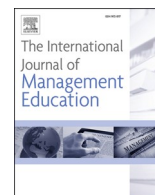


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How Dutch higher HRM education prepares future HR professionals for the impact of technological developments

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ABSTRACT

Technological developments are on the rise and considered to make way to a fourth industrial revolution. However, the extent to which (future) human resource (HR) professionals feel prepared to translate what technological developments mean for organizations and work remains largely unclear. In this article, we explore how higher human resource management (HRM) education prepares future HR professionals for the influence of technological developments in organizations. In addition, we investigate how alumni feel prepared by these programs to translate the impact of technological developments to their organization, by looking at the context of Dutch higher HRM education programs and deploying a qualitative case study methodology. Findings indicate that HR professionals face changes in their role, which require enrichments of their knowledge and competencies in the areas of technology change management, data literacy and ethics, and (line) management involvement in the implementation of technology related practices. Furthermore, results show that HR programs integrate the subject of technological developments in different degrees of depth and that there is room for (strategic) development. Practical implications focusing on how higher HRM education programs could integrate knowledge and competencies that arise from these developments to increase the strategic value of HR professionals are discussed.

1. Introduction

The rise of sophisticated new technologies and the emergence of digital industries are giving way for a fourth industrial revolution (Xu et al., 2018). Entire work processes, from production to delivery, are changing due to technological developments, such as robotics, automation, and digitalization (Schwab, 2017). These developments require that employees are managed in such a way that they can accommodate to new roles and responsibilities, which requires a crucial role for human resource management (HRM) (Bogdany et al., 2023; Freese & Borghouts, 2022). HRM refers to “all those activities associated with the management of work and people in organizations” (Boxall & Purcell, 2011, p. 1) and is thus responsible for 1) managing human capital in organizations and 2) ensuring that the human capital contributes to the organizational goals. The influence of technological developments in work do not only require a change in skills and competencies of employees, but also human resource (HR) professionals need to adapt and translate

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these developments into actions to support the workforce. This requires knowledge and skills of HR professionals to align HR policies and practices with the organization's (future) strategy (Boxall & Purcell, 2011).

However, research highlights several issues when it comes to the involvement of HR professionals and the influence of technological developments. Firstly, studies have shown that HR professionals are often unaware of the technological changes that impact work (Gikopoulos, 2019). More specifically, only 20% of HR professionals have concrete ideas of how technology will affect staffing, competencies, recruitment, and training needs of employees within the next two years, resulting in HR professionals that are unable to prepare their (line-)managers and employees for these developments due to a lack of knowledge (Freese et al., 2018). Secondly, in case HR professionals are aware of the nature of technological changes, they find it challenging to translate these developments into their own organizational context (Freese et al., 2018). Finally, research has shown that HR professionals are often involved at a later stage in the implementation of technological developments, rather than being a strategic partner who proactively considers how technological developments will affect the organization of work and employees (Freese & Dekker, 2018). These issues demonstrate a lack of knowledge and competencies of HR professionals on how to deal with technological developments in the organization (Sivathanu & Pillai, 2018; Freese & Borghouts, 2022).

Given these issues following from research in the field of HRM and technological developments, it is crucial to explore how the development of HR professionals comes about. Specifically, a large proportion of HR professionals have followed an educational program in the field of HRM. However, how higher HRM education prepares future HR professionals for translating how technological developments impact work and organizations remains largely unclear. Several recent studies have emphasized the importance of building a curriculum around knowledge and competencies that are identified to be important for HR professionals (Davidson et al., 2017; Giannantonio & Hurley, 2002; Gunarathne et al., 2021). More specifically, extant research has shown that it is essential that educational programs provide HR students with the necessary knowledge and competencies they will need to be able to show their strategic value and herewith to be able to manage technological developments that affect their organization in the future (Shrivastava et al., 2022). However, to date, it remains unknown how higher HRM education is organized around the topic of technological developments and the influence on the HR profession. In order to address this research gap, this study explores how educational programs prepare HR students, i.e., future HR professionals, for the impact that technological developments may have on organizations. Specifically, we focus on the following two research questions: What knowledge and competencies can help HR professionals translate the impact of technological developments in organizations? And how do higher HRM education programs prepare future HR professionals for their role when it comes to the impact of (future) technological developments affecting the organization?

