

The Value of Human Factors Engineering – Liv Systems White Paper

Introduction to Human Factors Engineering

The Health and Safety Executive give a simple definition of human factors:

“Human factors refer to environmental, organisational and job factors, and human and individual characteristics which influence behaviour at work in a way which can affect health and safety.” – Health and Safety Executive

This is not just in terms of human errors and violations, but also in positive contributions to system safety through resilience, adaptability, and recovery actions that restore safe situations.

You can manage human factors many ways - one way is through Human Factors Engineering (sometimes referred to as Ergonomics). Human Factors Engineering aims to design equipment, environments and work systems for people so that performance, satisfaction, and safety can be improved.

“Human Factors Engineering is concerned to optimise the relationship between people and their activities, by the systematic application of human sciences, integrated within the framework of systems engineering.” - Elwyn Edwards

Why Bother with Human Factors?

What are the benefits of Human Factors Engineering?

- Reduces errors
- Increases productivity
- Reduces support costs
- Reduces training time and cost
- Increases job satisfaction

We all have to live with the consequences of products where Human Factors considerations have not been addressed:



Figure 1 – Human Error Blamed for Trading Loss (source: BBC News)

In safety-related industries, this can have catastrophic consequences.

The earlier in the design process you find and fix Human Factors problems the less costly they are to change.

The aim of Human Factors Engineering is to be proactive about potential Human Factors issues, and identify, address, and resolve or mitigate them prior to implementation.

Human Factors Engineering can contribute to reduced lifecycle costs via an estimated ratio of 1:10:100. If it costs £1 to fix a Human Factors problem in the design stage, it will cost £10 to fix when the system is in prototype, and £100 to fix when the system is operational. This relationship can be seen in Figure 2 below.

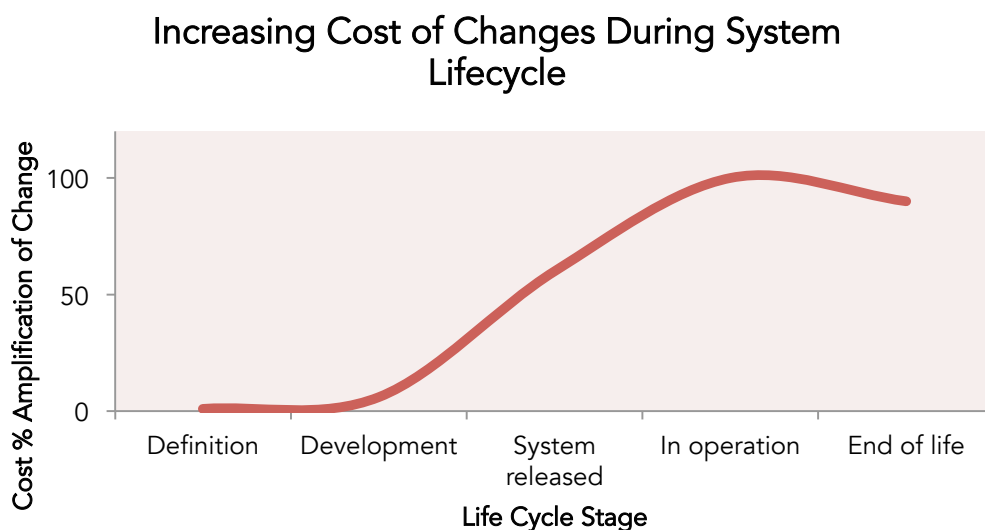


Figure 2 – Increasing Cost to Fix Problems (Pressman (1992))



Compared to the cost of changing the design during the definition phase of the life cycle, the cost of the changes made during the development will be increased by 1,5 to 6 times. The cost of the changes made to the system, after it has been finalised and delivered to the end users, will be amplified by between 60 to 100 times (Pressman (1992)).

It is also known that 80% of software lifecycle costs occur during the maintenance phase. Most of these costs are associated with 'unmet or unforeseen' user requirements and other usability problems.

