlation between the perceptions of manufacturers and retailers. Consequently the two sets of average scores were marked as points in a scatter plot, where a best-fitting straight line was identified (Figure 2).
<Insert Figure 2 here>

The relationship depicted in the scatter plot is then described qualitatively using Pearson Product-moment Correlation Coefficient. With the 17 pair of average scores of drivers, i.e. the means for manufacturers and retailers regarding driver A-D (Table 2), E-Q (Table 3), the value of the Correlation Coefficient r is 0.605. This is near the critical value (r=0.606) at p=0.01 (p is the level of significance) (Howitt and Cramer, 2003). This means that there is only about a 1% chance that the correlation does not exist. In other words, the correlation between the perceptions of manufacturers and retailers is significant. (Driver R was not included in the analysis because too few responses were received from the manufacturers).

3.2 PERCEIVED BARRIERS

In addition to the 26 barriers listed in the questionnaire, the respondents added a couple of barriers, namely:

- perception that the market place is too small; and
- lack of vision.

The first one was similar to '*perception that inclusive design represents a niche market*' (item 'f' in Table 4). The means and standard deviations of the responses were calculated, and the

barriers grouped into ‘perception barriers’ (Table 4); ‘technical barriers’ (Table 5) and ‘organizational barriers’ (Table 6).
<Insert Table 4, 5, and 6 here>

It was found that retailers tended to assign a higher level of significance than manufacturers to most of the barriers. The average rating score regarding the barriers was 4.1 for retailers and 3.9 for manufacturers.

The most significant barriers to manufacturers were ‘*lack of business case*’ (score: 5.0) and ‘*perceived sacrifice of aesthetics*’ (score: 4.6), while for retailers they were ‘*perception that inclusive design is more expensive*’ (score: 5.2) and ‘*perception that it can be complex to design inclusively*’ (score: 5.2).

The average scores to individual barriers assigned by manufacturers and retailers were compared and the majority of them were different. This had been expected because one of the hypotheses was that the perceptions of barriers to inclusive design might differ for manufacturers and retailers. The *t*-test was used to test the significance of the differences and the significant results are presented in Table 7.

The statistic test shows that manufacturers and retailers have significantly different perceptions on whether inclusive design is complex and whether inclusive design is expensive. An inspection of the average scores reveals that retailers are more likely to perceive inclusive design as expensive and complex than manufacturers.

4. COMPARISONS

In this section, comparisons are made between the findings from this study and those of the US and Japan. The findings from this study are also compared with earlier studies in the UK.

The findings from the survey in the US suggested that government regulation was a key external driver for the adoption of universal design, and other drivers included training and educational programs in universal design and the development of market data (Section 1). However, to manufacturers and retailers in the UK, government regulation was not a key external strategy. The average scores of the driver ‘*government regulations/legislation on inclusive design*’ were 4.4 for manufactures and 3.1 for retailers, and the average scores for the barrier ‘*lack of government regulations*’ were 3.7 for manufacturers and 3.3 for retailers.

'*Training on inclusive design available to staff/designers*' as a driver was of average effectiveness (4.0 for manufacturers and 4.7 for retailers), so was the '*availability of tools/methods to help the practice of inclusive design*' (4.0 for manufacturers and 4.7 for retailers).

Both UK manufacturers and retailers assigned a high score (5.2 for manufacturers and 5.5 for retailers) to the driver '*assessment of how many people are excluded*,' and this was similar to the findings in the US where '*development of market data*' were regarded as an important driver.

Since the Japanese survey provided some quantitative results in the form of percentages, the data collected from this study was also converted into percentages to facilitate the comparison. The method of conversion is as follows: the findings from this study used the 1-7 Likert type scale, and scores above 4 were regarded as '*significant*.' All significant scores were counted and converted to percentages. For example, if 18 out of 23 manufacturers assigned scores above 4 to a certain question, then the percentage regarding this question would be 18 out of 23, i.e.78%.

