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# WHEELCHAIR DESIGN ANALYSIS USING ETHNOGRAPHIC RESEARCH

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**Abstract—** This paper talks about benefits of introducing ethnographic research into specifically design engineering field. Ethnographic research is an emerging branch of research which uses scientific techniques like anthropology and sociology. Ethnographic research is done through participant observations and field work. In ethnographic study, minds of people or groups of people are studied. Such method of research can be very useful in analyzing the reliability of a design of engineering product. Around 10% of global population and 2.5% of Indian population is suffering from one or other type of the disability and they use wheelchair for their mobility. Therefore it can be beneficial to study the design of basic manual wheelchair by studying the minds of people or rather various groups of people who are associated with wheelchair by ethnographic research.

**Keywords –** Engineering design, Ethnographic research, Wheelchair

## I. INTRODUCTION

Ethnographic research is a different branch of research science. Scientists are using this type of research from early years of 19th century. In many of the fundamental researches, the experimentation or hypothesis leads to some conclusion which is accepted ambiguously. But in case of ethnographic research, its methodology is different. It studies minds, cultures, thinking abilities of participants with the help of anthropometry and sociology. In Ethnographic research, different methods of data collection are used like participant observation, Interviewing or by using archived research [1]. In case of participant observation, researcher may or may not take permission of the participant. Through this he spends time with and records concerned activities of participant. In case of interviewing participant, he directly approaches participant and collects required information. These are methods in which researcher will generate primary data required for his work. Third method of ethnographic research is use of archived research. Through this, researcher will use secondary data for his work. These are various methods of

conducting ethnographic research. By using appropriate technique among above, researcher can study the mindsets or thinking patterns of participant people or groups of people.

## II. AREAS WHERE ETHNOGRAPHIC RESEARCH IS USEFUL

Ethnographic research or study is sometimes considered as science and sometimes it is considered as art. As it studies minds of people, it is called as art and as it uses scientific techniques like anthropology and sociology. It is a type of qualitative research in which knowledge gain occurs about thoughts, opinions, and motivations by various data collection methods. Ethnographic research is useful in many areas. It can be used in areas like schooling, development of urban or rural areas, public health, use of various commodities (Electronic, technical, economic), any area which is associated with human arena [2].

## III. AN ETHNOGRAPHIC APPROACH TO ENGINEERING DESIGN

This started in early 1980's where many companies found that their market research was not up to the mark with developing understandings of customers. Many R & D people and anthropologists had recognized that there is a varying difference between what people say and what they do. They concluded that there is always a difference between proved psychological concepts and practical psychology of people. Therefore, many leading companies like HP, Apple computers, Xerox started believing in productive relationship of design of a product/process and ethnographic research. In today's arena, many big companies of developed countries hire anthropologists to conduct ethnographic research for development of their companies. Few of the names include Intel, Kodak, AT & T, Microsoft, etc. [3].

## IV. USE OF ETHNOGRAPHIC RESEARCH FOR ANALYSIS OF AN ENGINEERING PRODUCT

Wheelchair is a mechanical device which enables people for easy locomotion from one place to other. Wheelchair enhances mobility of individuals and helps them to live day to day life

with dignity. Roughly it can be said that the first wheelchair was used in 6th century by Chinese designers, but the actual evolution of wheelchair started in 16th century in Europe. Later in Europe and United States many evolutions occurred wherein wheelchairs were operated and driven by using electrical power. Also there are various types of wheelchairs like simple manual wheelchair, reclining wheelchairs, standing wheelchairs, sporty wheelchairs. People who face difficulty in locomotion due to illness, injury or due to some accidents use wheelchairs for mobility. But selection of a proper wheelchair is also an important factor because appropriate type of wheelchair can let anyone live comfortably. Selection of improper wheelchair may lead to difficulty in movement and it may lead to some secondary injuries or accidents.

