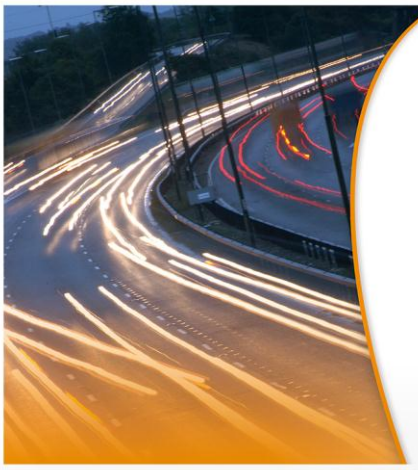

Human Factors at TRL

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Human Factors (also known as Ergonomics) is about people, products, systems and environments, and how they impact on each other. Human Factors is an interdisciplinary profession that focuses on identifying human abilities and limitations within work environments, and then applies that knowledge to improve people's interaction with their environments in order to optimise human well-being and overall system performance.

TRL is one of the world's leading transport research centres. It sets itself apart from other institutes with a unique combination of human factors researchers and a wide range of on-site testing facilities. Our expertise covers many other areas, including industrial safety and human computer interaction.

Human Factors should ideally be considered at all stages of a project that involves human operators; for example, this may begin with task analyses and user requirement capture and may end with a user trial and product or system evaluations.

What are the aims of Human Factors?

Human Factors can be thought of as having two separate (but not mutually exclusive) aims:

1. To improve performance. This includes quantity of work (e.g. increased human machine integration or increased effectiveness of team working), and the quality of performance (including fewer errors) and fewer accidents/ near misses.
2. To improve people's health and wellbeing. For example, fewer occupational injuries, less stress, increased usability of products and increased work motivation.

The main areas of interest

Human factors are primarily concerned with;

- **Cognitive**: how individual mental processes, such as perception, decision making, actions and memory may affect our behaviour Topics here include human error, situation awareness, work stress, mental workload and training.
- **Environmental:** All of our daily activities are performed in a physical environment. Through the study of basic Human Factors principles with key variables such as sound, temperature and lighting, we can identify and interpret how the physical environmental impacts the design and implementation of systems, tasks and equipment.
- **Organisational/Social:** Most people do not operate in isolation, so organisational ergonomics looks at ways to optimise the 'sociotechnical' system. This includes traffic environments, organisational structures, communication, working hours, organisational culture and teamwork.
- **Physical**: Concerned with human anthropometric (the science of body sizes), physiological (the science of normal body functions) and biomechanical (the mechanical properties of a moving body) activities, and how they relate to physical activities such as manual handling, vehicle/ workplace layout, working postures and work related disorders

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Different vehicle interiors

Developing Human Factors Standards and Guidelines:
TRL human factors specialists regularly make contributions to international standards and guidelines. For example, TRL provides expert representation to the main ISO group responsible for development and maintenance of human factors standards related to ITS in-vehicle systems.

Human Factors Toolkit

In addition to the experienced ergonomists at TRL, we are fortunate to have access to a range of sophisticated specialist equipment on site. This includes:

- • An advanced car simulator, DigiCar and a unique truck simulator, DigiTruck
- • A suite of sophisticated experimental laboratories where user trials can be undertaken
- • Eye tracking technologies
- • Occlusion goggles to assess driver distraction
- • Sophisticated systems to measure dynamic muscle activity
- • A large vehicle test track
- • Developers of Human Factors checklists, including for In-Vehicle Information Systems (IVIS)
- • Instrumented vehicles, video recording and analysis equipment, stand alone impairment tests,
- • A library of standard questionnaires and a leading transport research library
- • Direct access to other professionals within TRL, these include safety engineers, vehicle designers, statisticians, psychologists and traffic engineers
- • Unique contacts to other human factors professionals around the world
- • Advanced safety, quality and reporting procedures, together with an established track record in successfully completing work on time and to budget

TRL car simulator, DigiCar and : DigiCar control room

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Examples of work undertaken:

HMI Assessments and Redesigns:
TRL has developed an HMI safety checklist with which we can assess driver workload and interaction with multiple displays/warnings, taking into account human abilities and characteristics (including fatigue, vigilance, situation awareness and physical factors and human error).

Task Analysis:
Undertaking analyses of the operators' task, to help understand what the task involves, what information is required, what training is needed, and the different ways of achieving successful task performance.

Research and Analysis of Driver and Passenger Behaviour:
Measuring the visual behaviour of car or train drivers, simulator studies of driver inattention, analysis of passenger boarding and alighting (including emergency evacuation), or how changing aspects of the visual environment changes driver behaviour. With all of these, the TRL team assess the implications of the results, and, where applicable, propose systems design, policy or training interventions to optimise performance.

Physical Ergonomics Assessments:
TRL ergonomists have undertaken physical assessments of many types of vehicles. Issues investigated include passenger area design and layout, seating design and evaluation, work-related musculoskeletal problems, anthropometrics and manual handling. Also, TRL conducts many crash tests to assess injury criteria, injury mechanisms and vehicle/child restraint design during various crash conditions.

Training Needs Analysis:
Identifying gaps in knowledge and where and how best to place emphasis on training requirements. This can be done in part through use of simulation.

Pedestrian Environment Review Audits:
This includes a complete review of pedestrian environments, including the assessment of links, crossings, routes, interchange spaces, public spaces and public transport waiting areas. The pedestrian environments are scored according to a series of criteria that TRL has developed and incorporated into a software package (PERS).

Reviews of Organisational Factors:
For example, reviews, evaluations and revisions of Safety Management Systems, safety culture or work schedules.

Developing Methods:
Identifying and developing appropriate research and test methods. For example, to evaluate the primary and secondary safety performance of vehicles, to assess visual demand in the road environment, or to evaluate operator training.

Further Information

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