

Revolutionizing Digital Innovation: Prioritizing Usability in Pakistan

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Abstract: The importance of usability is gaining attention globally, but it remains relatively overlooked in Pakistan. This study examined the issue by conducting three survey reports within the Pakistan Information Technology (IT) industry and university academia, involving 189 participants. This paper aimed to understand the impact of exposure on usability insight, however the results indicated no significant effect based on the Usability Maturity Model (UMM). Interestingly, it was found that end users were often not included in the design process and many software organizations are at an unrecognized stage of UMM due to budget constraints. Furthermore, there is a lack of focus on usability, as reflected in the absence of postgraduate or undergraduate programs dedicated to this field in Pakistan. This underscores the need for increased awareness and investment in promoting usability practices within the country's IT industry and academic institutions.

Keywords: HCI; IT Industry; Accessibility; User Interface; Digital Initiatives.

1. Introduction

The particular regard of class on Personal Computer (PC) of the Association for Computing Machinery (ACM) classifies Human Computer Interaction (HCI) regulation should be concern about sketch, assessment, and execution. (SIGCHI Curriculum Development Group). HCI Knowledge has appeared as an essential requirement to assist individual's natural and concept for rising skills [1]. Around Europe and United State HCI exist acting an essential part from 1980 in IT industry [2].

In contrast with advanced nations Pakistan up-to-date stage so in HCI and utility is nascent. However, the Information Technology Uprising in Pakistan is the future of coming age, inspired by the decreasing price in telecommunication in the World. Thus, the act of conducting this research is to check the up-to-date country of HCI in Pakistan academia. How much HCI is involved in Pakistan academia?

After the introduction to HCI, the concepts of Usability were started in late 1980. They have done significant research work on Usability Engineering (Dumas, 2007). Utility of quantifiable attribute outcome of user interface e.g. simple usage and simple to be taught [2].

Oh the justice and impartiality in units on which the outcomes stand, in procedure the outcomes for single person is built. In the domain of folklore plus thoughtful educational societies, every view has expanded distinction inside area of higher information and ML [15], growing part in exploration [15]

Only in Indonesia have HCI practices and initiatives been promoted. Although there have long been efforts to advance the field of human-computer interaction, awareness of the significance of these issues just began in the last ten years [16].

In higher education computing programs, students receive training in software engineering, which emphasizes the technical aspects of coding and programming. However, the focus on engineering often leads to a lack of attention to user-centered design principles. As a result, developers may overlook

important considerations such as usability, accessibility, and inclusiveness when creating software. This issue becomes particularly problematic in companies that do not prioritize design cultures. [18].

Due to the knowledge in the field, researchers can improve the user experience of the digital product. By understanding the human nature for creating the interface of mobile app is easy. The aim is to increase the developers to make them think outside the box. This will help them to create new and interactive designs for apps which will be user friendly. By using the knowledge the designer can design an interactive user interface. Our main aim is to fill the gap between the mobile application development and researchers [19].

The recent study allows the researchers to gain knowledge to improve the experience for data analysis. By using the technique, the author can gather the data. It is very helpful for understanding the complex things in real-world environment. By using different methods, researchers can find practical and theoretical outcomes which can be very useful. The combination of the theory and the practical can be used to produce innovative outcomes. Combining these two will be very helpful in future for the developers [20].

In doing so, our goal is to identify areas where students commonly face difficulties when tackling interface design, such as user experience considerations, information architecture, and visual design principles. Through this research, the researchers hope to contribute to more effective pedagogical approaches that address the practical needs and learning styles of computing students in relation to HCI. Our findings will shed light on key areas for improvement within HCI education, potentially leading to enhanced student performance and competence in software interface design [23].

2. Literature Review

First dedicated usability engineering research laboratory initiated in IITG in 2002. Since now one PhD, 10 master graduates and 90 under graduates specialized in HCI/Usability area in IITG. Recently some research and development projects are completed in this area. IITG has more than 60 publications in journals/conferences in HCI and Usability area. Nearby lack in human-computer interaction (HCI) professionals in India; barely 10 PhD researchers are active in this area in India. Indians institutes need to produce more PhD's, Master graduates and more undergraduates [3].

A survey was conducted in Malaysia. Total 72 participants were involved inside the report, 23 of them were IT experts, number of students of IT was 27 along with number of non IT experts were 22. Respondents remained software developers, operator, agent, sales professionals and IT pupils. Result reveals that there is not at all large diversity on utility knowledge among IT practitioners, trainee and IT pupils. Findings indicate a certain utility coexist mutual intelligence knowledge for both IT and Non IT staff and usability is God gifted skill [4].

