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Inclusive design drivers and barriers – a manufacturing perspective from Pakistan

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The demographics of older people and people with disabilities in developing countries are discussed in the context of inclusive design and the drivers and barriers to inclusive design have been identified. Data were collected from 50 individuals from various industrial sectors in Pakistan. Corporate social responsibility (CSR) relates to inclusive aspects of products, but most respondents either did not know about CSR or did not have a CSR post in their organizations, but 64% had awareness of inclusive design terminology. The study concluded that motivation through social responsibility; innovation and differentiation; demographics and consumer trends; brand enhancement; customer satisfaction; new market opportunity; and legislation were the perceived drivers for manufacturers in Pakistan. Most respondents felt that lack of resources and guidance, lack of awareness about inclusive design, difficulty in changing the business culture, lack of government regulations, and the perception that inclusive design is expensive were the most significant barriers.

Keywords: inclusive design; drivers and barriers; manufacturing; corporate social responsibility (CSR); developing countries

1. Introduction

Inclusive design aims to address the design needs of the largest proportion of the population where special consideration is given to accommodating older people and people with disabilities along with the rest of the population in a single design solution. The percentage of the older population is increasing throughout the world; however, this trend is quite prominent in developed countries such as the USA, UK, Australia, Japan, Canada, and Germany because of better living facilities, medical treatment, and healthier working environments (U.N.O., 2009). On the other hand, in developing countries, while the average age of the population is lower than that of developed countries, these countries constitute a significant proportion of the overall world population. Attention has previously been given to assessing the level of awareness and exploring drivers and barriers for the promotion of the inclusive design approach in product, process, environment, and service design in developed countries like the UK, USA, and Japan. In spite of the challenging demographics of developing countries considered as the main contributors to the world population, no effort has been made to increase the level of

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awareness of the inclusive design approach, or to explore and highlight the drivers and barriers to the implementation of this design approach. This research is an effort to contribute in this respect by assessing the perspectives of manufacturers on the implementation of the inclusive design method.

2. Literature review

2.1. Demographics

The total population of many countries is increasing. However, this trend is quite significant in developing countries like China, India, Pakistan, and Bangladesh, where the population of these four countries is about 42% of the world population. In the same way, the populations of these countries contain a significant proportion of older people (37% of the world population,) and people with disabilities (6% of the world population) (CIA World Fact Book, 2014). These statistics clearly highlight the need for the implementation of an inclusive design approach in these countries as their contribution to the world population is quite significant.

In general, it is clear from the global demographics that older people and people with disabilities are a considerable proportion of the world population, and this justifies financial as well as legislative incentives for including these groups in the design of products, environments, and services (Coleman, 2001). However, the trends in this demographic change are different in different parts of the world. For example, the overall percentage of older workers is increasing in majority of the developed countries and this justifies their accommodation in the design of products, processes, environments, and services. However, in the developing countries, the same increase is prominent as the overall population of these countries is growing very quickly, and the proportion of older people and people with disabilities is increasing accordingly. These facts draw the attention of designers, ergonomists, engineers, psychologists, planners, and entrepreneurs to seriously consider the provision of healthy living conditions for this significant proportion of the world population. The following sections describe how these challenges can be met by design scenarios that are equally acceptable for the broadest range of the population and also identify the drivers and barriers in the promotion of these ideas.

2.2. Inclusive design – drivers and barriers

'Design is the process of converting an idea or market need into the detailed information from which a product or system can be made' (Royal Academy of Engineering, 2005).

The British Standards Institute (2005) defined inclusive design as 'The design of *mainstream* products and/or services that are accessible to, and *usable* by, *as many people* as reasonably possible … without the need for special adaptation or specialized design'. Subsequently, the inclusive design term has also been related to providing quality of life and independent living for the aging population (Waller & Clarkson, 2009). It can be said that approaches like 'Inclusive Design,' 'Universal Design,' and 'Design for All' have been developed to help designers in developing design strategies that can promote design scenarios that are equally acceptable for all, including older people and people with disabilities (European Institute for Design & Disability, 2006; Keates & Clarkson, 2004; Preiser & Ostroff, 2001).

Published literature shows that there have been previous efforts in different parts of the world to explore the drivers and barriers for inclusive design. Vanderheiden and Tobias (2000) conducted telephone interviews of 26 manufacturers of consumer products in the USA, and identified a range of barriers and motives including government regulation, market data, training, consumer demands, technical complexity and unavailability of highly relevant knowledge, data and techniques. A similar survey was conducted in Japan where 307 companies from different industrial categories were surveyed. Interestingly, Japanese companies provided results that were similar to the USA companies (Unpublished report, 2000).

In the UK, Keates & Clarkson (2004) found that few industries knew about inclusive design and that there were misconceptions in the fundamental understanding of this design method. Companies believed that inclusive design meant designing only for older people and people with disabilities. In another survey conducted by Sims (2003), 32 design professionals working with different types and sizes of companies were surveyed, and it was concluded that 'design for all' is widely known but unfortunately not practiced within the design community. The majority of designers were aware of the philosophy of 'design for all' but rarely considered the approach because of the perceived time and financial costs. Underwood and Metz (2003) and Bellerby and Davis (2003) also discussed how inclusive design methods can be promoted and design-related issues could be addressed. They suggested that the provision of guidelines and standards could be important drivers, as currently these are not presented appropriately. Moreover, legislation and brand imaging can also play an effective role as generic business drivers.