The comparison on drivers for inclusive design between industries in Japan and in the UK is listed in Table 8. Since the formulation of questions was different for the two surveys, similar questions were combined to generate comparative categories, for example, the '*new and expanding market*' in the survey of Japan and the '*potential market*' in the survey of the UK were combined into a common category '*potential market*' to facilitate the comparison. Such combinations of categories were also used in the comparisons on barriers to inclusive design between the two countries. The data from Japan reflect the perceptions of industry as a whole, while the data from this study in the UK separate the perceptions of the manufacturers and retailers.

<Insert Table 8 here>

In general, most of the drivers for inclusive design listed in Table 8 were of relative importance to industry in both Japan and the UK. A remarkable difference was found regarding the driver 'potential market.' It seems that much more manufacturers and retailers in the UK regard this driver as important than companies in Japan. Fewer manufacturers and retailers in the UK seem to regard '*government regulations*' or '*guidelines and standards*' as important drivers for inclusive design, compared with the findings from the survey in Japan.

The survey in Japan also identified a number of major barriers facing the involvement in universal design, and they were compared with the findings from the UK (Table 9).
<Insert Table 9 here>

A couple of remarkable differences were found from the comparison, namely, the perception on barriers '*lack of business case*' and '*lack of resources or guidance*.' A much higher percentage of manufacturers and retailers in the UK perceive these two barriers as significant barriers than companies in Japan.

As mentioned in Section 1, the workshop organised by the Design Council showed that industry were willing to implementing inclusive design providing that it was easy to do, or a consultant would offer help, or it did not increase costs, and stereotyping was also a very common problem (Keates, *et al.*, 2000). This survey of manufacturers and retailers revealed that the industry regarded 'complexity' and 'expensiveness' as major barriers to the adoption of inclusive design, and retailers were especially concerned with them. This finding explained why industry in the UK was slow to adapt. The pilot study showed design consultancies alone could not change the situation if clients were not motivated to practise inclusive design. Stereotyping was also found a common problem because one of the major barriers to inclusive design for manufacturers was '*perceived sacrifice of aesthetics*' ('j' in Table 4).

5. CONCLUSIONS AND DISCUSSION

In this section, the conclusions are drawn, the limitations of the research are addressed, and future work is proposed.

5.1 CONCLUSIONS

The conclusions are firstly drawn with a summary of major barriers and drivers for inclusive design to UK manufacturers and retailers.

It was found that the perceptions of the drivers for inclusive design were similar between UK manufacturers and retailers, with the '*potential market for those currently excluded*' and '*consumer dissatisfaction*' the top two. '*Chances of innovation*' and '*assessment of how many people are excluded*' were also relatively important drivers for inclusive design. The average rating scores for all the drivers were 4.7 for manufacturers and 4.8 for retailers, both were above the average effectiveness (i.e. score 4).

Most of the perceptions of barriers to inclusive design for manufacturers differed from retailers, although many of these differences were not statistically significant. The average

score of manufacturers' perception of barriers was 3.9 while that of retailers was 4.2. The top two barriers to inclusive design for manufacturers were '*lack of business case*' and '*perceived sacrifice of aesthetics*.' The most significant barriers to retailers were '*perception that inclusive design is more expensive*' and '*perception that it can be complex to design inclusively*.'

The conclusions are also drawn with regard to the hypotheses proposed.

Hypothesis 1. Drivers (including tools and methods) for inclusive design can help raise industry awareness and encourage the adoption of inclusive design practice.

The relatively high rating scores of most drivers indicate that they are effective in raising industry awareness and have the potential to encourage the adoption of inclusive design practice. This supports Hypothesis 1. The findings also make it clear that drivers can be effective regardless of the type of business. The implication of this is that more and more support and incentives should be provided to motivate industry to adopt and practise inclusive design, and every effort has a potential to make a difference.

Hypothesis 2. Barriers to inclusive design may differ for manufacturers and retailers.