Top Chinese companies considered User Experience (UX) as key problem. Many top Chinese companies take their own investigating workshops and utility work staff e.g. Intel, Baidu, Lenovo, Samsung electronics, Huawei, Tencent, Nokia and China mobile etc. There are more than 21 HCI/usability research laboratories in China. Round about 200 professionals are working in these laboratories. All professionals are from different backgrounds e.g. HCI, Interaction design, industrial design, SE, psychology, human factors etc. [5]. Companies like oracle, VERITAS, HP, SAP, Intel, General Electric and Adobe have their offices now in India. All these companies have their design group [6].

Another survey was conducted in Korea. Total 72 participants were involved in this study. The respondents happen to progress experts plus Utility specialists. The result shows that utility has never been functional within the schemes on the other hand understanding about utility rise as predicted.

In Korea stats show that 87.7% people of the age of 12-18 are user of mobile phone which is the highest rate of mobile phone usage in the world. After Sweden the Koreans are 95% the highest 2nd ratio of internet using in the world. Korean government is continuously promoting e services. School, industry and government are the most important players for usability development. Collaboration between these three key players with each other is doing a great work. In 1990 the scope of Graphic User Interfaces (GUI) are increased. Then trend shifted into Web/Mobile application. After 2005 the trend of Web/Mobile shifted into User Experience (UX). There are many professional society exist in Korea regarding usability, design etc. Usability research is very active in different institute in Korea. In all these institutes there are many Usability and research labs.

Most universities and institutes offer courses and very few offers full degree in HCI, Usability engineering and user experience. "Ben-Gurion University of the Negev" is offering MSC in HCI and PhD programs. The aim about package ensures direction towards professionals into research and evaluate new interface design and technology. The research is being conduct by three faculty members with the collaboration with others teachers this is largest research group in Israel. The Technician institute also offering MSc and PhD programs. Media innovation lab is HCI lab. Academic research on HCI is very active and well acknowledge by the world.

Usability education is involved in Thailand in computer science, product design, interaction design, computer engineering. HCI education is involved in Thailand in robotic schools, computer science, digital media, and information technology. HCI is widely used in web application.

There are ten schools which teach about product design. There is no journal in Thailand about HCI/usability but many researchers published many papers on these areas. Many Thai authors participate foreign conferences. Usability and HCI are completely involved in Thai industry. The IP phone is focused on principles of HCI and Pak Air is focused on Human centered design. Very few usability testing labs are there in Thailand with different purposes. Some seminars and conferences have been held in Thailand on usability and HCI.

Usability was considered almost decades before in pre computer areas in Czech Republic. There is a big difference between methodologies used those days and current day's methodologies. The boom in Usability was seen in computer science in 1980S. The situation changed dramatically when companies like IBM and Sun Microsystems started the research groups and established usability laboratories in Czech Republic. Cooperation between universities and these research centres played a very important role. From many years usability problems have been a part of universities. Many courses were dedicated to HCI/usability. Many courses have been taught at graduate and post graduate courses. Usability testing is being conducted in labs established by CTU and Sun Microsystems.

Conferences scheduled regularly in Czech Republic on usability issues. Many other events are conducted regularly for increasing awareness about usability. There are some good projects of usability like "Interaction in special Environments" and "Multimodal Interaction", "Users with special Needs". In the above mentioned projects all usability methods are applied [7].

More than 12 universities are offering courses about HCI/usability. Research activities are active in many universities about HCI. Industrial activities are active in many universities. Conferences, meetings, world usability day, trainings and seminars on usability are organized regularly. There are number of industrial and universities project in Poland usability methods and principles applied [8].

In Mexico 91% people are literate. Internet is commonly used by every people in Mexico. Usability started in Mexico from software engineering. In late 1980s papers published on GUI. At that stage ease of use of application is an odd topic for computer programmers. At that time user needs were considered very important. Usability was ignored.

In 1990 many Mexican undergraduate students got overseas scholarships. World class professors taught many of them about HCI. Several younger professors started extent the UCD (User centered Design) that was the most recognizable time for HCI. Another milestone for HCI was the ACM SIGCHI conference held in Mexico. And then HCI community was created. After that some courses were offered in software engineering programs. UsaLab is usability laboratory in Mexico provide usability services to different organizations. The UsaLab experience shows that usability still is hard cell issue in Mexico. Few companies are interested to pay for services. Most customers of the UsaLab are from foreign. Now research is active in HCI thought the country. HCI course is available in undergraduate programs. There is no graduate program fully devoted to HCI but a number of programs are available to offer specialization in HCI/Usability. Academic group is very active now organizing events on HCI regularly. CHI is the largest group of attention in HCI. Usability testing laboratories are increasing day by day in Mexico. Usability projects in industry are very rare yet. Basis of HCI were formed in last 20 years [9].