Dong, Keates, and Clarkson (2004) and Dong, Clarkson, Ahmed, and Keates (2004) conducted a more comprehensive study with SMEs, where a survey was carried out with 38 manufacturing and retailing companies, along with 35 design consultancies. It was concluded that different companies perceive different factors as major barriers. However, drivers within these groups were found to be the same. For example, manufacturers and retailers mentioned key barriers because of the assumptions that inclusive design is more expensive, difficult to practice and learn and time consuming. In 2006 Goodman, Dong, Langdon, and Clarkson (2006) unlike Dong, Keates, et al. (2004) and Dong, Clarkson, et al. (2004), targeted large organizations along with SMEs and used a survey method for obtaining a more detailed insight into the drivers and barriers for inclusive design, and used the same questionnaire for comparison purposes. Complete responses were collected from 101 UK companies and organizations, and a detailed analysis was carried out. Barriers most frequently identified were a lack of time and budget for supporting inclusive design, lack of knowledge and tools to practice it, and it not being perceived as a need of the end users. Moreover, the perception that there was no justifiable business case for inclusive design was considered extremely important by most of the respondents.

As mentioned earlier, the population of developing countries is growing rapidly and the proportion of older and disabled people is also increasing accordingly. There are important questions as to how the living standards and quality of life of these people can be maintained and improved. Currently, in these countries the needs of older people and people with disabilities are not considered sufficiently by designers, planners, architects, and ergonomists. It is critically important to create awareness for policy-makers, planners, manufacturers, and designers about the importance of the inclusive design approach for creating environments, products, and services that meet the diverse and changing needs of the whole population.

3. Research focus

The main focus of the research was to assess the level of awareness of inclusive design in developing countries like China, India, Pakistan, and Bangladesh as a significant proportion of the world population lives in these countries. Until now, no research has been conducted in these countries to explore the main drivers that can motivate manufacturers and barriers that are potentially the reasons for lack of interest and resistance to its promotion. This is potentially a huge market where manufacturers can gain benefits by implementing design solutions that are equally acceptable for a wide range of the population. An underlying purpose of the research was to provide awareness to the manufacturers about the inclusive design approach, so that manufacturing industries in this part of the world can create business opportunities by attracting older customers and customers with special needs (disabilities) along with rest of the population.

4. Research method

The main objective of the survey was to identify barriers and drivers for inclusive design from the perspective of manufacturers in Pakistan. Initially, a list of manufacturing companies was prepared from which some were recruited after telephone inquiries about their willingness to participate in the survey. Manufacturing companies from textile, beverage, sports, automotive, design consultancy, and automotive sectors were included in this research. The survey questionnaire was designed with reference to the method adopted by the Engineering Design Centre's Inclusive Design survey at the University of Cambridge (Coleman, 2001) and is shown in abbreviated form as Appendix A. However, additional drivers and barriers found in research studies from the USA and Japan were also included in the study. A pilot survey was carried out to assess the reliability of the method. During the pilot study, it was found that some people had no understanding of any of the terms, 'inclusive design,' 'universal design,' and 'design for all.' So, prior to final distribution, a revised questionnaire was developed including a two-page summary for basic understanding of these terms, elaborated with the help of practical examples, so that the underlying objective of increasing the level of awareness about inclusive design could be achieved. (the illustrations of the practical examples have been removed from Appendix A, but they covered a wide range of activities of daily living that people with disabilities might have difficulty with such as accessing cash machines and dealing with escalators). It was further concluded that questionnaires should be completed in the presence of a research project team member, so that more reliable results could be collected. Representatives from 8 manufacturing companies (linked with the design process within their organizations) were selected, and a total of 50 responses were collected. Pakistan has 6417 manufacturing companies, 3590 of them in Punjab state where this study was conducted (Pakistan Bureau of Statistics, 2006).

5. Results and discussion

Responses to the distributed questionnaires were analyzed using descriptive statistics, where frequencies, average scores (means), and standard deviations (SD) were calculated, keeping in view the type of question and which output parameters could be used as indicators. The overall analysis was divided into three main areas: awareness, drivers, and barriers.

5.1. Awareness

The first portion of the questionnaire was about the assessment of the level of awareness and current understanding of the terms 'Inclusive Design,' 'Universal Design,' and 'Design for All'. As mentioned, the data were collected from 50 respondents, from companies whose profiles with respect to the number of employees are shown in Table 1. Table 2 shows the categories of manufacturing organizations included in the study and their proportional relevance in the sample population. Table 1 shows that about 70% of the sample population belonged to organizations having between 251 and 5000 employees. Moreover, 26% were from large organizations having over 5000 employees. The respondents were asked if their organization had a post for corporate social responsibility (CSR), and all claimed to understand the term CSR. However, 42% admitted that they did not know whether or not their organization had such a post. This clearly indicates that many of those involved in design and manufacturing activities have some preliminary understanding of CSR, but that there is no clear focus on this in their organizations. On the other hand, 30% responded that their organizations had a CSR post and 28% clearly claimed that their organizations had no CSR post. Overall, it can be concluded that in nearly 70% of organizations those with responsibility for design and manufacturing either did not know of or had no clear focus on CSR (shown in Figure 1).

