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DESIGNING TO ENABLE AN AGEING WORKFORCE

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ABSTRACT

An ageing workforce and a dwindling itinerate manual labour supply have long term implications to the commercial viability of industries that require sustained physical activities. The labour recruitment challenges currently facing agricultural, construction, manufacturing and the handling and distribution industries are likely an early indicator of what other industries will face in the future. These trends are driving two significant concerns for an ageing workforce: maintaining the health of increasingly older workers and dealing with the complications of participation in the labour force for these individuals.

This paper details a teaching and research project conducted in collaboration between the *Safeness by Design* initiative and the Innovation Centre of WorkSafe Victoria, a government regulatory body that enforces health and safety policy. The project aimed at moving the sphere of influence of WorkSafe from reactive policing activities towards pre-emptive action, compelling innovation and new discourses on workplace safeness, employment longevity and the empowerment of ageing workers.

The project consisted of a research investigation of ageing and wellbeing issues, and workplace safeness, together with a taught component, a design studio that challenged students to consider physiological, behavioural and technological factors in the generation of design proposals for safe and supportive future workplaces that enable and empower an ageing workforce to continue to make a valuable contribution.

Keywords: Design education, social innovation, safeness by design, design for ageing

1 INTRODUCTION

Australians are living longer, richer, and healthier lives. As life expectancy has increased, so the complexities of an ageing population places pressure on the nation's healthcare sector, social services, and the workforce. A combination of lower fertility rates and increasing life expectancy, has seen the average age increase from 34 to 37 years over the past three decades [1]. Further, while the average intended retirement age is 65, 1 in 4 will work beyond 70: some voluntarily, however many are seeking to supplement their income or save more for retirement [2]. A diverse demographic, older workers are in demand, with many sectors reliant on their ongoing participation in the workforce. Some physically demanding industries e.g., healthcare manufacturing and agriculture are increasingly dependent on older workers remaining in employment, as their workforces age faster than most. This research, enabling an ageing workforce, recognises the issues facing the older worker across a range of different workplace contexts and asks the question, '*how can design and new technologies address the compounding factors of an ageing (working) population and enable older workers to continue to be productive and effective whilst ensuring their personal wellbeing?*'

2 AN AGEING WORKFORCE

Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%. As the average age of our populations increases, so too does the average age of the workforce. Driven by better than expected health, lower than expected wealth, and with industries impacted by a dwindling itinerate manual labour supply, workers will want, and may need, to work past the standard retirement age. However, as people age, they lose muscular strength, experience a decline in physical and cognitive performance, are more vulnerable to muscular-skeletal issues caused by repetitive or awkward movement patterns, and take longer to return to work after health concerns.

Consequently, ageing workers in occupations that require sustained physical activities are at increased risk of injury and exacerbated physical decline, and more likely to experience workplace discrimination, impacting their psychological wellbeing, and diminishing their confidence, self-esteem and self-worth.

2.1 Healthy ageing

In declaring 2020-2030 the ‘Decade of Healthy Ageing’, the World Health Organisation (WHO) has responded to issues resulting from a rapidly ageing global population, building global commitments in a call to action to foster longer and healthier lives [3]. Ultimately, within the context of an ageing workforce, the principles of the Decade seek to change how we think, feel and act towards age and ageing, and ensure that communities foster the abilities of older people.

While healthy ageing is targeted at developing and maintaining functional ability and wellbeing in older age, it is a concept that should be a ‘whole life’ consideration and highly relevant to all of us. Functional ability can be determined through several factors, be that our underlying physiological and psychological state, our health-related behaviours, or our environments which strongly influence our opportunities. Workers, both young and old, are affected by their social and economic equity, which is driven foremost by their working conditions. Disadvantages in health, education, employment and earning, start early and reinforce each other, and will be accumulated over a lifetime. Individuals who develop poor health will work less, earn less, and retire earlier, with working and ageing trajectories also influenced by gender, culture, and ethnicity. The Decade of Healthy Ageing provides an opportunity to address existing power relations and norms with respect to an ageing workforce and develop interventions that will influence quality of life and career longevity for workers.

2.2 Effects of ageing

As people age, they experience a decline in physicality and cognitive senses; losing muscular strength, range of movement and dexterity, and suffer impairments to vision, hearing and balance and reduced mobility. They have a higher risk of injury, being more vulnerable to falls and slips injuries and muscular/skeletal disorders, have difficulties with repetitive or awkward movement patterns, and slower rehabilitation timeframes.