Although only two significant results were identified between the perceptions of manufacturers and retailers, it is apparent that most of the perceptions of barriers of manufacturers differ from retailers. Since all the manufacturers and retailers contacted in the survey were from the consumer product sector, the difference of their perceptions to barriers were mainly due to the difference of the type of business, i.e. manufacturing or retailing. 'Perception barriers' were the majority of the barriers and the most significant, followed by 'technical barriers' and then 'organizational barriers.' This implies that efforts should be made in raising awareness to overcome perception barriers, and providing supportive tools to overcome technical barriers. Organisational barriers are often inherent barriers to change, and providing inclusive design-focused strategies or means of support may not combat such barriers effectively.

Further conclusions are drawn from the result of comparisons.
The comparison with the survey in the US revealed that the companies in the UK did not tend to perceive government regulation as a most effective driver for inclusive design, this was consistent with the findings from the interviews with the eight design consultancies (Dong *et*

al, 2002). The development of data showing the number of people excluded proved an effective driver for inclusive design to companies in both the US and UK.

Compared with the survey in Japan, the '*potential market*' seems to be a more effective driver for the adoption of inclusive design for the manufacturers and retailers in the UK, while '*government regulations*' and '*guidelines and standards*' seem to be less effective drivers. The '*lack of business case*' and the '*lack of resources and guidance*' seem to present barrier effect to more manufacturers and retailers in the UK than to the industry in Japan.

The comparison with earlier studies in the UK (Keates *et al.*, 2000; Sims, 2003) reinforced some of the common findings:
for manufacturers and retailers, major barriers to inclusive design are associated with perceived complexity, expensiveness, and lack of aesthetics and business case. For designers, major barriers to inclusive design included lack of time, money, client backing and awareness.

5.2 DISCUSSION

Since the questionnaire was designed to be as simple as possible to encourage a high response rate, the explicit descriptions of each driver and barrier were not given in the questionnaire. Hence, it is possible that the respondents interpreted them differently. Three respondents left a couple of questions unanswered, indicating that they might not have fully understood the questions. It may be worthwhile to clarify the answers through follow-up interviews. This has been planned for further work.

With the non-significant results, it is hard to generalise the conclusions. However, the data gathered have provided some insights into the problems and could help direct the focus of future research.

The comparison between the perceptions of companies in the UK, US and Japan was restricted by the available data. Although this survey produced rich data, it was not possible to make comparisons where similar data in the US and Japan are not available.

The validity of the study is shown by the similarities of the findings to the earlier studies in the UK. Further investigation of the perceptions of design consultancies in the UK to inclusive design is planned, and similar rating scales will be applied to facilitate the comparison between designers' perceptions with those of manufacturers and retailers. The

result will provide a reference for the development of strategies and tools to encourage the adoption and implementation of inclusive design for industry in the UK.

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BIOGRAPHY

Hua Dong studied at Tongji University before she joined the Cambridge Engineering Design Centre in 2001 as a PhD student. She has a BE degree in industrial design and an MA degree in architectural design and theory. She is interested in product design and urban design, especially in relation to inclusive design.

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List of Tables:

Table 1. Profile of the manufacturers and retailers

No. of employees	**1-20**	**21-50**	**51-100**	**100-200**	**200+**
No. of manufacturers (in total 18)	1	1	2	2	12
No. of retailers (in total 15)	5	2	3	2	3

Table 2. Perceptions of manufacturers and retailers regarding 'financial drivers' for inclusive design

Financial Drivers for Inclusive Design		**Manufacturers**		**Retailers**	
		Mean	SD	Mean	SD
A	Successful business studies (i.e. those showing commercial success)	4.2	1.6	4.8	1.5
B	Potential market for those currently excluded	6.0	1.1	5.5	1.6
C	New market opportunities by practising inclusive design*	5.9	1.2	5.1	2.0
D	Assessment of how many people are excluded	5.2	1.5	5.5	1.5

(* the questionnaire was modified once during the process of distribution, 'E' in Table 3 was combined with 'C' in Table 2 in the modified version)