Current understanding or awareness of different terms like 'Inclusive Design,' 'Universal Design,' and 'Design for All' were explored by asking respondents if they had heard of the terms and if they understood their meaning. By their responses, 36% showed no understanding of these terms. However, 64% did show understanding and the most popular term was 'Design for All' with 30% having previously heard of the term. Awareness or understanding of 'Inclusive Design,' and 'Universal Design' were recorded as 14 and 20%, respectively (Figure 2).

The above statistics clearly indicate a lack of awareness about the terminology and consequently of design inclusivity. Similar results were found in the pilot study and on the basis of this a two-page comprehensive summary of these terms along with useful and relevant examples were prepared, and made a necessary part of the questionnaire so that those who had no knowledge of the concepts could at least understand and give appropriate feedback about drivers and barriers to inclusive design. During final data collection, respondents were not allowed to see this information until they had recorded their responses about current understanding and awareness. As mentioned earlier, all the responses were collected in the presence of a member of the project team, so that the respondents were able to ask questions on the scope of drivers and barriers. A large majority of the respondents actively participated in discussion sessions by asking interesting questions and gained a clear understanding about these initiatives. Interestingly, 100% of the respondents requested our team members to send them final conclusions and findings of the research study, and this clearly shows their interest in this area. The following sections discuss findings related to drivers and barriers.

Table 1. Company profiles: number of employees.

No of employees	Frequency	Percent
Up to 250	3	6.0
251–1000	14	28.0
1001–5000	20	40.0
Over 5000	13	26.0
Total	50	100.0

Table 2. Types of manufacturing industries and number of responses.

Type	Responses
Textile	7
Beverages	10
Electronics	10
Design consultancies	12
Sports	3
Automotive	8
Total	50

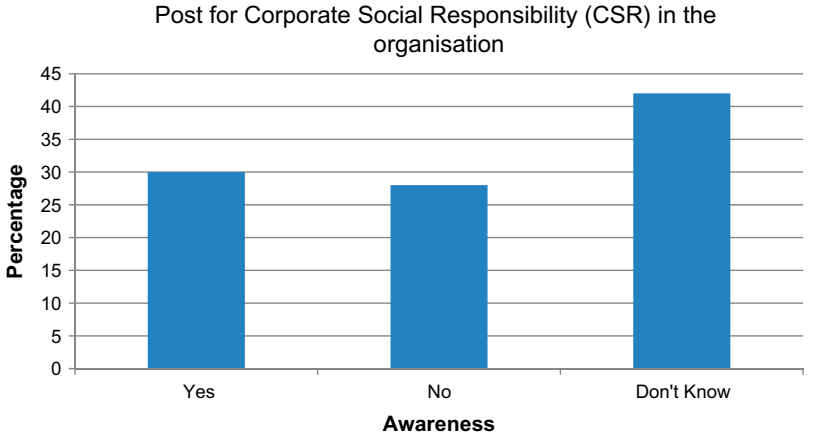

Figure 1. Corporate social responsibility (CSR) awareness.

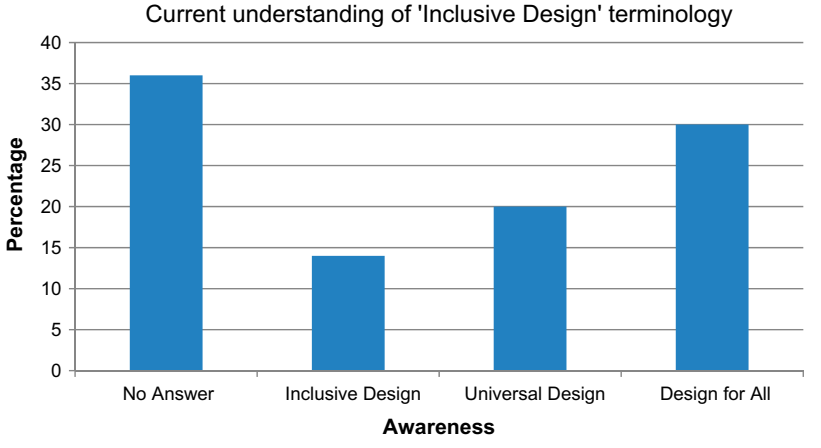

Figure 2. Current understanding of 'Inclusive Design' terminology.