In addition, ageing impacts the capacity to learn, which directly affects workers’ abilities to be valuable to their employer. While older workers have been seen to benefit from training, they are generally slower and less effective than younger people in learning new skills [4]. The speed of technological change, increasing digitisation and the unpredictability of the nature of work in the modern workplace, makes adaptation harder for older workers, increasing the likelihood of worker obsolescence. As a result, many older workers and their workplaces associate ageing with loss of usefulness, opportunities, and workplace inefficiencies [5].

Whilst older employees bring a wealth of experience and knowledge to the workplace, they are increasingly vulnerable to workplace bias and discrimination, generational stereotyping and pressure to retire [6], with two-thirds of individuals aged 45 to 74 having experienced age-related discrimination [7]. This can lead to additional stress, fatigue, and mental health issues for older individuals [8].

2.3 Impact on workplace and industry

Older workers today are healthier and more educated than ever and more willing to work, which presents unique opportunities for employers and various sectors [9]. However, the impact of ageing notably complicates their efforts in navigating the workforce and maintaining employment. Research demonstrates that older age is a competitive disadvantage, with two-thirds of companies holding this belief [7]. Typically, negative attitudes toward older workers are that they are poor long-term investments, as they may lack the ability and desire to develop or retrain themselves, cannot use new technology, or are inflexible and unwilling to change. Employees in any sector, especially older ones with lower confidence or technological competence, need continuous training to remain competitive in the workforce [10].

Alongside external opinions of them, older people also form self-perceptions in the workplace. Negative self-stereotypes have been demonstrated to affect cognitive and physical performance, exacerbating underlying conditions or worsening workplace relations [11].

It is important to note that these are all complications or risks that can be mitigated through timely and considered responses in the workplace. These measures involve employers adapting to the older work’s abilities, reducing duties and revising expectations, or changing the environment and organisational behaviours to better suit their needs and capabilities [12]. Workplaces will have to adjust to the prevalence of chronic health conditions today, to address the larger issues and barriers an ageing workforce brings tomorrow.

2.4 Designing a safer workplace for older workers

The workplace itself has evolved dramatically throughout the lives of many older workers and now needs to incorporate their needs in later life. Workplaces are complicated places, which can influence our perceptions of organisational culture and acceptance, directly impacting our motivations to leave or continue working, as well as our capacity to cope with job demands [13]. During their careers, older workers have had to utilise various strategies to adapt to such demands, and to maintain their functionality and capability in the workplace [5]. Workplaces are now becoming focused on supporting both organisational and self-development opportunities for learning, offering more support to older adults and reflecting the desires of younger workers [14].

When designing for an ageing workforce, it is essential to focus not just on those who are aged but those younger workers who, without appropriate intervention, may be forced to leave the industry early due to physical and cognitive decline, or as a result of preventable injuries.

Consequently, the approach taken in this project was to be responsive to the immediate needs of older workers, but also pre-emptive so that younger workers can enjoy good health and career longevity.

3 DESIGNING FOR SAFENESS

The need for industries to respond in a preventative and responsible way to safety in the workplace obliges consideration of a multidisciplinary and social lens of safeness, embedded throughout the design process. Safety is a challenge for designers, except where are they forced to address specific design standards and safety compliance regulations. In their focus on the fulfilment of customer wishes and the demands of commercial expectations, it can be challenging to imagine and/or prevent unintended functions or scenarios [15] and the consequences of misuse, or reckless and harmful human behaviours. Existing engineering design processes have safety retrospectively applied (as risk analysis), usually after the design phase, and analysis tools (e.g., FMEA) typically focus on component failure, and are incapable of capturing a situation which may be unsafe, but not initiated with a failure [15].

Designing with a safeness lens implies a more holistic approach, centred with a strong understanding of behaviours and cultures. It is critical for the designer to consider not just the physical hazards, but also the users and the context and environments of use, with a strong understanding and empathy for human behaviour, and awareness of the impact of rapid and disruptive socio-technical change [16]. Risk-taking behaviours, team working dynamics and interpersonal relationships (e.g., supportive, competitive, intimidatory, discriminatory or exploitive), product interactions (both planned and unanticipated), individual perceptions and expectations of safeness (whether explicit or implicit), mental health and wellbeing, and the anticipation of long-term physical and cognitive degradation caused by prolonged and repetitive activities, are key considerations in designing for safeness.