In 2011 HCI was extended to other projects. In 2009 a survey was conducted and its aim was that how HCI courses have been taught in Brazil. Total 89 professors were participant of 63 different universities. Participants give detail of courses. For analysing purpose they classified courses into three levels Module of HCI, Advance HCI and Introductory HCI. 57% Fifty-seven percent were introductory courses. Twenty-eight percent courses considered advance HCI. Most Introductory developments partly enclosed program

recommended by HCI public. Another survey was conducted in Brazil via discover every opportunities to test within HCI learning. Overall 109 participants participated within every study. From survey the author found some challenges, some of the greatest contest towards noble HCI spot within organization after finishing graduation, second the author should keep updating our academic professor with latest development. Finally the professors should collaborate with each other's [10].

The adaptive recognition and real-time monitoring system (Ada-HAR) for social events. They perform an experiment involving 25 participants. The result was 95.15 % then 92.20 % compact. Online approach was the most special feature. It is an online method to deal out with the need for labeling data .The smartphones located within different positions and instruction throughout analysis. The performance of Ada-HAR system is better than both the volume and activities [17].

The Holzinger extreme usability development method represents a significant integration of agile development practices with human-computer interaction (HCI) principles. This approach focuses on creating software that prioritizes user experience through iterative, flexible development cycles. By incorporating elements from both agile and HCI, the Holzinger method aims to produce highly usable software that addresses user needs effectively. Key features of this approach include regular user testing and feedback loops to ensure continuous improvement and refinement based on user input. Agile development practices such as sprints and stand-up meetings are coupled with HCI techniques such as task analysis and usability studies to create a well-balanced framework for software development. This method emphasizes close collaboration between developers, designers, and end users to achieve high levels of usability. The integration of agile development and HCI in the Holzinger method offers a unique blend of technology-driven iteration and user-centered design, aiming to deliver optimized software solutions. Ultimately, it provides a structured yet adaptable framework for developing highly usable software products in a dynamic environment [18].

3. Research Methodology

First of all problem was analyzed clearly after that literature review was completed. After completing the literature review questionnaires were prepared for data collection. After collecting the data through three different studies in IT industry and Pakistan Academia results were made. Then in the end some guidelines were extracted.

For data collection purpose questionnaire and interviews both methods were used. After studying the literature review, the author come to a point that for finding the awareness state of usability and HCI, IT industry and Academia are equally important. Therefore two questionnaires were created. One was prepared for Pakistan academia to check the current state of HCI. The other one was prepared for the IT industry. Both questionnaires were online created through Google forms.

For data collection purpose first of all pilot study shown inside IT business of Pakistan prior to check the up-to-date nation of utility. Online questionnaire was sent to different IT companies for collecting data. Interviews of IT professionals were held for collecting data and their perception about usability importance. After completing pilot study data was analysed and results was built. After all these procedure questionnaire of study one was modified and errors removed. Some questions were added in questionnaire and 2nd study in IT industry was performed for finding the current state of awareness of usability. Interviews were also held in during 2nd study. Questionnaire sent through emails to different participants. On social media website like Facebook and LinkedIn questionnaire were also sent to dedicated IT professionals. Software technology parks of Islamabad and Lahore were visited and questionnaire was live filled from different companies. Interviews of software engineers and Developers are also performed during this study.

After collecting the data results were analysed. From the results some guidelines were extracted for improving the awareness about usability and HCI. Research about HCI and Usability is not sufficiently active in Pakistan Academia. Many organizations in IT industry remain hidden or recognized stage. Software engineers are very clear about usability and they think usability is equally important as inner functionality of the system. While on other hand developers mind sets need to be changed about usability and HCI.

Overall, by providing an in-depth yet accessible overview of existing research, systematic mapping studies play an important role in advancing our understanding of specific fields and guiding future research endeavors [20].

3.1. Questionnaire

A survey was made and sent to internet to targeted organizations. The normal queries found in questionnaires are locked questions that trailed via reply option. But, many flexible queries were as well tested from survey to discovery the answer of the participants. Face to face interviews also held in order the record the personnel opinion about the facts under consideration. However all the questions are asked during interviews were open-ended. The questions mention in Table 1 from the defendant to check the up-to-date nation of utility awareness in IT industry of Pakistan:

Table 1. Questions for Usability

Sr: #	Question asked
Q1	Do you consider your operating system to be functional?
Q2	There is something wrong with the system interface, but you don't know what it is or how to change it.
Q3	Do your company produced reliable goods?
Q4	Is your business consistently This business begins to form a specialist team to address user interface problems useful goods?
Q5	Does your company have a budget for utility?
Q6	The key decision-makers in this organization have switched their attention from internal technology to design for human use.

The survey participants included a diverse range of professionals, such as software developers, software engineers, senior executives, managers, graphic designers, software testers, and system analysts. Among the respondents, a majority (82.5%) were under 30 years old. The remaining 17.5% fell into the 31-40 age groups. This distribution is visually represented in Figure 1.

These findings may also contribute to discussions about fostering diversity and inclusion within tech-related fields by acknowledging differences across generations.