In today's world, many people are suffering from one or other type of disabilities. Statistically around 2.5% of population of India is suffering from one or other type of disability because of which they use wheelchairs. Simple manual wheelchair is the most commonly used wheelchair. Simple manual wheelchair consists of common parts which are used in manufacturing any type of wheelchair. These common parts are Wheelchair frame, wheelchair arm sets, wheelchair foot rests, wheelchair wheels, wheelchair brakes, wheelchair casters, seating system. Looking at the statistics, it looks necessary to study the design of manual simple wheelchair. Few studies have been done on wheelchairs so as to improve its design, safety, propulsion, ergonomics and other technical difficulties by many engineers and psychologists. New attempt can be made by which various manual elements associated with wheelchair. For this help of ethnographic research can be taken so that various persons associated with use of wheelchairs can be observed. This study is also important as it can encourage the development, production, distribution and serving of assisting devices and equipment as well as spreading knowledge about them according to United Nations standard rules (1994), convention on the rights of persons with disabilities [5].

Manual wheelchair is the simplest form of wheelchair. Manual wheelchairs are found in various hospitals, rehabilitation centres, and many places where mobility of patients, elder people is easily done. Basically persons with lower limb injuries prefer these wheelchairs because of few advantages. It is easy to propel. Its operation is also simple. It requires less repairing and other maintenance cost [6]. The simple view of manual wheelchair can be seen in figure. It shows the basic parts used to manufacture the wheelchair.

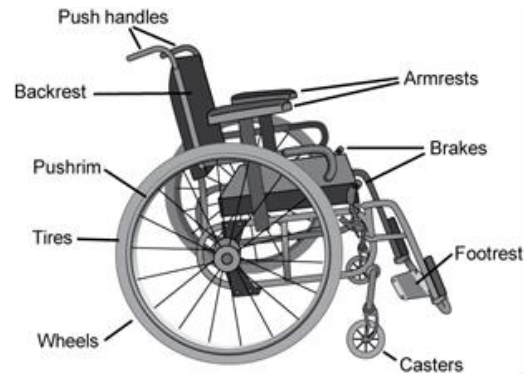
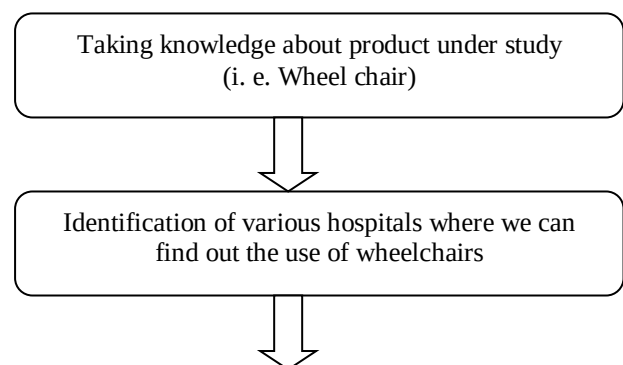


Fig.1: Components of manual wheelchairs [7]

## **I. METHODOLOGY OF USING ETHNOGRAPHIC RESEARCH FOR ANALYZING EXISTING DESIGN OF WHEELCHAIR**

As we know that ethnographic study can be done by participant observation, interviewing him or by using some archived research. In ethnographic research language it is also called as immersion. This immersion or access in the life of participant may be limited or unlimited depending upon few of the local circumstances. Here permission of various hospitals should be taken before starting the observations. These hospitals should have different work area like Government hospital, Multispecialty hospitals, especially orthopaedic hospitals where number of wheelchair users is more. There after various persons who are associated with the usage of wheelchair are decided. These will be the participants upon which we can make our ethnographic work. These different types of persons are Doctors or the owners of the hospitals, Attendants who propel the wheelchairs, patients who actually use wheelchairs. These patients can again be of two types as temporary wheelchair users and long term wheelchair users. These various persons can be identified so as to understand the thinking process of person accessing wheelchairs.

