ASSISTIVE TECHNOLOGY DESIGN CRITERIA

Lecture# 6

ASSISTIVE TECHNOLOGY DESIGN CRITERIA

- Substantial portion of time and effort spent on evaluation and design of AT
- Design is critical performance
- 17 factors are identified as being significant importance to consumers

AFFORDABILITY

- Person with disability depends on AT
- Purchase, maintenance and repair of device are the concern of consumers
- Due to sufficient income of disable person AT is purchased by third party

COMPATIBILITY

- Integrate device is concern to consumer
- Much devices require specialized hardware
- Engineers need to be aware of international standards
- Engineers need to standardize components and hardware

- In design of wheel chair
- Two major problem occurs

1) no standard type and location of mounting hardware for seating systems

2) no type of locking mechanism

- Wheelchair manufactures must share some common features

CONSUMER REPARABILITY

- Designed in a way which require simple repair and maintenance
- Consumer should be able to operate self-diagnostics of personal equipment
- For example: if power wheelchair were to incorporate a watchdog microprocessor that could be queried by the user to determine problem and inform repair center to prepare proper arrangement for repairmen.

DEPENDABILITY

- Consumer depend on AT
- Alternative technology is not available
- Device should function repeatable
- Consumer must be aware of restrictions in device
- Restriction must be minimal

DURABILITY

- Must be operate able over extended periods of time
- Consumer understand life expectancy of device
- Care, maintained which give them maximum expectancy
- Devices design to meet life expectancy

EASE OF ASSEMBLY

- Devices must be designed in a way so they can be easily assembled
- It play important role in travelling
- Manufacturer should pay attention to packaging as well as design
- Required tools must be given for the assembly

EASE OF MAINTENANCE

- AT maintained in a operable & safe condition
- User can maintain and clean the device
- Maintenance require training
- Devices design require minimum maintenance
- Manual must be provided

EFFECTIVENESS

- Effectiveness of device is crucial
- Enhancing functional capability
- Increase independence
- Cover specific needs

FLEXIBILITY

- Consumer needs are different
- It is useful to provide some adjustment
- Accessories must be provided to accommodated by a single basic design

LEARNABILITY

- Divide task b/w device and user
- New technology device perform complicated task by commands
- Give user numerous options
- User must be able to learn device
- Design a device to allow maximum flexibility
- Instruction must be easy
- Training cost should not be prohibitive

OPERABILITY

- Device must be easy to operate
- Controls provided to user
- Short startup time
- Alarms are acceptable in terms of harshness, loudness, length and frequency

PERSONAL ACCEPTABILITY

- Designed to augment the abilities of individual using it
- Consider physiological impact of AT
- Congruent with user personality
- Should not be embracing

PHYSICAL EFFORT

- AT should not cause discomfort or pain
- Avoid materials that can cause problem
- Comfort should be primary consideration while designing

PHYSICAL SECURITY

- Consumer should operate without any risk or injury
- AT should incorporate safety features in their features
- Design should not disturb the physiological function of the user
- User must protected from electric shock,puncture,cuts,burns,allergic reactions and excessive force or pressure

PORTABILITY

- Transport or moving of AD play a important role in restoration of function and independence for person with disability
- Devices must be light and transportable with compromising function
- Portable power supplies
- Batteries should be easily removed and replaced

SECURABILITY

- AT must be in physical control in order to reduce theft or vandalism,
- Should be secured with password or code to operate them,
- Consider security measure.

PROFESSIONAL REPARABILITY

- AD need repair or replacement
- Repair and maintained should be performed by consumer
- Replacement parts should be available

PRODUCT TESTING

- Important in development of quality product
- R.E demands total quality management
- It is different from product evaluation
- Goal is to improve product design
- P.T occurs at three basic level;
- 1) testing of individual components of the system
- 2) Testing of preproduction prototypes
- 3) testing from production line

- Testing ensure a quality product
- Manufactures can use testing to improve their product
- Testing consist of several important parts

MEASUREMENT OF SYSTEM CHARACTERTICS

- A.D must made to some tolerances and specifications,
- These specifications may be electrical/electronic and mechanical components of the system
- Testing for tolerances simply requires measuring the properties of interest
- Testing system characteristics helps to ensure at least minimum performance on a component scale

- It is important to hold devices and its components within reasonable tolerances to ensure similar function for different units and to make replacement parts

MEASUREMENT OF PERFORMANCE

- Testing ensure that product meets prespecified performance standards
- Performance standard vary with product type
- Product meet safety and controllability standard
- Safety standard should minimize the discomfort and risk of injury to the consumer, assistants and repair

- A.D need to be controllable but have degree of freedom
- For some automated devices, robots, and power wheelchairs, a speed standard is also required to ensure minimum safe performance
- Example
- The maximum speed, maximum acceleration/deceleration,turning acceleration and directional control may be tested in factory

MEASUREMENT OF ROBUSTNESS

- AD have potential to be subjected to impacts, spills, heat and cold
- Mishaps must be avoided
- Products are tested for their strength
- Mechanical and electronic devices require testing for robustness

MEASUREMENT OF DURABILITY

- Durability is often time consuming and difficult testing to perform
- Fatigue testing is commonly used to measure the durability of a device
- Fatigue testing is for both electronic and mechanical system is a statistical process
- Difficult to get much information from single test
- Tested during continuous operation with a number of units

EXAMPLE

- 3 wheelchairs with a 200 pound dummy were tested by pulling them back and forth over a half inch door threshold 100 thousand times, two wheelchairs might break where the cross frame member meets a side frame member, where as the third may show no damage.
- If one chair had been tested the potential problem might not have been identified.

Thanks