Technology for workable work? Developing personas to assess job quality impact of new technologies

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Abstract
Organisations face challenges due to societal transitions and labour market pressures, including increased product complexity and labour shortages. New technologies offer potential solutions to improve job quality and address workload issues. The 'Technology for Workable Work' living lab, launched in Flanders, Belgium, in 2022, aims to identify needs and develop market-ready technological and organisational solutions to enhance job quality and make manufacturing jobs more accessible. Technologists and social scientists collaborate in this project to design innovative solutions. In order to be able to match concrete job quality risks with possible technological and organisational solutions, we develop personas, which are defined as fictional, concrete representations of workers and job seekers which are faced with specific job quality risks. The process involves setting goals, acquiring relevant data, creating worker profiles based on job quality risk factors, discussing profiles with stakeholders, analysing technological solutions, and composing personas that align with the selected technologies and organisational arrangements. The personas are described in narrative form to demonstrate their potential impact. The study has led to three types of results for the manufacturing industry in Flanders: (1) a set of 9 worker profiles, each with a list of related workability risk factors; (2) a more detailed list of the specific factors which may impact workability of manufacturing jobs; (3) a list of 10 personas. In a next phase of the research, the resulting list of personas will be used within the living lab to assess and demonstrate the potential impact of the 9 selected technological solutions in an organisational context. Research-based persona could offer a valuable and hands-on perspective to inform managers on job quality risks of their employees, and to assess job quality impact of technological and organisational changes.

Context
Organisations are increasingly affected by societal transitions and political issues. As in many parts of Europe, the production industry in the region of Flanders, Belgium, is being confronted with a growing market demand for high quality, customised products, at a cost comparable to mass production (Flanders Make, 2019). This evolution leads to an increase in product complexity and variability. Furthermore, this increasing complexity permeates the production environment, with a high risk of growing physical and cognitive workload. At the same time, labour markets are under pressure in Flanders, characterised by considerable labour shortages (Van Impe et al., 2022). The region is confronted with a growing number of people not working due to long-term illnesses. Moreover, the retirement age is gradually increasing. Job quality has become a key policy issue for the regional government of Flanders. Job quality refers to job features which are related to meeting people's needs from work in terms of health and well-being (Eurofound, 2021).
At the same time new technologies are starting to enter the workplace, driven by the digital transformation (Flanders Make, 2019). Combined with work organisation interventions, these technologies may contribute to improving job quality in manufacturing (Veile et al., 2019).

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In January 2022, the Flemish Minister of Work launched the Living Lab 'Technology for Workable Work'. The goal is to improve job quality, in order to avoid workers from dropping out, and to make jobs more accessible for job seekers, in the context of today's tight labour market. The three-year project aims at mapping the needs and requirements for various target groups. Where possible, these needs will be mapped to market-ready technological and organisational solutions that may reduce job quality risks. Within the living lab, we test solutions, support companies, and disseminate knowledge. In this practice-oriented research, technologists (such as IT specialists and engineers) collaborate with social scientists to design and innovate technology and work organisation together.

Objectives

In order to be able to match concrete job quality risks with possible technological and organisational solutions, we develop personas, which are defined as fictional, concrete representations (Adlin & Pruitt, 2010a) of workers and job seekers which are faced with specific job quality risks.

Methods

As a framework for the process of personas development, Aldin and Pruitt's (2010) Persona Lifecycle is applied. In a first step we formulate the goal of the persona development, we list the relevant data sources and acquire the available data (including survey data, statistics, reports, papers). In a second step we create a set of 7 worker profiles, each with a list of related job quality risk factors, starting from 2019 survey data from the Job Quality Monitor (in Dutch: 'Werkbaarheidsmonitor'), a three-yearly survey on job quality in Flanders, using the job demands-control model (Karasek, 1979), and categories of social support (Jolly et al., 2021). In a third step we discuss the 7 profiles with various stakeholders (from unions, employer organisations, occupational safety and health prevention services, the employment agency, and companies). Through these interviews we gather concrete examples from practice, and identify specific factors which may impact job quality in manufacturing. In a fourth step, a detailed analysis is made of the 9 technological solutions involved in the living lab, after which they are grouped following their potential type of job quality impact (e.g. reducing physical load). These four steps provide the research-based foundation for composing the actual personas in the fifth step. Since the aim of the study is to create personas which can be used to assess and demonstrate the potential impact of the 9 selected technological solutions (in combination with organisational arrangements), only personas for which these technologies may be of relevance are developed. Each persona is described in a narrative form.

Main results

The study has led to three types of results for the manufacturing industry in Flanders: (1) a set of 7 worker profiles, each with a list of related job quality risk factors; (2) a more detailed list of the specific factors which may impact job quality of manufacturing jobs; (3) a list of 10 personas.

