The Impact of Organizational Properties on the Design of Robotic Support for Employees with Disabilities

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ABSTRACT

In this position paper we report on a study of a Korean business that employs people with cognitive and developmental disabilities (DDs) across a variety of operations. The goal of the study was to contribute to the development of scenarios involving the use of a robotic platform to enhance the work-experience of the disabled employees. Based on our findings, we argue for the importance of understanding the broad organizational and bureaucratic properties of a business or workplace when devising HRI scenarios, and of bringing elements like business models, operating philosophy and organizational hierarchies directly into the design process.

CCS CONCEPTS

• **Human-centered computing~User studies** • **Human-centered computing~Field studies** • Human-centered computing~Scenario-based design

KEYWORDS

Cognitive impairment; Workplace; Ethnographic study; Design.

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1 Introduction, Related Work and Method

Extensive research has been conducted with a focus on designing robots that successfully support people with disabilities. A large amount of research in HRI is dedicated to the use of robots as therapeutic aids in controlled experimental or clinical environments. These studies leverage the fact that robots lend themselves well to repetitive tasks and can be used in training scenarios to teach specific skills [5].

HRI scenarios used to test therapy protocols can also be used to investigate and test cognitive, social and intellectual abilities and characteristics of specific disabilities [9]. As it is the case in therapeutic scenarios, researchers leverage the suitability of robots for repetitive tasks, and their potentially non-threatening nature. For example, anthropomorphic robots or robots with facial features are used as proxies for humans to practice emotion recognition skills, under the assumption that they are "easier" to interact with and may thus boost engagement.

Outside of clinical and experimental scenarios, HRI is interested in the potential for robots to be used in the care and assistance of people with disabilities. This concerns people with physical disabilities and the elderly as much as people with DDs. Robots may be used to assist caregivers or directly replace them, which may be desirable because the elderly and disabled may value independence [11]. The scenarios may require attending to the needs of many people at the same time [14], including those of fully abled caregivers.

While experimental and clinical scenarios are naturally of interest to the HCI community in robotics for disabilities, we consider the workplace an equally, if not more important setting. Work integration is one of the biggest challenges faced by people with DDs [3]. While many countries have legislation mandating companies to employ a quota of disabled workers, the categories are broad and people with DDs (as opposed to physical or medical disabilities) may find it difficult to find gainful and interesting employment opportunities [4][12]. There is a lack of proper support when finding employment and during the employment period. It can also be difficult for prospective employers to evaluate the true skill level and potential of employees with disabilities and to provide an environment that is adapted to their needs.

Other researchers have studied the use of robotic support to enable employees with DDs to perform specific tasks [1][6][7][13]. However, to the best of our knowledge there is less focus on understanding the impact of the organizational characteristics in the definition of the robotic support. We believe that this is a

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critical aspect to consider in the design process in order to propose solutions that have a real opportunity of being implemented.

Our own organization was developing a robotic platform capable of independently navigating complex, crowded environments that could be used to transport and deliver small objects. We were instructed to explore a potential integration of this platform into a Korean company that employs people with DDs, and look for opportunities to use the robotic platform to provide some form of cognitive or emotional assistance, or as a skill development enabler. To assess the possible value and feasibility of a robotic platform in the context of this company, we initially sought to understand, through an ethnographic study, the organizational properties of the services (infrastructure and technology, service culture and provision), and their educational and professional development goals.

Ethnography is targeted at providing an understanding of social phenomena as they occur in everyday settings. It is qualitative and involves interviews, observation and participation in natural settings. Our analytic orientation is ethnomethodological which means it is not theory driven but focuses on describing the way in which people organise their activities and their understandings, aiming to minimise technical language, which makes it particularly useful in multi-disciplinary research [10].

2 The Study

Two researchers from our team undertook an ethnographic study consisting of 3 days of observation of the activities of the company (the management of a coffee shop, a printshop, a flower shop, a bakery and the local delivery of their in-house products) and semi-structured interviews with the CEO, the educational team (similar to HR) and managers from each area. The notes from the interviews were analysed and coded to define the underlying themes. We understood that the business model of this company is built around independent operations which sell their services to other businesses in their area. Purchasing products or services from this company allows businesses to partially fulfill their obligation to provide employment for people with disabilities.

The self-described goal of this organization is to show the value of disabled workers, develop their skills within the company and help them transfer to other companies. They have over two hundred employees with degrees of DDs and run most of their operations at a profit. They went to great lengths to deliver products which are undistinguishable from what might be provided by any other printshop, florist, or bakery, and with very short turnaround. They achieved this by breaking down their workflows to basic tasks and implementing a strict division of labor. This means that many of their employees are engaged in repetitive activities requiring limited initiative or creativity, basic coordination of tasks (as you might find on a production line), and little need to deal with unexpected occurrences.

This organization of work limits opportunities for technological and organizational disruption, even with the promise of opportunities for learning and professional development. We do not mean to be critical of a company that takes its vocation to provide employment for workers with disabilities seriously, and on its own terms, does so with success. We do notice, as researchers with a vested interest in pushing innovation, that this business model and organization of work come with a major consequence: operational concerns compete with clinical and educational configurations of the worker. Consequently, assessments about employee ability to handle uncertainty and evaluation of skills and their development may conflict with concerns about disrupting existing workflows.

3 Design Framework

The findings provide a framework to define the issues to address, considering employees and managers' needs, as well as the organizational and business needs. We address three broad areas:

Workplace Integration. Every proposed change should avoid disrupting the serialized processes, which involve multiple employees and tasks, and should assure a consistent product quality. Any robot should adapt not only to the activities, but also to the spatial constraints of the existing settings.

Robot Roles. Robots can be used as a tool for assistance or for instruction. Robots could assist the employees to develop their tasks more efficiently but always respecting their role in the process, prioritizing their social and professional skills above the process optimization. Robots could also enable new types of tasks by providing a structure that standardizes activities not currently performed by the employees due to their flexible nature or their higher level of complexity.

Organizational Operations. The operation of the robot should be simple enough to be used by people without technical knowledge. The interface should be targeted to the current managers, who have no technical knowledge, and to employees with cognitive impairments.

Respecting this framework, we conducted participatory design sessions [2][8] with managers from the company we studied, engineers in charge of developing the robots, and designers that will define and shape the interaction methods between humans and robots. Sharing these guidelines with the participants helped us direct the ideation towards feasible solutions that can support the work of employees with DDs while respecting the characteristics of the organization.

4 Conclusion

In this paper, we presented an ethnographic study on an organization that employs people with DDs. Through this example we illustrated the relevance of understanding the organizational characteristics of a business in order to define feasible robotic solutions. The definition of a framework containing these constraints and opportunities is valuable for designers as it guides the ideation process towards solutions that have a better opportunity of being implemented in existing organizations and real-world scenarios.

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