In conclusion, the distribution of age groups among survey respondents provides valuable information for understanding career trends and preferences among professionals in tech-related roles. This data has broad implications for talent management strategies and initiatives aimed at nurturing diversity and inclusion within the industry.

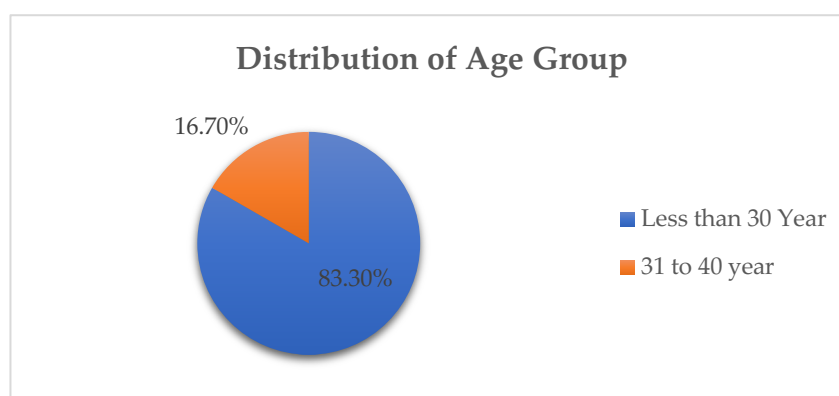


Figure 1. Age Distribution

During the discussion on educational qualifications, several individuals with diverse backgrounds were queried. Of the attendees, 45 possessed a first degree while 18 held an associate degree. Furthermore, 5 individuals possessed a Master of Science (MS) credential. Notably, one individual who had pursued undergraduate studies emerged as the founder of an IT business. It was observed that each participant boasted a technical proficiency in computer science and related fields.

The pie chart in Figure 2 shows the visual representation of the work experience. It shows the tenure of the people. From the total number of people data shows that 32.5% have 5 years of work experience,

22.5% have the working experience of 3 years, whereas 22.5% have the experience of 1 year. The 5% of the people have only 10 year tenure.

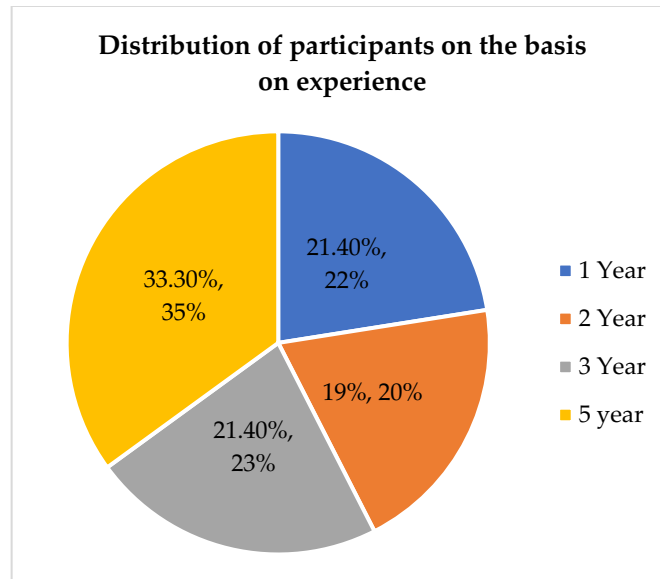


Figure 2. Distribution of participants on the basis on experience

This study aimed to know the current position of Usability in IT business. The model is used as a frame work to understand the usability in nation's IT industry. The surveys and interviews conducted with experts working in It sector across Pakistan. The data was gathered by the surveys and then the analysis was performed according to the UMM criteria. The result shows that some companies have very high Usability, some lagged behind. It shed light on the areas where improvements can be done.

In the second phase, participants from Islamabad were actively involved with the assistance of PSEB authorities. The researcher meticulously visited the Evacuee Trust Complex office of PSEB and interacted with several IT companies to gather crucial data. Additionally, extensive examinations were conducted at the main office of PSEB in Islamabad to gain a comprehensive understanding of their operations and procedures.

Furthermore, the author also made a thorough exploration of the Software Technology Park located in the I-9 sector of Islamabad. These visits provided invaluable insights into the technological landscape and industry infrastructure in the region.

A total of 117 individuals actively participated in this study, with participants categorized into Android, iOS, Web, and Computer System developers. The gender distribution among the participants was found to be heavily skewed towards males, comprising 86.3% of the total sample. In contrast, females accounted for 13.7% of the participant group, representing lower representation.

Further analysis revealed that there were 101 male respondents and 16 female respondents, following a notable gender discrepancy. These findings are visually illustrated in Figure 4, which depicts the gender-based distribution of the participants.