The first result is a set of 7 worker profiles. Our goal was to create profiles of common (groups of) industry occupations with their most prominent job quality risks. From the 2019 dataset of the Workability Monitor we selected the data on employees working in industrial sectors. The dataset encompasses 6 general occupation groups: Unskilled or Semi-skilled Worker, Skilled Worker / Technician, Executive Employee, Staff Member, Manager, and Care or Education Function. In the further analysis we dropped the latter function because it is very scarce in industrial sectors. We then applied the job demand-control model to the dataset. The model proposes four types of jobs. High strain jobs are jobs with high job demands and low job control.

Workers in these jobs are at the greatest risk for experiencing job strain, which can lead to psychological and physical health problems. Passive jobs are jobs with low job demands and low job control. The workers tend to be stuck in boring and repetitive jobs, with low levels of motivation and little chances for learning. Active jobs are jobs with high job demands and high job control, which are highly challenging but also offer a lot of autonomy. Low strain jobs are jobs with low job demands and high job control. Workers in these jobs are typically experience the least amount of stress, although a lack of challenges could hamper learning possibilities and motivation. Since we were interested in identifying profiles with the most prominent job quality risks, we decided to focus on high strain and passive jobs. A logistic regression analysis on the dataset corroborated this decision. Because of the imbalance between job demand and control, low strain jobs are also often seen as undesirable. However, our analysis showed relatively low problematic scores on job quality indicators for this job type. And while active jobs are usually considered the type of job that should be pursued, our analysis showed a high problematic score for work stress for this type of job, especially in management positions. We calculated the distribution of the four job types for each of the 6 common industry occupation. We used a threshold value of 10% for deciding whether high strain or passive job types are prominent for a certain industry occupation. We thus created two profiles (i.e. high strain versus passive) for Unskilled or Semi-skilled Worker, two for the Skilled Worker / Technician, and two for the Executive Employee. The active job type was only included in the two occupational groups with a high number of active jobs: Staff member and Manager, which we merged into one single profile. Table 1 shows the resulting 7 profiles, which aim to highlight the most risky situations. Social support is considered as an additional risk factor in all profiles. Emotional support refers to the provision of psychosocial support such as empathy and caring; instrumental support is the provision of resources that help an individual in need to directly address a demand; informational support is about the provision of information that may help an individual address a demand; and appraisal support refers to the provision of information that helps individuals in need to evaluate themselves (Jolly et al., 2021).

Table 1 - Profiles of occupation groups and job quality risk factors

Nr.	Occupation group	Risk factors
1	Unskilled or semi-skilled worker	- High workload and/or emotional strain - Low autonomy and/or task variation - Presence of heavy context and/or different time/location - Low emotional, instrumental, informational and/or appraisal support
2	Unskilled or semi-skilled worker	- Low autonomy and/or low task variation - Presence of heavy context and/or deviant time/location - Low emotional, instrumental, informational and/or appraisal support
3	Skilled Worker / Technician	- High workload and/or emotional strain - Low autonomy and/or task variation - Presence heavy context and/or deviant time/location - Low emotional, instrumental, informational and/or appraisal support
4	Skilled Worker / Technician	- Low autonomy and/or low task variation - Presence of heavy context and/or deviant time/location - Low emotional, instrumental, informational and/or appraisal support
5	Executive employee	- High workload and/or emotional strain - Low autonomy and/or task variation - Low emotional, instrumental, informational and/or appraisal support
6	Executive employee	- Low autonomy and/or low task variation - Low emotional, instrumental, informational and/or appraisal support
7	Staff member / Manager	- Too high workload and/or emotional strain for degree of control options - Possible presence different time/location - Low emotional, instrumental, informational and/or appraisal support

For each of the 7 profiles we assembled an information sheet. Table 2 shows this sheet for Profile 1. Some personal characteristics were added: age (physical, cognitive), low literacy, and support needs. Generally speaking, it can be said that physical and cognitive abilities may decline with age (Wolf et al., 2019). Low-literate workers may not understand information well and be less socially active (Van der Velden & Bijlsma, 2019), which may lead to wellbeing issues. And employees may have special support needs based on a disability, physical condition or illness. Job quality issues may arise when work is not (sufficiently) adapted to these special needs. It should also be noted that the characteristics and risks in the sheets not only impact job quality of people working in jobs matching the profile, but also represent hindrances for job seekers in finding a suitable and accessible job.

