What’s Human Factors?

Theoretical bases, relevant models and methods of application in projects

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in this presentation…

- what is human factors
- human factors objectives
- human factors applications
- human factors in drill and well operations
- human factors project process
- summary
- short discussion
our focus today is on....

- human factors as a perspective and method to help improve work in high risk environments
fields of application...
human factors...

- **scientific discipline** concerned with understanding human abilities and limitations relevant to design of organizational and technological systems
- application of **multidisciplinary** information to design
- **profession** that applies knowledge from theory, principles, data, and particular methods to the design process
- **systematic, holistic approach** to evaluate and improve the interaction between the human, technology, organization and the environment in which they function
- general principles to guide collection and analysis of **context oriented and meaningful information** to situation and its people
- objectives are to **provide for appropriate human interaction** in design, **optimize system efficiency** while **prioritizing safety**.
what’s in a name…

- human factors engineering (HFE)
  - USA
  - emerged after WWII
    - military aviation

- ergonomics
  - Europe
  - driving force in worker health and safety

- man technology organization (MTO)
  - Swedish concept
  - nuclear plant
  - widely used in Europe

- human machine interaction (HMI)
  - hardware issues

- human computer interaction (HCI)
  - software issues
a systematic approach

HUMAN FACTORS

- Psychology
- Anatomy and Physiology
- Sociology and Anthropology
- Mechanical and Industrial Engineering
- Operations
- Organizational Management
a systematic approach …

- **psychology**
  - individual thinking and behaviour
  - contributes knowledge on performance based on how the human mind processes information, and personal attitudes

- **anatomy & physiology**
  - physical build and physiological responses
  - contributes knowledge on the human body, both anthropometrically and the internal system responses

- **sociology & anthropology**
  - group thinking and behaviour
  - contributes knowledge on culture and population needs and limitations, based on morals, practices, and understanding
a systematic approach …

- **mechanical and industrial engineering**
  - design of equipment and tools
  - contributes knowledge toward the feasibility, usability, and functionality

- **operations**
  - design of operational and maintenance work processes
  - contributes knowledge toward the handling and maintenance of equipment and processes

- **organizational management**
  - design of business processes
  - contributes knowledge to the development of organizational make up, leadership, decision making, communication processes
  - provides tools and information for competence training
different types of knowledge and skills are needed to study the complex interaction between humans, technology, and the organizational systems they function in

human factors knowledge and skills
  - based in research and theory
  - analysis is conducted through qualitative and/or quantitative means
  - information obtained from that research is maintained and developed continuously

the human factors specialist
  - uses grounded, context oriented, meaningful knowledge
  - applies a human centred approach in design
human centred design…

Traditional Perspective

Current perspective

Technology

Organization

Human Centred Design

Human

Organization

Technology
more about human factors …

- goals of human factors
  - achieve efficient and effective productivity and safety

- goals of productivity
  - design technology and organization to maximize task performance
  - compare capabilities of the human operator with the performance requirements of the system

- goals of safety
  - design a safer working environment
  - compare performance limitations of the human operator with the performance requirements of the system

- productivity vs. safety
  - production is a clear goal
  - safety is not as clear as it is often measured by the absence of negative outcomes
objectives of human factors

- operational objectives
  - increase safety
  - increase reliability
  - improve system performance
  - improve maintainability
  - reduce loss of time and equipment
  - reduce errors
  - assess personnel requirements
  - assess training requirements
  - increase economy of production

- users and operators
  - improve working environment
  - increase ease of use
  - increase user acceptance
  - increase human comfort
  - reduce monotony
  - reduce fatigue
  - reduce mental and physical stress
  - increase aesthetic appearance
general application of human factors ...

- hardware and software design
  - usability and functionality assessments of structure and system
    - i.e. control panels, alarms,
  - allocation of tasks between human and machines
  - introduction and implementation of new technology
    - assessments against relevant standards

- organizational design
  - management processes
    - assess decision making practices, feedback, communication practices
    - evaluations on current and new processes
    - support change management
  - management tools
    - assess, develop, evaluate and implement tools for operations, i.e. rules and procedures, etc.
  - training
    - assess, develop, evaluate and implement training methods for general and specific tasks
  - manning
    - assess and evaluate manning needs
general application of human factors

- job/task design
  - job and task
    - designing job and task processes based on context
  - safety culture
    - developing methods and tools for assessing, developing, and implementing practices

- system performance
  - accident and incident investigation and analysis
  - error prediction and management
  - barrier and prevention analysis

- working environment
  - assessment and evaluation of noise, light, temperature conditions
  - assessment of workplace design
  - assessment of hazards associated with tasks
applying human factors in drill and well operations...

- controls and alarm design
  - does design support efficient and effective work
  - does current design provides for safety
  - how does design affect risk levels
  - purposes of automation
  - assessments of effects of automation

- new technology
  - clarify new roles for drill operators
  - identify new tasks to manage work
  - develop new training material to manage tasks
  - develop new methods for management
more on applying human factors in drill operations...

- organization management
  - does management lead and guide operations in an appropriate manner
  - does management understand actual operations

- procedures and work descriptions
  - are they applicable in theory and in practice
  - are they understood
  - are they available
  - do these support integrated work internally and externally

- communication and common ground
  - how is the work organized
  - how is communication managed and supported
  - is this sufficient to create common ground
  - how does one stay in the loop of operational processes

- training
  - assessing the need for more/different training
  - assessing how and when should training should be conducted
example on process...

- applies to both new and modification projects
- identify the objectives, requirements, and constraints of project
- identify user groups and environment
- clarify critical success factors and the quality factors for the application project from the point of view of the developers and the users
- identify usability and functionality requirements of equipment design
- identify management of operational requirements
- identify development of training, job and task design
- NOTE: This is a cyclical process and is not to be applied in a linear manner
when to apply …

- early in the concept and planning stage and throughout the project
- late participation results in costly changes and reluctance in changing design

Note:

*However, it is never too late in working on optimizing these interactions even in older systems and learning from design problems for future applications*
summary

- systematic, holistic approach
- context oriented and meaningful
- multidisciplinary knowledge
- evaluate and improve the interaction between human, technology, and organization
- providing for appropriate human interaction in design to optimally contribute toward system efficiency while prioritizing safety
- based on considering human abilities, limitations, and the needs of the people who function in a system and applying it to design principles
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