5.2. Drivers

The perceptions of drivers of inclusive design from manufacturers have been computed as average scores (mean values) and SD. Responses were collected on a 1–4 Likert-type scale, where 22 drivers were listed and divided into two categories. Drivers, such as legislation, The Employment and Rehabilitation Act, social responsibility, demographic and consumer trends and brand enhancement were included in category one, where responses were collected in the form of agreement or disagreement ('strongly disagree' to 'strongly agree'). In the second category, all other drivers mentioned in Table 2 were included and responses were again collected on a four-point Likert-type scale, where effectiveness in terms of commercial benefits was measured ('not effective' to 'very effective'). The responses indicated that the vast majority of individuals in manufacturing felt that motivation through social responsibility awareness would be the most significant driver for the promotion of inclusive design in their organizations. As discussed in the preceding section, there is a need to promote CSR initiatives in organizations so that the level of awareness about inclusive aspects of products, environment, or service design might be increased. Motivation through social responsibility awareness was perceived as the most effective driver (mean 3.28 and SD .970) in the implementation of design inclusivity. Similarly, other drivers that were perceived as significant were: source of innovation and differentiation (mean 3.28); demographic and consumer trends (3.26); brand enhancement (3.22); increase customer satisfaction (3.16); and new market opportunity (3.12). However, the least significant drivers were: consumer dissatisfaction with current products (mean 2.40); assessment of how many people are excluded (2.58); champion for inclusive design on company board (2.66); major competitors adoption of inclusive design (2.68); and increase the large share of current market (2.70). Full details of means and SD values for all 22 drivers are shown in Table 3.

5.3. Barriers

This section discusses the results of data analysis concerning perceived barriers to inclusive design. The perspectives of respondents on 27 potential barriers to inclusive design promotion among manufacturers in Pakistan were sought. Table 4 shows the results of the data analysis, and highlights the percentages of respondents in agreement with the barrier statements. It was concluded that lack of resources/guidance and awareness of inclusive design are the most prominent perceived barriers as about 84% (42 respondents out of 50) and 80% (40 out of 50) respondents showed agreement, respectively. Moreover, change in culture of business (76%), lack of government regulations (76%), perception that inclusive design is more expensive (68%), and that it increased time to market (68%) were perceived as significant barriers to inclusive design. Interestingly, about 80% of the respondents perceived that implementation of inclusive design was not an unachievable goal, and a significant number of people felt that inclusive design was not a passing trend and did not compromise the esthetics of design. Similarly, more than 50% of respondents from manufacturing organizations did not feel that inclusive design was a too difficult thing to practice. These findings highlight that the majority of manufacturing-related people were of the opinion that inclusive design was not too difficult to implement. However, inclusive design can be promoted by launching an organized campaign about the associated usefulness and benefits, by providing proper resources and guidance, along with changes in organizational culture and enforcement of focused regulations regarding inclusive design. The percentage agreements of the respondents with other barriers are shown in Table 4.

Table 3. Perceptions of manufacturers regarding 'drivers' for inclusive design.

Drivers	Mean	SD
Motivation through social responsibility	3.28	.970
Source of innovation and differentiation	3.28	.858
Demographic and consumer trends	3.26	1.121
Brand enhancement	3.22	1.166
Increase customer satisfaction	3.16	.934
Employment and Rehabilitation Act 1981 will help in practicing inclusive design	3.16	1.131
New market opportunity	3.12	.872
Chances of innovation by practicing inclusive design	3.10	.931
Entrance to new market	3.08	.944
Legislation	3.08	1.209
Increase revenue through increased usage	3.06	.913
Increase customer loyalty	3.04	.903
Increase the size of potential market	2.94	.793
Availability of tools/methods to help practicing	2.88	.872
Public awareness of inclusive design	2.88	.982
Availability of expert consultation on inclusive design	2.82	.941
Availability of training opportunities on inclusive design	2.80	.948
Increase the large share of current market	2.70	.863
Major competitors adoption of inclusive design	2.68	.935
Champion for inclusive design on company board	2.66	.823
Assessment of how many people are excluded	2.58	.950
Consumer dissatisfaction with current products	2.40	1.030

From the analysis of the data presented above, many of the drivers and barriers found important in this study were the same as those highlighted by other studies conducted in the UK, USA, and Japan. For example, drivers such as new market opportunity, brand enhancement, and source of innovation were commonly perceived drivers in all these studies. Similarly, barriers like awareness of inclusive design, lack of resources and guidance, and lack of time and budget were common barriers presented in all of these studies. Moreover, barriers such as inclusive design was too difficult and an unachievable goal that compromised the esthetics of design were perceived as relatively less significant barriers. This shows that almost all studies have concluded that people who have seen the relevance of the promotion and implementation of inclusive design felt that there was a great need to increase levels of awareness within companies especially amongst designers. At the same time, they felt that design for inclusivity is not an unachievable goal; it can be achieved by increasing awareness about its importance, usefulness, and relevance with our daily life and by providing technical and financial assistance at the organizational and country level.

Tables 5 and 6 present a comparison of results on perceived drivers and barriers for the different manufacturing sectors (textile, beverages, electronics, sports, automotive and design consultancy). It is quite clear that there were variations in the perceptions of inclusive design drivers and barriers depending upon the type of manufacturing sector. For example, in the electronics manufacturing sector, legislation was perceived as the most prominent driver with a mean score of 3.9, not only highest in this sector but overall as well (Table 5). Similarly, in the beverage sector, it was commonly perceived that putting effort into an increase in customer satisfaction by applying inclusive design methodologies was the most important driver. In the automotive sector, it was felt that new market opportunity and increase in customer loyalty were the most prominent drivers, whereas the same had relatively less importance (in the middle of the list) in

Table 4. Perceptions of manufacturers regarding 'barriers' for inclusive design.