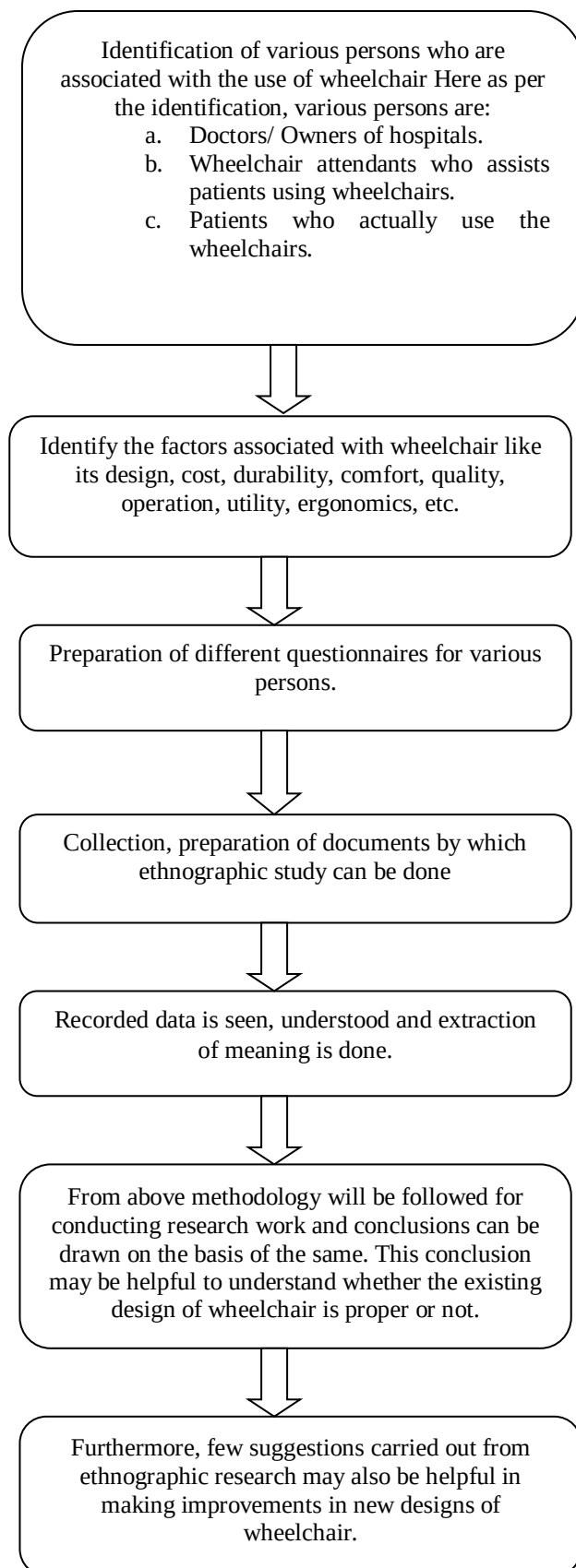
The flow diagram of procedure of conduction of ethnographic research:







Reactivity, Reliability and Validity are three important aspects of any ethnographic research. How much a participant is influenced by researcher is the reactivity. Reliability and validity of ethnographic research has always been an issue. There are few standards which are developed by ethnographers. By using these standards, credibility and reliability of certain work can be judged <sup>[8]</sup>. Anyhow use of ethnographic research for analyzing the existing design will be dependent upon few factors like immersion of researcher in the life of participants, nature and standards used for this process, sensitivity of data collection techniques used, Depth of analysis of collected data done. However the standards which are set for ethnographic research are more familiar for such educational works.



## V. CONCLUSIONS

1. Ethnographic research enables to understand the mentality of participant regarding use of wheelchair and his working culture rather only treating him as an object.
2. Ethnographic research is not done in a day. Sufficiently longer time is invested in conducting such research work; therefore changing mentality of participants with change in time regarding use of wheelchair can also be understood.
3. As researcher will deal with the different manual dimensions like doctors, patients, attendants; researcher will deal with different sources of information therefore the depth of understanding about the subject will be better.
4. Ethnographic research also lets researcher to know, to learn the new things regarding operation, working of wheelchair which are previously not known.
5. Ethnographic research for analyzing the existing design can also help in further investigation and further improvements in design of wheelchair.

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