# A process to assess the use of human augmentation technologies in defence

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#### SUMMARY

This research evaluated and adapted the use of the Early Human Factors Analysis (EHFA) process to create a methodology for assessing the use of human augmentation technologies in defence.

#### **KEYWORDS**

Human augmentation, Defence, Early Human Factors Assessment

#### Introduction

The aim of this research was to support and bring forward the introduction of human augmentation technologies to defence, by developing a process to help identify how such technologies could be applied to achieve competitive advantage.

The project evaluated, tested and modified the current Early Human Factors Analysis (EHFA) process (as documented in the MoD EHFA Methodology Guide (2016 Issue 1.2Error! Reference source not found.)) to create a process that can be used to assess human augmentation technologies in the context of defence. Defining criteria for what 'success' looks like when the modified EHFA is applied to human augmentation technology was critical in the development of the modified process. The success criteria articulate what the EHFA must do to identify potential risks and benefits from the use of human augmentation technology, thereby supporting subsequent decisions on implementation and operationalisation.

#### **Developing the modified EHFA**

A set of success criteria was developed to direct the development of the modified EHFA. These criteria acted as requirements for the modified process; for example, the modified EHFA should enable operational benefits of the human augmentation technology in the specific context to be identified. Use of haptic gloves to enhance Explosive Ordinance Device (EOD) training was selected as an example against which to test the current EHFA (MoD, 2016, Issue 1.2), and identify potential modifications to the process. Human Factors Subject Matter Experts (SMEs) and other SMEs from academia were consulted to provide further insights into how the EHFA process needed to be modified in order to satisfy the success criteria. Exploiting these insights, the modified EHFA was then tested against an example Generation After Next (GAN) human augmentation technology; a Cognitive Implant to enhance attention / concentration when undertaking imagery intelligence tasks.

## The modified EHFA

The modified EHFA is shown in Figure 1. The macro-stages of the current EHFA process remain, but there are modifications at every stage. Key additions are:

- A human augmentation considerations table required to support the collation of baseline information on the human augmentation technology and the context / intended use.
- An 'ethical concern' column and scale required to ensure explicit exposure and subsequent consideration of ethics. The scale allows Human Factors Integration (HFI) Risks, Assumptions, Issues, Dependencies and Opportunities (RAIDO) items to be judged for the level of ethical concern that they pose, based on a defined and appropriately tailored scale.
- A decision point at the end of EHFA Stage 3 'Assess' required to determine if the EFHA indicates that there is adequate justification to continue with implementation of the human augmentation technology, and thus completion of 'Plan', and 'Implement' stages.
- A new output addressing the success criteria required to capture information on operational benefits, capability vulnerabilities, capability development activities, trust considerations and any other considerations relating to the specific nature of the human augmentation technology concerned (such as invasiveness and permanence).



Figure 1: The modified EHFA process, for assessing human augmentation technologies

# Conclusions

The modified EHFA process can be used to assess a human augmentation technology for hypothetical implementation into a specific military context. Conducting Stages 1-3 of the modified EHFA will enable decision makers to judge whether a human augmentation technology should be pursued as part of acquisition into a defence or security context. However, further testing and piloting of the modified EHFA process is required in order to refine and validate the process.

# Benefits

The modified EHFA process provides a means of establishing the potential benefits of human augmentation technologies, informing and de-risking investment decisions in order to deliver maximum competitive advantage and counter any competitive advantage gained by adversaries exploitation of human augmentation technologies.

## References

Ministry of Defence (2016) Early Human Factors Analysis (EHFA) Methodology Guide. Technical Note Issue 1.2