Barriers	No. of responses	Percentage agreed
Lack of resources/guidance on inclusive design	42	84
Lack of awareness of inclusive design	40	80
Difficulty in changing the culture of business	38	76
Lack of government regulations	38	76
Implementing inclusive design could require significant cultural change	35	70
Perception that inclusive design is more expensive	34	68
Perceived longer development time to market	34	68
Perception – more complex to design inclusively	34	68
Lack of interest in inclusive design	34	68
Stigma associated with inclusive design	33	66
Lack of time and budget	33	66
Lack of company policy on inclusive design	32	64
Inclusive design is a perceived need of our end user	32	64
Lack of methods/tools for practicing inclusive design	32	64
Lack of motivation for tackling inclusive design	32	64
Perception of brand association with disabled/older people	32	64
Lack of availability of good design examples	31	62
Perception – there is no need to practice inclusive design	31	62
Working for short term financial objectives	30	60
Perception that inclusive design represents a niche market	29	58
Unavailability of internal support for inclusive design	29	58
No justifiable business case to support inclusive design	27	54
Lack of knowledge and tools to practice inclusive design	26	52
Perception – inclusive design is too difficult	23	46
Perception – inclusive design is a passing trend	20	40
Inclusive design compromises the aesthetics of design	18	36
Perceived as an unachievable goal	10	20

the overall priority list. Generally, it can be said that the textile, beverages, design consultancy, and electronics manufacturing sectors provided similar kinds of results to those of the overall analysis. As shown, only three respondents from sports industries recorded their responses, however, those were not of high significance because of the smaller sample size. The sports sector is one of the leading export-based manufacturing sectors in Pakistan, and so there is a need to explore this sector in a detailed way.

A comparison of different perceived barriers among a variety of manufacturing sectors is shown in Table 6, where differences in perceptions can be observed. For example, in the automotive sector, the vast majority of respondents agreed that there was no need to practice inclusive design, that it reduces short-term financial advantage and was associated with stigma. In comparison with the overall perception, these factors showed relatively less significance. A detailed comparison is shown in Table 6.

6. Future work

Future work will focus initially on capturing the perceptions about inclusive design drivers and barriers from designers working in different areas like architecture, civil engineering, town planning and design, transportation design and management in Pakistan, so as to widen the scope of the investigations. Subsequently, the same study will be carried out in China, India, and Bangladesh, and efforts have been started to

Table 5. Comparison of different manufacturing sectors on perceived inclusive design drivers.

	Overall		Textile		Sports		Beverages		Design consultancies		Electronics		Automotive	
Drivers	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Motivation through social responsibility	3.28	.970	3.57	.787	3.00	1.000	2.90	.876	3.67	.651	3.40	1.265	2.88	1.126
Source of innovation and differentiation	3.28	.858	3.71	.488	3.33	1.155	3.20	.919	3.33	.985	2.90	.994	3.38	.518
Demographic and consumer trends	3.26	1.121	3.00	.816	2.33	1.528	3.10	1.287	3.67	.985	3.50	1.179	3.13	1.126
Brand enhancement	3.22	1.166	3.00	1.155	2.33	1.528	2.90	1.287	3.75	1.215	3.60	.966	2.88	.835
Increase customer satisfaction	3.16	.934	3.57	.787	3.33	1.155	3.30	1.059	3.17	.937	2.60	.843	3.25	.886
Employment and Rehabilitation Act 1981will help in practicing inclusive design	3.16	1.131	3.29	1.113	4.00	1.732	3.10	.994	3.42	1.240	3.00	1.054	2.63	1.061
New market opportunity	3.12	.872	3.71	.488	2.67	1.528	2.80	.919	2.92	1.084	3.20	.632	3.38	.518
Chances of innovation by practicing inclusive design	3.10	.931	3.86	.378	3.00	1.732	2.70	.949	3.25	.965	2.70	.823	3.25	.707
Entrance to new market	3.08	.944	3.29	1.113	3.00	1.732	3.10	.876	3.17	1.030	3.10	.738	2.75	.886
Legislation	3.08	1.209	2.86	1.069	4.33	.577	3.20	1.229	2.58	1.311	3.90	.876	2.38	.916
Increase revenue through increased usage	3.06	.913	3.43	.787	2.67	1.155	3.20	.919	2.83	1.030	3.10	.876	3.00	.926
Increase customer loyalty	3.04	.903	3.00	1.000	3.00	1.000	3.20	1.033	2.58	.996	3.20	.632	3.38	.744
Increase the size of potential market	2.94	.793	3.29	.951	3.00	1.000	2.90	.876	2.83	.718	2.80	.632	3.00	.926
Availability of tools/methods to help practicing	2.88	.872	2.86	.900	2.33	1.528	3.00	1.054	2.67	.888	3.00	.471	3.13	.835
Public awareness of inclusive design	2.88	.982	3.29	.756	3.00	1.732	2.80	1.033	3.00	1.044	2.70	.823	2.63	1.061
Availability of expert consultation on inclusive design	2.82	.941	3.14	.900	2.67	1.528	2.90	.994	3.00	.953	2.50	.707	2.63	1.061
Availability of training opportunities on inclusive design	2.80	.948	3.00	1.000	2.33	1.528	2.40	1.174	2.92	.793	2.70	.823	3.25	.707
Increase the large share of current market	2.70	.863	3.00	1.000	2.67	1.528	2.70	.949	2.50	.798	2.60	.516	2.88	.991
Major competitors adoption of inclusive design	2.68	.935	2.71	1.113	2.33	1.155	2.80	.919	2.83	1.030	2.20	.632	3.00	.926
Champion for inclusive design on company board	2.66	.823	2.71	.951	2.33	.577	2.50	1.080	2.75	.622	2.60	.699	2.88	.991
Assessment of how many people are excluded	2.58	.950	3.00	.816	2.33	1.528	2.40	.843	2.75	1.215	2.50	.850	2.38	.744
Consumer dissatisfaction with current products	2.40	1.030	2.43	1.272	1.33	.577	2.10	.994	2.25	.965	2.80	.789	2.88	1.126