Table 3. Perceptions of manufacturers and retailers regarding 'non-financial drivers' for inclusive design

	Non-financial Drivers for Inclusive Design	Manufacturers		Retailers	
		Mean	SD	Mean	SD
E	Consumer dissatisfaction with current products	5.7	1.3	5.5	1.5
F	Chances of innovation by practising inclusive design	5.4	1.0	5.4	1.2
G	Analysis of why people are excluded	5.2	1.0	5.0	1.6
H	Public/consumer awareness of inclusive design	3.8	1.7	4.9	1.2
I	Availability of expert consultation on inclusive design	3.9	1.6	4.3	1.9
J	Availability of tools/methods to help the practice of inclusive design	4.0	1.4	4.7	1.5
K	Government regulation/legislation on inclusive design	4.4	2.1	3.1	2.2
L	Users available for testing prototypes during the design process	4.1	1.4	4.8	1.7
M	Availability of training on inclusive design to staff/designers	3.8	1.6	4.6	1.8
N	Chances of improving brand image by practising inclusive design	5.1	1.7	5.3	1.4
O	Champion for inclusive design on company boards	4.1	1.7	4.7	1.9
P	Corporate strategy incorporating inclusive design	4.5	1.7	4.6	1.7
Q	Availability of standards/guidelines on inclusive design	4.0	1.8	4.6	1.5
R	Major competitor's adoption of inclusive design	_	_	4.4	1.5

(Few data were received from manufacturers regarding the driver R)

Table 4. ‘Perception barriers’ to inclusive design for manufacturers and retailers

Perception Barriers to Inclusive Design		**Manufacturers**		**Retailers**	
		Mean	SD	Mean	SD
a	Lack of awareness of inclusive design	4.2	2.0	4.9	1.9
b	Lack of interest in inclusive design	4.3	2.1	4.4	2.1
c	Lack of motivation for tackling inclusive design	4.1	2.1	3.9	2.0
d	Perception that inclusive design is more expensive	4.1	1.7	5.2	1.8
e	Perception that it can be complex to design inclusively	3.8	1.6	5.2	1.8
f	Perception that inclusive design represents a niche market	4.3	2.0	4.7	1.9
g	Lack of business case	5.0	1.7	4.3	1.9
h	Perception that inclusive design is an unachievable goal	3.9	2.0	4.2	2.1
i	Perceived problems of brand association with disabled/older people	2.9	1.7	3.0	1.2
j	Perceived ‘sacrifice’ of the aesthetics of the brand	4.6	1.4	3.7	2.0
k	Perceived longer development time to market	3.9	1.7	4.8	1.6
l	Perception that there is no need to practise inclusive design	3.7	2.0	3.7	1.7
m	Perception that inclusive design is contradictory to the diversity of the market/market segments	3.8	1.7	4.4	1.9
n	Perception that the social context for inclusive design has not been set	3.4	1.5	4.3	1.9
o	Perception that inclusive design is a passing trend	2.8	1.6	3.5	1.9

Table 5. ‘Technical barriers’ to inclusive design for manufacturers and retailers

Technical Barriers to Inclusive Design		**Manufacturers**		**Retailers**	
	Descriptions	Mean	SD	Mean	SD
p	Lack of resources/guidance on inclusive design	4.3	1.9	4.8	1.6
q	Time taken to learn the approach	3.9	2.0	4.1	1.7
r	Lack of availability of good design examples	4.3	1.8	4.5	2.0
s	Lack of government regulations	3.7	2.2	3.3	2.0
t	Lack of methods/tools for practising inclusive design	3.8	1.6	4.3	1.9

Table 6. ‘Organizational barriers’ to inclusive design for manufacturers and retailers