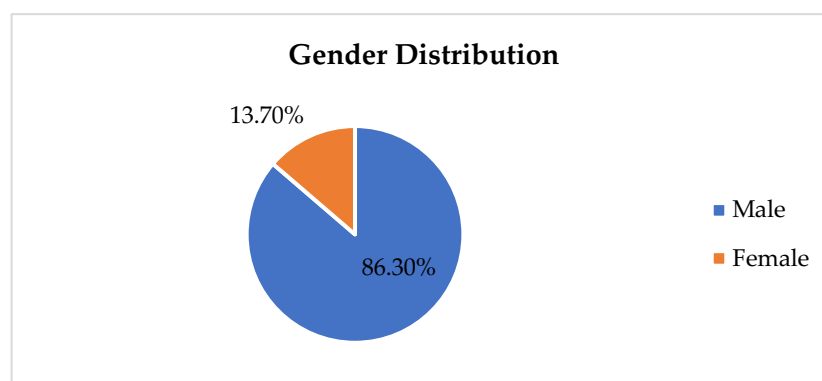


Figure 3. Gender Distribution

According to the data, individuals aged up to 30 years old account for 82.9% of the total respondents, while those in the 31 to 40-year-old bracket make up 16.2%. Additionally, the survey reveals that all single respondents are over 60 years of age. The specific age distribution is graphically depicted in Figure 5. The predominance of younger participants, particularly those under the age of 30, indicates a significant representation of this demographic in the sample. This may have implications for interpreting the findings and understanding the perspective of different age groups within the population. Moreover, the noteworthy absence of respondents between ages 41 and 60 raises questions about potential biases and limitations in capturing insights from individuals in this age range.

As evidenced by these statistics, there is a clear concentration of respondents within specific stages of adulthood, with limited representation of middle-aged individuals and a notable presence of older singles. These findings underscore the importance of considering age-related factors when analyzing and generalizing results across diverse segments of the population.

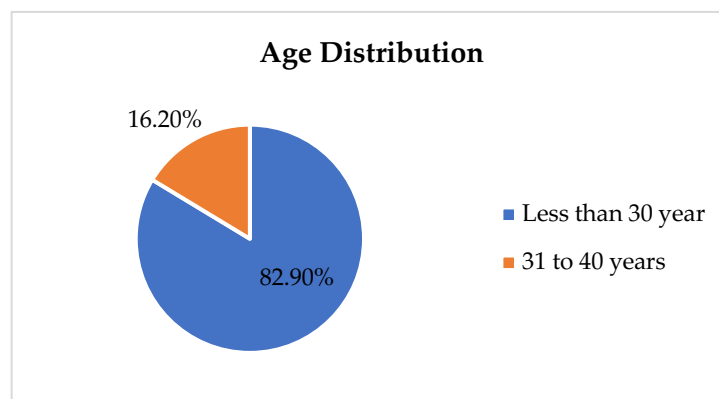


Figure 4. Age Distribution

According to recent data, 29.1% of individuals have accumulated one year of experience within a recognized organization. Furthermore, 23.1% possess a two-year tenure at a well-established institution. The percentage falls to 16.2% for those with five years of professional experience. Moreover, only 12% have completed three years within a reputable organization. As for those with four years of practice, the percentage stands at 10.3%. Interestingly, the percentage drastically decreases to below representational levels for those with ten or more years of experience. This data highlights the significance and scarcity of long-term tenures within organizations and emphasizes the need for further analysis and investigation into this matter.