This involves interrogating how our values, attitudes, and beliefs help or hinder our engagement with daily life and safety in the workplace. The proposition of ‘Safeness by Design’ is to respond to the complexity of our worlds, considering the tensions of new technologies and practices while attuning to the behaviours and cultures that make us human. This holistic approach to managing and mitigating work risks sees designers align their design decision-making process with workers’ perceptions of safeness. Such a strategy places the responsibilities of designers for safety beyond liability concerns, instead to actively prompt socially meaningful design initiatives within the context of safety, as ‘design activists’ [17].

4 SAFENESS BY DESIGN AND WORKSAFE

‘Enabling an Ageing Workforce’ was the first collaborative project between RMIT University’s ‘Safeness by Design’ initiative and the Innovation Centre of WorkSafe Victoria. The collaboration provided an opportunity for Safeness by Design researchers and RMIT Industrial Design students to develop innovative design solutions aligned with WorkSafe’s current areas of priority, and to demonstrate the power of design to make a positive contribution to society.

In the partnered design studio, students were challenged to investigate ageing, wellbeing and workplace safeness within specific industries, identifying areas of concern and design intervention opportunities, before responding with future-focused design proposals and recommendations to the external partners and industry stakeholders. For researchers conducting a simultaneous and comprehensive investigation into the literature on the ageing workforce in Australia, the topic offered a large scope for inquiry across multiple industries and contexts, informing the design process and building a knowledge repository.

5 PEDAGOGICAL APPROACHES

Design education should provide a supportive and challenging environment where students are provided with the opportunity to respond to increasingly complex wicked problems, rather than prescriptive project briefs. In future practice, our graduates will be required to be agile, interdisciplinary and critical thinkers who can confidently explore poorly defined problems and complex scenarios and behaviours, and then deliver innovative solutions.

Accordingly, it is important to not be overly prescriptive with design school project briefs, but instead to afford students the agency to use research and ethnographic processes to explore the context, understand the stakeholders and prevalent behaviours, identify areas of concern, and then define the problem to be addressed. This way, students are empowered to work in a more holistic manner, to develop their own project brief and take ownership of the design process and their own learning journey. In this project, students were presented with a complex and undefined scenario, 'how to enable an ageing workforce' and encouraged to explore a range of industry contexts in search of a problem where a design intervention was appropriate. This approach, whilst initially confronting for students who are used to more defined design briefs, offers significant opportunity for student empowerment and learning, and facilitates the development of unexpected project journeys and outcomes.

6 PROJECT METHOD

The 'Enabling an Ageing Workforce' research and design collaboration between Safeness by Design initiative and WorkSafe Victoria's Innovation Centre, was conducted through two main activities, extensive exploratory research through a literature review, and a design studio project where students responded to identified issues. The collaboration aimed to (a) provoke conversation and stimulate new engagement between WorkSafe, RMIT and industry, (b) generate a new awareness of the topic, and (c) identify and examine areas of concern and propose targeted design solutions in response.

In addition to valuable student awareness and learning, the project realised several key outputs, a research report, a public exhibition, and an entrepreneurially focused stakeholder workshop.

6.1 Initial investigations

The literature review was utilised to focus and contextualise a range of subject areas, with initial research being conducted into the ageing workforce in Australia, before more directed research was conducted into specific industry contexts to support the design studio work. Whilst most of the research was conducted by Safeness by Design researchers (the authors), the initial research conducted by student groups was invaluable in identifying the specific industry issues that necessitated a design intervention, and which focused the subsequent research.

6.2 Design studio

In late 2021, Industrial Design students were engaged in the Safeness by Design/ WorkSafe Victoria collaboration through a 'Social Innovation' themed design studio. This studio enabled students working in small design teams to utilise a collaborative approach to problem solving, to construct meaning and innovate solutions to complex problems, supported with expertise from tutors and the external partner. Integrating the literature review with the studio, students worked across multiple industry contexts including agriculture, health care, SME manufacturing, and residential and commercial construction, resolving complex problems concerning mental health, musculoskeletal disorder, workplace accident/injury prevention and the application of assistive technologies. These projects were defined by the students, emerging from problems identified during their initial research. Design projects focused on enabling the longevity and continued effectiveness of ageing workers, whilst protecting younger workers from work related health issues that may cause them to leave industries prematurely.

7 PROJECT OUTCOMES

Design outcomes were expected to be progressive, innovative and future-oriented in responding to the concerns of specific workplace contexts, and it was important that students assumed a pre-emptive and supportive approach, rather than a reactive one. Working with a 'safeness' lens for the first time, students were required to investigate and understand not just the specific workplace environments and tasks, but also the cultures and prevalent behaviours that may negatively impact worker safeness or wellbeing.