Table 6. Comparison of different manufacturing sectors on perceived barriers to inclusive design.

Barriers	Overall	Textile	Sports	Beverages	Design consultancies	Electronics	Automotive
Lack of resources/guidance on inclusive design	84	85.7	100.0	90	91.7	80	62.5
Lack of awareness of inclusive design	80	85.7	66.7	80	91.7	70	75.0
Difficulty in changing the culture of business	76	71.4	66.7	70	83.3	70	87.5
Lack of government regulations	76	71.4	100.0	90	91.7	60	50.0
Implementing inclusive design could require significant cultural change	70	85.7	66.7	80	66.7	50	75.0
Perception that inclusive design is more expensive	68	71.4	33.3	70	91.7	40	75.0
Perceived longer development time to market	68	42.9	66.7	50	75.0	90	75.0
Perception – more complex to design inclusively	68	57.1	66.7	70	91.7	40	75.0
Lack of interest in inclusive design	68	57.1	66.7	80	83.3	50	62.5
Stigma associated with inclusive design	66	85.7	33.3	30	83.3	60	87.5
Lack of time and budget	66	57.1	66.7	50	75.0	70	75.0
Lack of company policy on inclusive design	64	71.4	66.7	60	75.0	40	75.0
Inclusive design is a perceived need of our end user	64	85.7	66.7	40	66.7	80	50.0
Lack of methods/tools for practicing inclusive design	64	85.7	66.7	70	75.0	40	50.0
Lack of motivation for tackling inclusive design	64	85.7	100.0	70	83.3	20	50.0
Lack of availability of good design examples	62	71.4	66.7	50	75.0	50	62.5
Perception – there is no need to practice inclusive design	62	71.4	33.3	60	58.3	50	87.5
Working for short term financial objectives	60	42.9	100.0	40	66.7	50	87.5
Perception that inclusive design represents a niche market	58	42.9	66.7	40	75.0	50	75.0
Unavailability of internal support for inclusive design	58	57.1	66.7	60	58.3	40	75.0
Perception of brand association with disabled/older people	54	57.1	100.0	70	66.7	60	62.5
No justifiable business case to support inclusive design	54	57.1	33.3	40	50.0	70	62.5
Lack of knowledge and tools to practice inclusive design	52	57.1	66.7	40	58.3	40	62.5

engage relevant people in these countries. Moreover, during this research exercise, efforts will be made to educate the relevant people about the importance of inclusive design and its impact on our daily life in terms of work productivity and better living. In addition to the social aspects of inclusive design, another important associated factor is the potential business opportunities, and efforts will be made to develop useful business cases for companies to motivate them in the promotion of inclusive design.

7. Conclusion

Changing demographics demand the promotion of the inclusive design method throughout the world. Developing countries like China, India, Pakistan, and Bangladesh make a major contribution to the world population, and the overall population in these countries is increasing and the proportion of older people and people with disabilities is increasing accordingly. This article reveals the need to explore the main barriers and drivers for inclusive design from the perspective of manufacturers, so that drivers can be promoted and barriers can be removed. It has been concluded that people from manufacturing organizations feel that motivation through social responsibility, source of innovation, brand enhancement, and new market opportunities are the main drivers for inclusive design in Pakistan. On the other hand, lack of awareness about inclusive design, lack of resources, guidance, change in culture, government regulations, time and budget are perceived as barriers toward the implementation of design inclusivity in manufacturing organizations. The conclusions on drivers are in close agreement with those found by similar studies in the UK, USA, and Japan as are those on barriers except that this study found that inclusive design was not considered too difficult, less achievable, or likely to compromise esthetics.

However, a difference in the perceptions on drivers and barriers has been observed in different manufacturing sectors that shows that inclusive design promotion can be carried out by focusing on the prioritized relevant factors in each sector. Hence, for example, the electronics industry showed considerable concern for legislation, whereas for the automotive industry customer loyalty and market opportunities were prominent. This supports the idea that efforts are needed to make people aware of the usefulness of inclusive design, not only in the social responsibility context, but also as a potential business opportunity.