2. Technological developments in organizations: the role of the HR function

The focus in this paper is on technological developments in terms of digitalization, automation, and robotization which are considered key areas in the field of technology (Calvino & Virgillito, 2018). Parry and Strohmeier (2014) indicate three focal areas where the role of the HR professionals is changing in relation to these technological developments: digital employees, digital work, digital employee management. *Digital employees* are the newly starting workforce that have grown up with technology and therefore have different qualifications and expectations that HR professionals need to adhere to. At the same time, this requires that employees who work longer in the organization, must be able to use and understand the new technologies as well. Here, the role of HR professionals is to support and facilitate the entire workforce with these changes. Therefore, technological developments require work to be organized differently, which is labelled as *digital work*. This implies for example an increase in automation of routine work, and more use of virtual teams in organizations. This necessitates HR professionals to prepare and manage these changes in work and ensure that employees can keep up with these changes. Lastly, *digital employee management* refers to the application of digital technologies to support and network the HR profession, which is also called electronic HRM (e.g., Bondarouk & Ruël, 2009). The HR function has a growing number of tasks that are performed digitally (e.g., recruitment, performance management and payroll) (Parry & Strohmeier, 2014). These changes in the role of the HR profession mean that knowledge and competencies to accommodate developments brought forth by digitalization, automation, and robotization are necessary. Freese et al. (2018) emphasize the importance of HR in guiding the transition of employees when their work partially or completely disappears or changes. They must prepare the workforce for agility so that it can move with the changing business models, products, or services due to new technologies (Freese & Borghouts, 2022).

2.1. Essential knowledge and competencies for HR professionals to translate the impact of technological developments

Already in 1997, Brockbank and colleagues identified HR technology as one of the five main competencies an HR professional should possess, in addition to strategic contribution, personal credibility, HR delivery, and business knowledge. HR technology entails for example that an HR professional can use online tools for communication (e.g., social media) to set up an organizational identity and maintain relations within the company (Ulrich et al., 2017). Related to the 'digital' labels proposed by Parry and Strohmeier (2014), certain knowledge and competencies are required for HR professionals. When it comes to *digital employees*, HR professionals should be able to identify the level of digital attitudes, qualifications, behaviors, and expectations of the new workforce, as well as for the existing workforce (D'Netto & Ahmed, 2012). When it comes to *digital work*, HR professionals should be able to understand the "digital literacy", i.e., the set of technical and mental skills of employees to acquire, process, produce and use information, to keep up with the digital change both on individual and organizational level in how work is affected (Nawaz & Kundi, 2010). Finally, *digital employee management* requires a shift in HR qualifications in such a way that HR professionals should deal with technical implementation and application skills (Hempel, 2004). In addition, studies highlight the importance of the competence of the analytics designer and interpreter (Peeters, Paauwe, & Van De Voorde, 2020; Ulrich et al., 2017). This competency aims to use analytics to enhance decision

making which is more data-driven. HR analytics can be used to provide insight in the status of an organization, as well as aid in predicting potential scenarios (Peeters, Paauwe, & Van De Voorde, 2020). An HR professional could use this knowledge and competencies to be able to understand the implications of the assembled and analyzed data and translate this into concrete actions for the organization (Marler & Boudreau, 2017; Peeters, Paauwe, & Van De Voorde, 2020).

Studies highlight the importance of technological knowledge and competencies that are considered valuable in addition to more social and strategic competencies (Parry & Strohmeier, 2014). Recent work has shown that HR professionals lack key analytical competencies, where they can propose business relevant research questions and run and understand analytical models (Minbaeva, 2021; Peeters, Paauwe, & Van De Voorde, 2020). Additionally, findings show that HR professionals are supposed to be sensitive to what is happening on the work floor. If they know what employees consider to be important and relevant when it comes to technological evolutions, they can develop HR policies and practices accordingly. Thereby, HR professionals who show willingness to change and an open and proactive attitude to make sure the organization can keep up with its competitors and the technological changes score high on analytical competencies (Bogdany et al., 2023; McCartney et al., 2020). In the coming years, where technological developments keep growing, developing knowledge and competencies accordingly is essential (Nankervis et al., 2021; Peeters, Paauwe, & Van De Voorde, 2020).