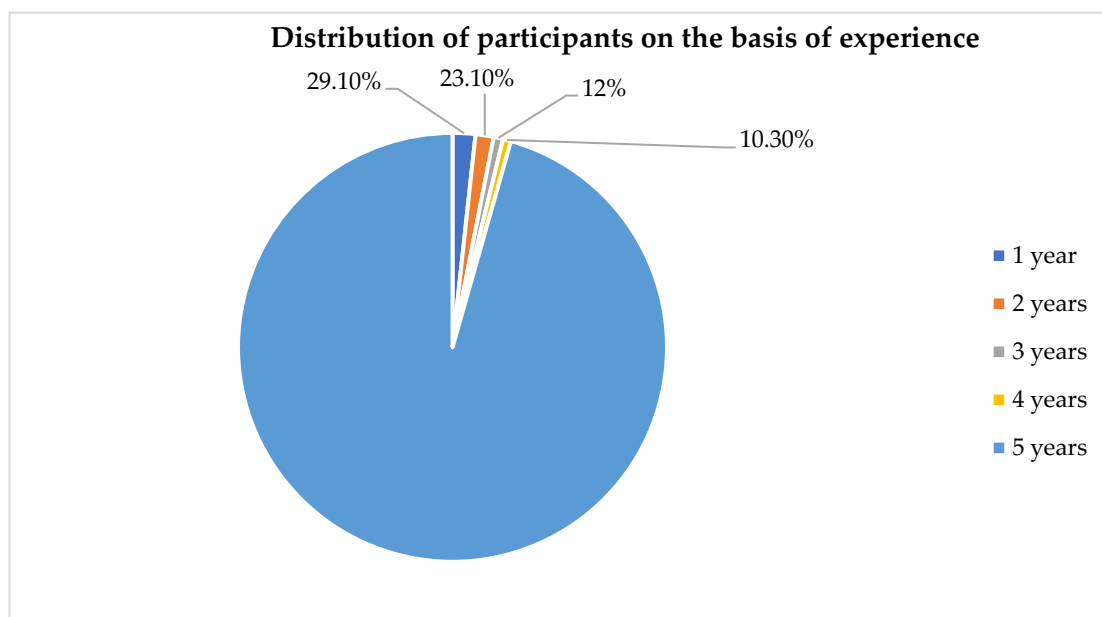


Figure 5. Distribution of participants on the basis of experience

The majority of the participants, comprising 59 individuals or 50.4% of the total sample size, held a bachelor's degree. Additionally, 37.6% of respondents, comprising 44 individuals, reported having completed sixteen years of education. A single respondent reported an intermediate level of education, while three others (2.6%) did not specify their educational background. This distribution is visually illustrated in Figure 7, which provides a clear overview of the educational qualifications held by the participants in this survey.

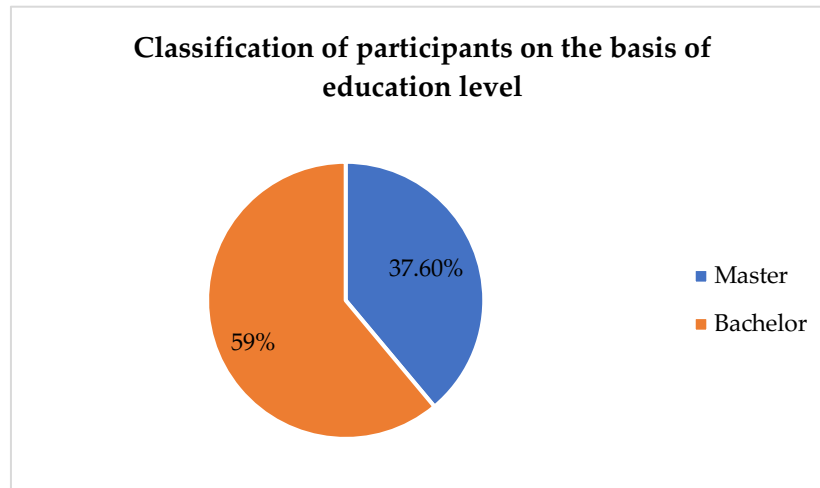


Figure 6. Classification of participants on the basis of education level

A query was raised to investigate the importance of organizational utility in achieving success. The findings indicated that out of 117 individuals surveyed, 53 believed that utility plays a crucial role in achieving success. Figure 8 provides a visual representation of responses towards the perceived importance of utility. In conclusion, while a substantial number of individuals acknowledge the link between utility and success, there exists divergence in opinion about its necessity. This highlights the complexity inherent in assessing the role of organizational utility in achieving successful outcomes and emphasizes the need for nuanced consideration when examining this topic further.

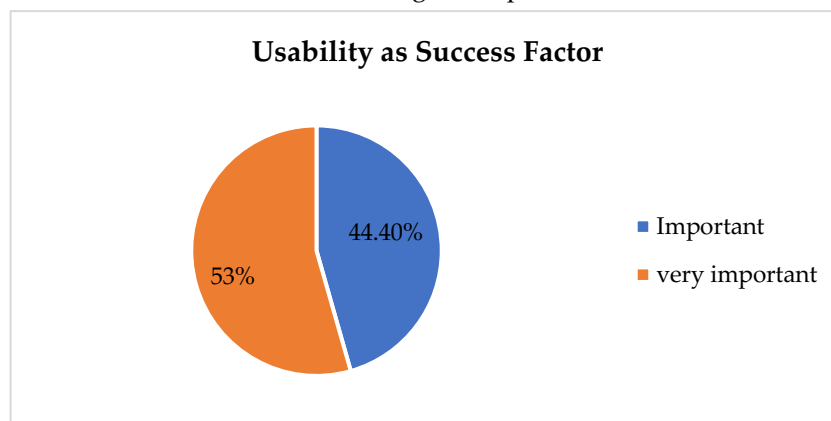


Figure 7. Usability as success factor

Human-Computer Interaction (HCI) has significantly enhanced the efficiency and productivity of companies, with a utility rating of 50.4 in 2018. As a result, thirty companies have appointed User Knowledge Professionals to focus on optimizing the user experience of their products and services. This demand for HCI expertise has grown rapidly over the past two decades, leading to an increase in the number of professionals specializing in user interface (UI) development.