The promotion of inclusive design practices will not only be useful in improving living conditions of the people of the developing world, but also will open greater business opportunities for companies. It is not only the responsibility of manufacturing companies, but also of governments to provide adequate resources/guidance that can help in increasing awareness about the usefulness of inclusive design. Development and implementation of proper legislation is also an important area on which to focus where regulatory agencies would have to make sure that organizations are properly implementing inclusive design strategies in their true spirit. These investigations can help in shaping different strategies for the promotion of inclusive design awareness in manufacturing industries in general; and textile, automotive, electronics, beverages, and design consultancies in particular.

This research has contributed in terms of promoting a better understanding of the inclusive design approach and this will ultimately help manufacturers and designers in designing products, services, processes, and environments that are equally safe, healthy,

productive, and acceptable for a wide range of population. The aim is to achieve an improvement in living conditions of older people and people with disabilities along with the rest of the population, while developing a business case for manufacturers as these countries constitute a huge potential market of product consumers.

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Appendix A. SURVEY Inclusive Design Survey for assessing the level of awareness, drivers and barriers among Designers

This survey consists of six parts and will only take a few minutes to complete.
Please answer all Questions:

Contact Name
Company name
Position in Company
Telephone Number
E-mail Address
Company Web Site:

Please Note: We will not share this information with any third party or use these detail to contact you unless you ask us to share the results from this study where these results will be presented in an anonymized form.

- Please provide an email address and tick this box if you would like us to send you the anonymized result from this study.
- Please tick this box if you would like us to contact you to discuss how inclusive Design may assist your organization.

1.Please describe what your organization does:
2.Please list down the names of the products/Services your organization provides

Part-1: Company Profile

1. Number of Employees approximately	☐ Up to 250 ☐ 251-1000 ☐ 1001-5000 ☐ Over 5000
2. How many people use your products/services?	☐ Up to 1000 ☐ 1001-10,000 ☐ 10,001-100,000 ☐ 100,001-1 Million ☐ Over 1 Million
3. How many companies represent most of your sales?	☐ Up to 5 ☐ 6-50 ☐ 51-500 ☐ Over 500 ☐ Direct to customer
4. Global Profile (tick all if apply)	☐ Pakistan ☐ Asia ☐ Europe ☐ USA ☐ Global
5. Does your organization have a post for corporate social responsibility (CSR)?	☐ Yes ☐ No ☐ Don't know ☐ Don't understand

Part-2: Current Understanding

1. Have you heard of the following terms? (tick all if apply)	☐ Inclusive Design ☐ Universal Design ☐ Design for all
2. What do you think they mean?	

Part-3: Current Company Position

In answering the following. Please think of the definition of inclusive design."A process whereby designers, manufacturers, and service providers ensure that their products and services address the needs of the widest possible audience."

(Please select the appropriate number)

1. What level of awareness of Inclusive Design is there in your organization?	☐ 1 (No awareness) ☐ 2 ☐ 3 ☐ 4 (Extremely aware)
2. How inclusive do you think your products/services are?	☐ (Not inclusive) ☐ 2 ☐ 3 ☐ 4 (very inclusive))
3. What level of effort is utilized to make your products/ services inclusive?	☐ 1 (Little or no effort) ☐ 2 ☐ 3 ☐ 4 (Large amount of effort)
4. Is your company interested in making your products/ services more inclusive?	☐ 1 (Not interested) ☐ 2 ☐ 3 ☐ 4 (Extremely interested)
5. How aware is your company or organization?	**A.** The (Employment and Rehabilitation) Act,1981 of Pakistan ☐ 1 (No awareness) ☐ 2 ☐ 3 ☐ 4 (Extremely aware) **B.** Other legislation, Policies and, or codes of practice? ☐ 1 (No awareness) ☐ 2 ☐ 3 ☐ 4 (Extremely aware)
6. Have you ever heard about the (Employment and Rehabilitation) Act,1981	☐ Yes ☐ No
7. Please specify and particular products/services that are designed to be inclusive.	
8. What level of effort is currently utilized to make your products/services inclusive?	☐ 1 (Little or no effort) ☐ 2 ☐ 3 ☐ 4 (Large amount of effort)
Please elaborate on any specific initiatives that you are able to discuss and comment on their success.	

Part-4: Drivers for inclusive Design

1. How much do you agree with the following five statements?	**1**. Legislation is a major driver for inclusive design within our organization. ☐ 1 (Strongly disagree) ☐ 2 ☐ 3 ☐ 4 (Strongly agree) ☐ Don't know **2.** The (Employment and Rehabilitation) Act, 1981 will help us to practice and manage inclusive design. ☐ 1 (Strongly disagree) ☐ 2 ☐ 3 ☐ 4 (Strongly agree) ☐ Don't know **3**. Social responsibility motivates our organization to consider inclusive design. ☐ 1 (Strongly disagree) ☐ 2 ☐ 3 ☐ 4 (Strongly agree) ☐ Don't know **4**. Demographic and consumer trends are driving our organization commitment to inclusive design. ☐ 1 (Strongly disagree) ☐ 2 ☐ 3 ☐ 4 (Strongly agree) ☐ Don't know **5**. Brand enhancement is a key driver for inclusive design within our organization. ☐ 1 (Strongly disagree) ☐ 2 ☐ 3 ☐ 4 (Strongly agree) ☐ Don't know
2. How effective do you think inclusive design could be in helping you to achieve the following commercial benefits?	Entrance to a new market. ☐ 1 (Not effective) ☐ 2 ☐ 3 ☐ 4 (very effective) Increase the size of your potential market. ☐ 1 (Not effective) ☐ 2 ☐ 3 ☐ 4 (very effective) Increase the size of your potential market. ☐ 1 (Not effective) ☐ 2 ☐ 3 ☐ 4 (very effective)