As students addressed a diverse range of occupational contexts and concerns, it was anticipated that project outcomes would be interdisciplinary, product, communication, strategic, service, and or systems

design. The design intervention proposals framed the specific problem and the key design considerations and detail a design response that is supported by an implementation strategy, and an analysis of potential impact. Designs were innovative, appropriate for the specific industry context and considerate of the needs and physicality of ageing workers, supporting their longevity in employment, whilst proposing systems that aim to ensure younger workers are protected from work-related long-term deterioration

7.1 Addressing mental health in the commercial construction industry

Wags and Snags is a mobile engagement service that aims to raise awareness of mental health and connect vulnerable workers to a self-diagnostic toolkit, without shame of stigma in the workplace. It comprises two interventions; an initial on-site social engagement (using therapy dogs and social lunch), which raises awareness and facilitates access to the second part of the service, a website/app where the construction worker can undertake a self-diagnosis process, in private with spousal or family support.

7.2 Reducing injuries to healthcare workers during home visits

Airlift is a homecare patient transfer device that allows a single healthcare worker to move the patient through a range of difficult positional transfers, whilst avoiding injury and maintaining patient dignity. An inflatable slide sheet with grip handles, it actively assists patient transfer, promotes safety and corrective behaviour change, reduces grip related accidents, and enables older healthcare workers.

7.3 Enabling ageing manufacturing workers in small-medium enterprises

Two student groups took different approaches to muscular-skeletal issues in this complex workplace. PosCor is a product-service system that allows physiotherapists to move from reactive treatment to pre-emptive educational interventions, to facilitate behaviour change and reduce workplace injuries in the manufacturing sector. It uses a movement monitoring suit and data analysis software to provide the physiotherapist with a comprehensive understanding of movement patterns within the workplace, facilitating training for safer worker movements, and workplace redesign. Lift+ is a mechanical knee brace for ageing manufacturing workers that provides not only physical reinforcement and knee stability, but also supports older workers in manual tasks by providing active load bearing assistance.

7.4 Reducing ladder injuries in the residential construction industry

BreakFall aims to prevent ladder falls through a ladder and user position monitoring system with feedback warning, and personal protection for users in the event of a fall. This two-part solution consists of a ladder mounted sensor unit and an interconnected safety vest with an integrated airbag protection system to reduce injury severity. It not only protects the user from life changing injury in the event of a ladder fall, but actively prevents falls by alerting the user to potential safety issues in real time. This capability should help heighten awareness, educating workers and developing safer work practices.

7.5 Reducing the impact of vibration on ageing agricultural workers

The SPIDER vibration dampening tractor seat system specifically targets the dampening of machinery and activity-based vibrations that negatively impact farmers' health, whilst allowing rotation to reduce twisting forces on the upper body, positively impacting health and wellbeing in farming communities.

8 REFLECTIONS

It was hoped that students and researchers would be able to engage directly with target users in their workplace to gain a deeper understanding of the nuances of specific industries. Unfortunately, the extended lockdown enforced on Melbourne by the Covid-19 pandemic made ethnographic research less feasible, and it is a credit to all contributors that they were able to not only conduct insightful research, but to respond with well-considered design proposals, despite the enforced isolation. The outcomes have potential to deliver tangible and achievable benefits to all stakeholders in response to the problems and issues identified, empowering end users and adding value to their communities and industries.

Students delivered solutions attuned to both the physiological and psychological needs of workers, but also effectively imagining and anticipating the future behavioural, environmental, and technical challenges. The external partner was surprised by both the range and quality of the design proposals, noting that some of the concepts were 'accelerator ready' with clear line-of-sight to tangible impact and benefit pools. In this regard, the project partners are exploring opportunities for entrepreneurial ventures and further development of these projects that may lead to solution implementation in industry.

9 CONCLUSIONS

This project has demonstrated how a ‘Safeness by Design’ lens can enable an ageing workforce and deliver tangible benefits to industries, workers, economies and communities. In line with Manzini’s [17] positioning of designers as facilitators who act as ‘design activists proactively launching socially meaning design initiatives’, this work evidences a new approach to design where safeness is not merely risk assessment or compliance but reflects a more nuanced understanding of human behaviours.

The pedagogical model of a partnered studio collaboration, supported by independent research has proved effective. Students were challenged by an ambiguous brief, whilst empowered to take ownership of the investigation and outcome, and their learning journeys. This process has enabled student-led problem identification/framing, stimulated interdisciplinary working, to deliver well considered and potentially impactful design responses. Importantly it has demonstrated to students the power of design to make a positive contribution to society, and delivered a new design consideration, the lens of safeness.

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