Specifically, 14.5 people were recently elected as UI developers due to the high demand for their skills in gaming, website development, and portable product design. Additionally, there has been a parallel surge in appointments for individuals focusing on man-machine interaction. Thirteen-point-five

professionals have recently been welcomed into this role to address the evolving needs of companies seeking to enhance human-computer cooperation within their systems.

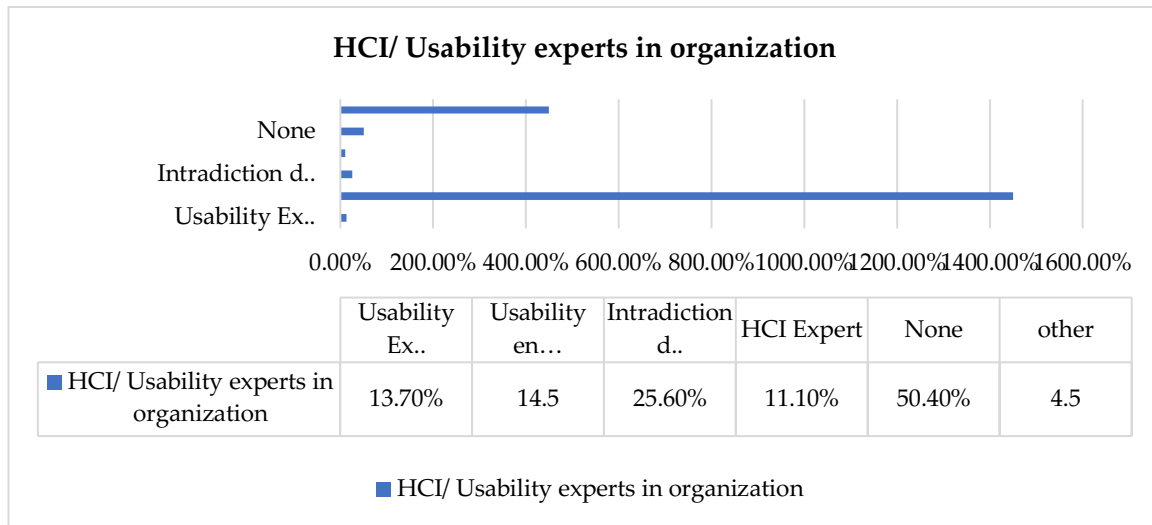


Figure 8. HCI/ Usability experts in organization

According to recent research, nearly a quarter of IT organizations do not take guest opinions into account during the software lifecycle design phase. When consumer feedback is disregarded at this critical stage, the likelihood of creating a user-friendly system decreases significantly. It is widely acknowledged that energetic and consistent customer feedback is essential in the User-System Design process (UCSD) [12]. This emphasizes the crucial role that user input plays in ensuring that software systems are intuitive and effective for end users. Ignoring such feedback may result in systems that do not adequately meet the needs and expectations of their intended users, ultimately hindering productivity and user satisfaction. Therefore, incorporating regular customer feedback into the design phase is fundamental to achieving successful outcomes in software development. The involvement of consumers is a crucial factor in the development of a successful system and the attainment of our objectives (13). In 1988, research indicated that 75.2% of organizations integrated consumer feedback during the design phase, underscoring the significant role of consumer contribution in the process. This emphasis on consumer input highlights its essential nature in reaching our intended goals.

As demonstrated in Figure 10, the impact of consumer participation is visually represented, serving as a visual testament to its vital influence. The data reinforces the importance of engaging consumers from an early stage and incorporating their insights into system development. The high percentage of organizations leveraging consumer feedback underscores its widespread recognition as a valuable asset in achieving targeted outcomes. In conclusion, the evidence from 1988 demonstrates that leveraging consumer contributions plays an integral part in building systems and ultimately realizing our goals. This insight serves as a valuable reminder for current and future initiatives about the positive impact of involving consumers early on in the process.