2.2. How higher HRM education programs prepare future HR professionals for technological developments in organizations

In general, a smooth transition from graduation to work is considered essential (Steiner et al., 2022), which also applies to graduating from HRM education to HR practice. One aspect of this transition is the importance of interfaces between education and work (Gallo, 2013; Lundahl & Olofsson, 2014). Research emphasizes the importance of building a curriculum around the knowledge and competencies identified for future HR professionals, to accommodate a smooth transition from school to work (Giannantonio & Hurley 2002; Langbert, 2005). The Australian Human Resource Institute encourages universities to adapt curricula to the competencies needed in the (future) work field of HRM (Davidson et al., 2017). However, given the multidisciplinary field of HRM, it is challenging to incorporate all disciplines such as economy, psychology, law, and sociology, while also applying a critical and applied paradigm (Kaufman, 2002). Collaboration with HR professionals is important to achieve alignment between education and the work field, in terms of knowledge and competencies at work. Another important aspect is that universities recognize graduates as a product of their education (Davidson et al., 2017; Giannantonio & Hurley, 2002). Only then, HR education can prepare students to fill vacancies in the market.

Organizations expect that future HR-professionals are significantly prepared to step into the work field after they have finished their HRM studies and rely on educational systems to make this happen (Davidson et al., 2017; Langbert, 2005). Educational HRM programs must therefore take into account the changing demands for future generations of work in light of the fourth industrial revolution. Furthermore, these programs need to prepare their students for more complex jobs and foreseeing the consequences of using and cooperating with technology and robotics (Peeters, Paauwe, & Van De Voorde, 2020). Thus, educational programs are faced with the challenges of preparing students to work in this digitalized work environment (Harteis, 2017; Freese & Borghouts, 2022). This also means that it is important that educational research contributes to shaping and pointing out these necessary changes. Table 1 provides an overview of the literature covering the elements discussed in the theoretical framework of the paper that focus on the influence of technology on work of HR professionals, as well as the role of HRM education in this respect.

3. Methodology

We examine how technological developments affect the HR professional and how higher HRM educational programs can prepare for this in the case of higher education in the Netherlands. Dutch higher education consists of universities of applied sciences (UoAS), which offer professional bachelor programs, and universities, which offer academic bachelor and master programs. We do not intend to compare the UoAS bachelor programs with the master programs, since the programs differ in length (i.e., UoAS programs last four years and university master programs last one year) and prerequisites (i.e., to be eligible in following a UoAS program, students need a certain secondary education entrance level, while students need to have a bachelor’s degree to be eligible to start at a university master program). We conducted the case study among three Dutch universities and three Dutch universities of applied sciences with a

Table 1
Overview of the main literature discussed in the theoretical framework.

Constructs and theory discussed	Literature focusing on HRM and technological developments	Literature focusing on higher (HRM) education
Three focal areas where the role of HR is changing with respect to technological developments: Digital employees, digital work, digital employee management.	Parry and Strohmeier (2014); Bondarouk and Ruël (2009)	
Essential knowledge and competencies for HR professionals, such as digital attitudes, qualifications, behaviors, and expectations.	D’Netto & Ahmed (2012); Nawaz & Kundi (2010); Peeters, Paauwe, & Van De Voorde (2020)	
Multidisciplinary field of HRM, including challenges that relate to work in digitalized work environments.		Kaufman (2002); Davidson et al. (2017); Freese & Borghouts (2022)

bachelor or master program in the field of HRM. We executed in-depth interviews with program coordinators, teachers, and alumni of these higher HRM education programs (see [Appendix A](#) for more information about the alumni of the HR programs). A two-step approach was used for data-collection and analysis. First, a document analysis was conducted in which we studied the curricula of HR programs of UoAS and the universities through reviewing catalogues and websites of the programs and documentation that was supplied by the participating HR programs, such as curricula guides and course syllabi. Specifically, the curricula of the HR programs were analyzed and compared on the extent to which the program, learning lines, and courses focus on knowledge and competencies related to technological developments. This input served as basis for the second step: the interviews.