Table 2 - Example of a profile information sheet

PROFILE 1

Unskilled or semi-skilled worker with…

High strain job
- High workload and/or emotional strain
- Low autonomy and/or task variation

24% of workers have high strain job
Top: chemistry

Heavy working conditions

- Work posture	> 47% of workers: 'often or always'	Top: wood/paper, construction, food
- Repetitive movements	> 67%	Top: wood/paper, food, chemistry
- Vibrations	> 57%	Top: construction, wood/paper
- Noise nuisance	> 77%	Top: construction, chemistry
- Extreme temperatures	> 34%	Top: food, chemistry
- Hazardous substances	> 27%	Top: chemistry, metal
- Physically hard work	> 55%	Top: construction

Non-standard time and location
Such as night work, weekend work, shift work, irregular hours, overnight stays

17% of workers did night work
Top: chemistry, wood/paper

Low social support
- Emotional support
- Instrumental support
- Informative support
- Appraisal support

73% of workers followed no training in 2019
Top: textile, wood/paper

24% of workers with problematic relation with line manager
Top: chemistry, metal

Personal characteristics
Age (physical, cognitive), low literacy, support needs

The second result is a more detailed list of the specific factors which may impact job quality in manufacturing. In order to verify, and possibly supplement, the information in the sheets, as well as to obtain richer, textual data for the step from profiles to personas, we held semi-structured interviews.

The interviews highlighted work pressure as the most common bottleneck, with workers experiencing high time pressure, hard work, and unpredictability. Clerical and management positions mentioned carried responsibility, understaffing, and accumulating tasks. Emotional strain and cognitive load were mentioned by some, particularly in clerical and management roles. Work variety was discussed in most interviews, while monotonous work was associated with blue-collar workers but not always seen as negative. Physical strain was a concern for blue-collar workers, while sedentary work was mentioned by clerical and managerial positions. Non-standard time and location, long working days, and shift work were identified as issues, especially among workers. Working from home had both advantages and challenges in terms of work-life balance. Social support, training, and the need for flexibility were also mentioned as important factors in the work environment.

The third result is a set of 10 personas. The challenge was to condense the extensive knowledge gained into manageable personas that align with the 9 technological solutions in the living lab. The personas are designed to directly address the most relevant job quality risks targeted by specific technologies. After analysing the 9 technologies, three types of technologies are identified, as shown in Table 3.

Table 3 - Overview of the 10 personas grouped by the aim of the related technology

Aim of technology	**Persona**
Reducing cognitive load / improving cognitive development (e.g. digital work instructions)	Kai, age 33, worker in sheltered workshop
	Robin, age 27, worker
	Pascal, age 55, administrative employee
Reducing heavy load / improving work posture (e.g. exoskeletons)	Dominique, age 60, worker
	Yaniek, age 32, worker
	Charlie, age 48, worker
	Alex, age 21, job seeker
Improving work environment (e.g. environment monitor)	Taylor, age 28, worker
	Manoa, age 44, worker with language barrier
	Nikki, age 35, job seeker

For each of the three types of technologies, we developed a set of personas. An example of persona: "Charlie works as a technician in a metalworking company. Together with other colleagues, they are responsible for the maintenance of all machines. Because of the various maintenance tasks and additional administrative duties, the work is varied and challenging which is what they like. However, the recent downsizing of the maintenance team means that more work falls to them, which increasingly leads to overtime. The sometimes poor accessibility of manufacturers' service departments is partly causing delays when Google and their experience is no longer adequate. Physically, Charlie is also beginning to notice that they are getting a day older. Crawling under and between machines to get to something, for example, no longer comes easily to them. And with the shrinking of the team, they can also rely less on help from colleagues."

These personas are intended to provoke thought when it comes to the topic of job quality within the manufacturing industry. Gender-neutral names and language were used because the observed bottlenecks did not appear to be related to a person's gender. The age has relevance mainly in the case of heavy load, work posture and cognitive ability. In terms of functions, the focus is mainly on workers given that the technologies mainly address risks that are present among this group. The personas were developed using a specific sector as a concrete context, but it should be noted that the personas serve as tools to communicate a broader message.

Discussion/perspectives

In the next phase, the personas will be utilised in the living lab to evaluate and demonstrate the potential impact of the 9 selected technological solutions in real organisational contexts. Our ongoing collaboration with technology partners involves analysing the applicability of each technology, resulting in three detailed examples or scenarios for their potential use in work processes. Concurrently, workshops are being conducted with workers and managers from individual companies to assess job quality impacts based on variations in technological and job design. We are also planning a set of workshops with jobs seekers, focusing on possible hindrances they experience and the role specific technologies in a suitable work organisation could play in this regard. Finally, in-company pilot studies will allow workers to test the technology with their own processes. The Technology Impact Method (Oeij et al., 2021) serves as the methodology for assessing job quality impact, with the set of personas supporting the scenarios, workshops, and pilot studies, which may be adjusted or expanded as needed.
Research-based persona could offer a valuable and hands-on perspective to inform managers on job quality risks of their employees, and to assess job quality impact of technological and organisational changes. Furthermore, by not limiting the scope of the living lab research to the job design of the technology user, but also including the broader work organisation design, job quality impacts for line managers and other related jobs could as well be included in the assessment.

Keywords

Digital Transformation, Technology design, Work design, Personas, Job quality

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