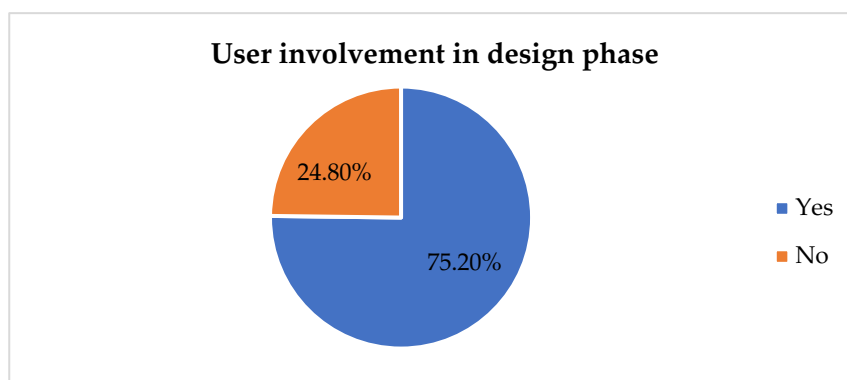


Figure 9. User involvement in design phase

4. Results and Discussions

Before starting this research study author assumes that HCI and Usability are fully involved in IT industry and partially involved in Pakistani university academia. But unfortunately after analysing the data and results of this research, the author finds that usability is partially involved in IT Industry of Pakistan. HCI is at birth stage in Academia. In this research study, the author uses two different terms for academia and IT industry. Human Computer Interaction (HCI) was used for academia and Usability was used for IT industry. The reason of using two different terms is that after studying and analysing the literature HCI was mostly used for academia perspective because HCI is broad term. HCI is huge field in the world. Usability was used for IT industry mostly in ICT industry of Developed or developing country.

To increase awareness about HCI and usability in Pakistan, the author assumes that first of all find the current level of HCI and Usability. Then need to propose the tools, technique, and theories to increase the awareness. Once the professionals think usability and HCI are very important for project success then usable product will be produced. Therefore researchers need to explore up-to-date nation of man-machine interaction and utility respectively within academia and IT business.

To perform the present research first of all a questionnaire was designed in the direction to explore out the up-to-date nation in utility. It was a pilot study questionnaire was sent to open house software through emails and dedicated persons. After data collection results reveals that in overall organization usability was no considered important. Most of the organizations have financial budgets regarding usability. HCI and Usability Professionals were not hired. Consumer feedback was neglected in design stage regards study. In most of the organizations IT professionals were needed to be trained about usability of the software system. Developers mind are needed to be changed about usability. Developers' perceptions were not satisfying regarding usability. They are not aware about usability of the system is equally important as inner functionality but unfortunately they don't think so. Software professional having great insight as associated with planner and computer programmers. This is why programmers take extra interest with consumer as compared developers and computer programmers. Before starting this study the author assumes that experience should have big influence about usability. But unfortunately internee, juniors and seniors developers have same level of perceptions about usability. Another study was steered in The Islamic Republic of Pakistan Academia to find the up-to-date activity in HCI and related terms. In most of the universities research in HCI is not active. HCI, IUI, Web usability, usability Engineering, Interaction designer etc. subjects are offered in most of the universities at undergraduate level in computer science department. Specialization in HCI programs in undergraduate or postgraduate levels or not offered even in a single university. There is no single usability laboratory in any public or private university. From survey in Pakistani Academia some guidelines were extracted.

Results of the research study reveals that in open software houses usability is not currently involved. In open software houses usability awareness is in at unrecognised and partially at recognised level of Usability Maturity Model (UMM). While on other side registered software houses with Pakistan Software Export Board (PSEB) usability is involved. In these organizations usability is considered very important for project success.

Other important point noticed from this research study is that background of IT professionals matter or can change the perception of IT professionals about usability. Perception about usability of all IT professionals graduates from Federal Urdu University of Arts, Science and Technology (FUUAST) very clear about usability. They define usability and they consider usability equally important as inner technology of the system. All they think usability is very important for project success.

5. Conclusion

This research conducted in Pakistan sheds light on the current state of usability, indicating that while utility and user interface have received significant attention from global scholars and business experts, the level of consumer focus on design remains underdeveloped within Pakistan. Despite the increased emphasis on usability in other parts of the world, there is a noticeable gap in consumer awareness and maturity towards usability considerations in the Pakistani context. The findings suggest that there is a need for greater education and awareness among consumers regarding the importance of user-centered design. Additionally, businesses and designers in Pakistan may benefit from incorporating more user-centric

approaches to product development and interface design. By prioritizing usability and considering consumer needs and preferences, organizations can potentially enhance their competitiveness in the local market.

This paper provides the thorough understanding of the HCI in Pakistan. Offering precious insights for improving the both IT enterprises and academic institution. Software engineers are significantly influenced by the growing emphasis on usability in application development. This trend has been primarily driven by the impact of Human-Computer Interaction (HCI) education, which has played a crucial role in enhancing usability awareness. While organizations have shown partial involvement in HCI and usability, there remains a pressing need to shift the mindset of application developers towards recognizing the importance of usability alongside technical functionality. In academia, establishing dedicated usability laboratories is essential for nurturing a deeper understanding of user-centric design principles. These facilities can provide students and researchers with invaluable hands-on experience and allow them to explore innovative methods for improving user experiences. Ultimately, fostering a culture that prioritizes both inner technology and usability will be critical for advancing the field of software engineering.

Moreover, exploring the effectiveness of these global methods within Pakistan's specific context would provide invaluable data for industry professionals. It is important for further research to closely examine the relationship between higher management and consumer feedback, as this dynamic plays a crucial role in shaping blueprints and facilitating IT improvements. Understanding this association will ultimately contribute to more informed decision-making processes within the industry.

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