	Organizational Barriers to Inclusive Design	**Manufacturers**		**Retailers**	
		Mean	SD	Mean	SD
u	Difficulty in changing the culture of a business	3.8	1.9	4.1	2.0
v	Lack of company policy on inclusive design	3.7	2.1	3.9	2.2
w	Business is sales-led rather than design-led	4.4	1.9	4.6	2.2
x	Lack of willingness to change	3.7	1.8	2.9	1.8
y	Lack of risk-taking/unwillingness to invest money in a new practice	3.7	2.3	4.1	2.0
z	Working for short-term financial objectives	3.7	2.0	2.9	1.7

Table 7. Comparison between perceptions of barriers for manufacturers and retailers – significant results

Barriers	Probability (P)	Means of manufacturers	Means of retailers
Perception that inclusive design is more expensive	P=0.045	4.1	5.4
Perception that it can be complex to design inclusively	P=0.024	3.8	5.3

Table 8. Comparison between perceptions of drivers for companies in Japan and in the UK

Drivers	**Survey in Japan**	**Survey in the UK**	
		Manufacturers	Retailers
Consumer dissatisfaction	77.0%	78%	81%
Potential market	44.8%	74%	81%
Guidelines and Standards	53.7%	43%	50%
Government regulations	50.9%	48%	44%
Fundamental techniques/Tools and methods	42.9%	48%	56%
Consumer/Public awareness	42.3%	39%	69%

Table 9. Comparison between perceptions of barriers for companies in Japan and in the UK

Barriers	**Survey in Japan**	**Survey in the UK**	
		Manufacturers	Retailers
Technical complexity	39.1%	26%	60%
Lack of business case	39.1%	57%	53%
Unable to achieve	39.1%	30%	40%
Lack of knowledge, technique and methods	36.8%	39%	40%
Lack of resources or guidance	34.5%	48%	53%

List of Figures:

OXO Good Grips Kitchen Utensils

BT Big Button phone

Figure 1. Examples of inclusive design

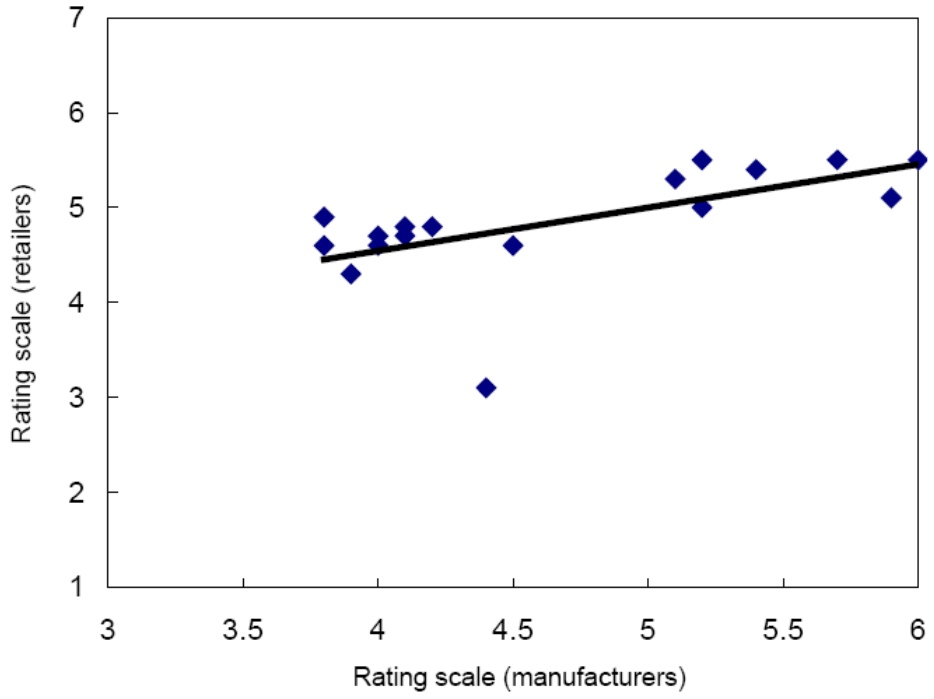

Figure 2. Correlation of manufacturers and retailers' perceptions of drivers for inclusive design