(*Continued*)

Achieve a large share of your current market.
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Increase customer loyalty
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Increase revenue through increased usage
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Increase customer satisfaction
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

A source of innovation and differentiation
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

New market opportunities by practicing inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Assessment of how many people are excluded
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Consumer dissatisfaction with current products
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Chances of innovation by practicing inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Public/consumer awareness of inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Availability of expert consultation on inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

(*Continued*)

Availability of tools/methods to help the practice of inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Availability of training opportunities on inclusive design for staff/designers
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Champion for inclusive design on company boards
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

Major competitor's adoption of inclusive design
- ☐ 1 (Not effective)
- ☐ 2
- ☐ 3
- ☐ 4 (very effective)

If there are other key Drivers for your organization, please specify?

Part-5: Barriers to inclusive Design

1. Please respond to the following statements on barriers to inclusive design with respect to your organization.	There is little or no internal support for inclusive design. ☐ Yes ☐ No Implementing inclusive design could require significant cultural change. ☐ Yes ☐ No We lack the knowledge and tools to practice inclusive design. ☐ Yes ☐ No There is no justifiable business case to support inclusive design. ☐ Yes ☐ No There is a lack of time and budget to support inclusive design. ☐ Yes ☐ No There is a perception that inclusive design is too difficult. ☐ Yes ☐ No Inclusive design compromises the aesthetics of the design. ☐ Yes ☐ No Inclusive design is a perceived need of our end users. ☐ Yes ☐ No There is a stigma associated with inclusive design. ☐ Yes ☐ No Inclusive Design is seen as an unachievable goal. ☐ Yes ☐ No Lack of awareness of inclusive design ☐ Yes ☐ No Lack of interest in inclusive design ☐ Yes ☐ No Lack of motivation for tackling inclusive design ☐ Yes ☐ No Perception that inclusive design is more expensive ☐ Yes ☐ No Perception that it can be more complex to design inclusively ☐ Yes ☐ No

(*Continued*)

Perception that inclusive design represents a niche market
- ☐ Yes
- ☐ No

Perceived problems of brand association with disabled/order people
- ☐ Yes
- ☐ No

Perceived longer development time to market
- ☐ Yes
- ☐ No

Perception that there is no need to practice inclusive design
- ☐ Yes
- ☐ No

Perception that inclusive design is a passing trend
- ☐ Yes
- ☐ No

Lack of resources/guidance on inclusive design
- ☐ Yes
- ☐ No

Lack of availability of good design examples
- ☐ Yes
- ☐ No

Lack of government regulations
- ☐ Yes
- ☐ No

Lack of methods/tools for practicing inclusive design
- ☐ Yes
- ☐ No

Difficulty in changing the culture of business
- ☐ Yes
- ☐ No

Lack of company policy on inclusive design
- ☐ Yes
- ☐ No

Working for short-term financial objectives
- ☐ Yes
- ☐ No

2. Which of the following barriers do you perceive as most important.
   - ☐ Most important.
   - ☐ Second most important.
   - ☐ Third most important.
3. Which of the above barriers do you perceive as least important and.
   - ☐ Least important.
   - ☐ Second least important.
   - ☐ Third least important.
4. Are there any other significant barriers to the adoption of inclusive Design within your organization?

Part-6: Tools to increase the Usage of Inclusive Design

1. How important do you perceive the following tools to encourage inclusive Design within your organization?	(A) Convincing arguments (business case) for top level management. ☐ 1 (not important) ☐ 2 ☐ 3 ☐ 4 (extremely important) (B) An increased understanding of inclusive design. ☐ 1 (not important) ☐ 2 ☐ 3 ☐ 4 (extremely important) (C) Skills or tools to assist with designing inclusively ☐ 1 (not important) ☐ 2 ☐ 3 ☐ 4 (extremely important) (D) Effective tools to market inclusive Design ☐ 1 (not important) ☐ 2 ☐ 3 ☐ 4 (extremely important)
Which of these (A-D) is the most important?	Most important Second Most important Third most important
2. Which of the following would be useful to your business (tick at that apply)	**A.** A national awareness campaign. **B.** A national centre of excellence for inclusive Design. **C.** Attending an Inclusive Design event. **D.** Receiving an exclusion assessment on your product/service. **E.** Consultancy and/or training on inclusive design for your organization. **F.** Other, please specify:
Which of these (A-F) is most important, and why?	Most important Second Most important Third most important