Keep Assembling and Carry On: A Satirical View on Solving the Workforce Problem through Cognitively Impaired Labor

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ABSTRACT

Western economies are facing a workforce crisis in which many low-paid job posts, especially in manufacturing, remain unfilled. This has a negative impact on the economy which hinders industrial growth. To counteract this, we present an assistive system that enables cognitively impaired users to effectively assemble automotive parts within eight-hour shifts. While assistive systems have been studied extensively in HCI, our work is the first to explore their economic benefits. We contribute the design and implementation of an augmented reality system that provides just-in-time visual cues to assure optimal production pace. The system also provides incentives and necessary enforcement to optimize productivity. This satirical work shows how future assistive systems could ignore the rights of workers when ethical aspects are not considered in the design process.

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KEYWORDS

Ethics; Manual Assembly; Cognitive Impairment

INTRODUCTION

While researchers within the domain of artificial intelligence build a vision of soon-to-be-real automation where the role of humans is reduced, the reality of Western economies is different. Worker shortages in different areas, such as at manual assembly lines, is becoming a major issue for companies due to low lot sizes during production. Consequently, there is an urgent need for increasing the volume of the worker pool. One way to achieve that is for the society to benefit from the working hands of those who are usually fully supported by society — the cognitively impaired. In this paper, we present effective ways to design systems that put cognitively impaired into efficient working units. We use the example of an automotive factory to show that requesting eight hours of non-stop work from cognitively impaired people results in a boost in manufacturing productivity.

BACKGROUND

Human-Computer Interaction (HCI) research established a track record of assistive technology that catered for the needs of the cognitively impaired. Past research has investigated how tenants in sheltered housing can be trained to cook for themselves [3, 4]. Funk et al. [1, 2] showed that employing cognitively impaired in industrial production is possible by showing feedback through in-situ projections. They showed that the cognitively impaired were able to contribute to industrial labor instead of spending time on free time activities. Our work attempts to build on these past efforts not only enabling the cognitively impaired to work, but also providing them with effective incentive and enforcement systems. We illustrate the functionality of the system through a user story.

USER STORY

Gerhard wakes up in his room at the sheltered housing facility. His bed vibrates intensively so that he is sure that he can be up by 5:30 AM. This, way he can easily make it to the 7 AM shift. He gets dressed efficiently and goes downstairs to the kitchen. The cooking assistive system is already engaged and showing that there are 23 minutes and 17 seconds left to finish breakfast. He quickly decides to have a honey sandwich and the system provides projected instructions on how to prepare the meal. After breakfast, exactly at 6:15 AM, the doors to the transport vestibule open and the autonomous people mover transports the workers to the automotive factory. Gerhard watches a Disney cartoon on the compulsory transport VR headset. At the factory, projected instructions guide Gerhard to his workplace (see Figure 1).

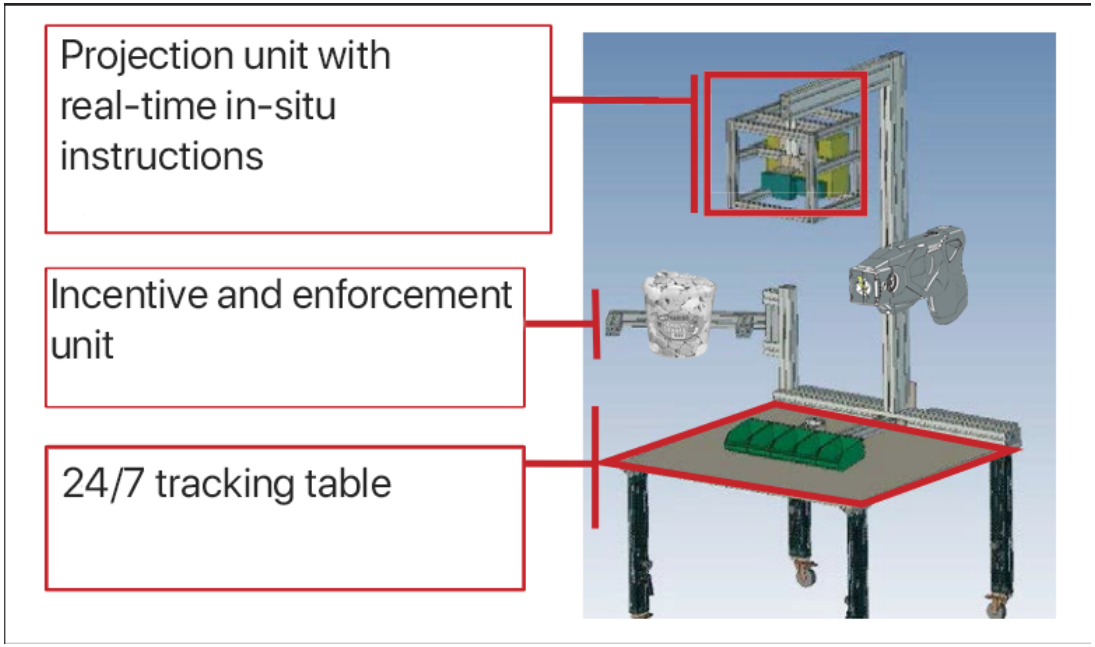

Figure 1: An assistive system for effective assembly. The cognitively impaired are optimally motivated through reward and enforcement elements integrated in the system.

He quickly moves a working position a begins assembling recycled alternators for a car. He is happy to be efficient as he receives a wine gum for every three alternators assembled. As Gerhard slowly gets to the 40 wine gum mark, he starts to feel a bit drowsy. Luckily, the integrated enforcement system refocuses his attention with a light electric shock. Gerhard is now motivated and he manages to get 20 more wine gums by the end of the day.

SYSTEM DESIGN

Our system enables the cognitively impaired to work efficiently. We designed effective in-situ projected queues that not only assure that the workers complete their tasks correctly, but also provide opportunities for increased motivation. Motivation is assured through three design features. First, an electric shock is activated when the worker performs the task incorrectly or with inadequate speed.

Second, sweet treats can be dispensed when multiple consecutive tasks are completed efficiently. Finally, the system enables designing user-adaptive motivational queues which can also support gamification approaches.

CONCLUSION

In this paper, we presented a satirical view on an interactive assistive system for effectively activating the cognitively impaired workforce. Through a mix of motivational features, embedded in interactive techniques, we show how cognitively impaired workers can be used to contribute to solving the unskilled workforce crisis in Western economies. With this work, we want the HCI community to reflect on the implications that future assistive systems bring to workers at manual assembly workplaces.

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