Impact of Human Factors Engineering (HFE) on System Cost Profile

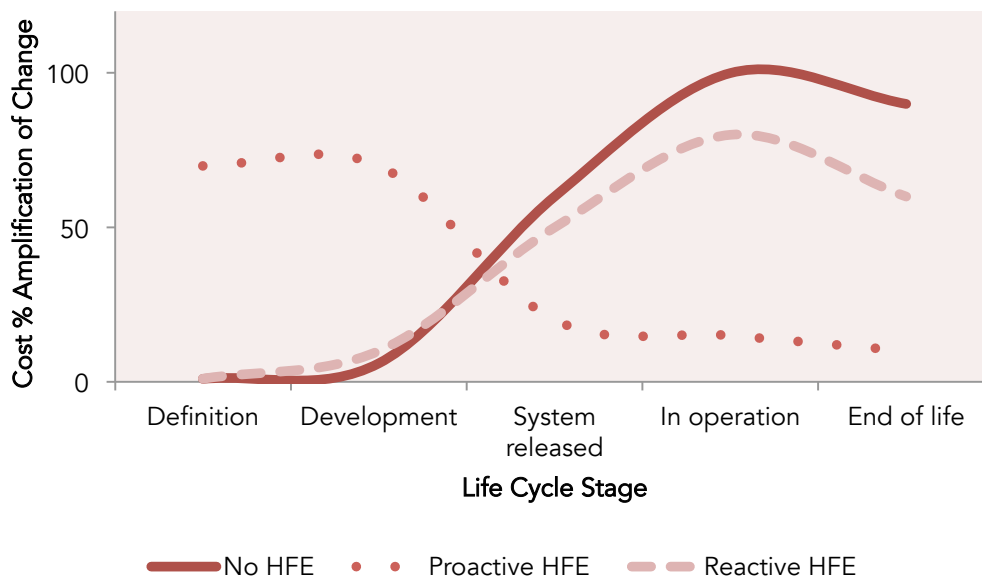


Figure 3 – Cost Profiles of Addressing HF Issues (EUROCONTROL (2000))

The graph shows how proactive human performance support to projects reduces costs over the lifecycle, especially when compared to reactive Human Performance efforts, or even no human performance support at all.

Therefore, as well as improving operability, Human Factors Engineering can also reduce costs by spotting problems early in the system design process.

That is all very good but...

Famous (engineering) last words:

- "We'll explain it in the manual."
- "We'll address it through training."
- "We'll fix it during commissioning."



- “Don’t worry about the user interface yet—we’re just working on the functionality.”
- “This event is unlikely to happen.”
- “Performance won’t be a problem.”

So what do to?

Where to Start with Human Factors Engineering

The fundamental principle of Human Factors Engineering is to take account of human skills, abilities, and limitations in the design of systems.

A good starting point is to consider the factors associated with the Job, Person, and Organisation that affect human performance at work:

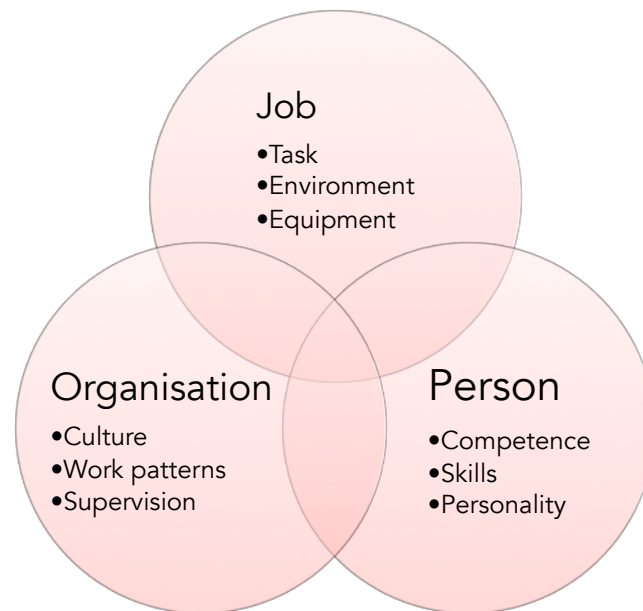


Figure 4 – Some Factors that Influence Behaviour at Work

This model of Human Factors is from the HSE. More details can be found in the HSE publication ‘Reducing Error and Influencing Behaviour’ (HSG48).

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