Between January 2022 and April 2022, we held 26 semi-structured interviews with program coordinators, teachers, and alumni of the HR education programs. Specifically, we interviewed nine employees working at three Dutch UoAS: one education coordinator and two teachers per case. Furthermore, six alumni of the UoAS HR programs were interviewed. In addition, we interviewed the education directors of the university HR programs and one teacher, and seven alumni of the three HR programs. Program coordinators and teachers were contacted directly and invited to participate in the study. Alumni were first approached via the coordinators of the HR programs, then the researchers contacted the alumni with an invitation to participate in the research. The requirement was that alumni had gained work experience in the field of HRM and worked as HR professional. The first author conducted the interviews together with two research assistants. The interviews were conducted online, via the online teleconference tool Zoom due to the Covid-19 situation. Each interview took approximately 60–90 min. Prior to the interviews, the researchers developed two different interview guides, one for educational directors and teachers, and one for alumni (see [Appendix B](#)). All participants were asked informed consent including permission to record the interview. The Ethical Review Board of the university approved the research design and interview questions prior to executing the research.

All interviews were transcribed verbatim. The program ATLAS.ti was used to code the data. This analysis involved three types of coding: open coding, axial coding, and selective coding ([Corbin & Strauss, 1990](#)). Firstly, the first author and research assistants went through a round of inductive, open coding, where short, simple, and precise codes were given to text fragments ([Thornberg & Charmaz, 2014](#)). This coding scheme included inductive codes that related to the knowledge and competencies HR professionals need to manage technological developments, such as ‘interpreting dashboards’, ‘ethical aspect in technology’ and ‘advisory skills’. Throughout this process, similar actions described in single sentences, paragraphs, or larger pieces of the text, were identified and coded using words reported by the respondent ([Corbin & Strauss, 1990](#)). The initial coding resulted in 552 codes. The second step involved the process of axial coding. Here categories were related to subcategories and the researcher continued to look to develop new categories ([Corbin & Strauss, 1990](#)). For example, codes such as ‘data analyses’ and ‘analyzing data for HR’ were codes with similar meanings and were therefore merged. These fragments with the similar codes were clustered to gain a better oversight of the data and how codes and categories related to each other. Lastly, selective coding was used. The categories were unified and were integrated in the theoretical constructs found in the literature. Categories were also further explained if necessary. Furthermore, besides coding, the researchers also selected relevant quotes. The quotes were used in the results section to support the findings (see [Appendix C](#)).

4. Results

4.1. *The necessary knowledge and competencies to translate the impact of technological developments according to HR professionals*

Most alumni indicated that the use of data and digitalization of HR systems were prominent changes they experienced in their work due to technological developments. Specifically, the professionals mentioned that they noticed that more data are being collected by companies. One reason why data is collected is that organizations want to go along with the recent developments of collecting data for decision making and that there is a trend in linking different (types of) data sets to support policy decision making. This development calls for a variety of new competencies that are asked of HR professionals, such as the ability to work and interpret data dashboards and knowledge about how these numbers impact their work, department, and organization. HR professionals should thus be able to understand and make decisions based on the data that is collected and translate their ideas into the strategy of the organization.

However, some professionals indicated they do not know what to do with the data or what the intentions of the data collected are. In addition, they argued that there is an ethical aspect related to the use of data. Although HR professionals argued that more is expected from them when it comes to the use of data, they also indicated that more complex data science solutions and predictions will not be asked of HR professionals as this is too much of a specialist role which fits the role of a data scientist better. Moreover, participants argued that analysts specifically focusing on HR data can be seen as a more advanced administrative worker, where they need to either manage a system or should be able to work with numbers better than the more general HR professionals. The task of HR professionals then focuses more on interpreting the information arising from the data and collaborate with the parties, i.e., data scientists, to collect and analyze the data in a way that helps the organization prepare and manage technological developments. Finally, the HR professionals indicated that there is also an ethical role for them when it comes to collecting, analyzing, and interpreting data, in such a way that one should wonder and carefully consider in advance what should and should not be collected and retrieved from the data.

The alumni also noticed the rise of automation and herewith the implementation of digital HR systems. Most of the professionals mentioned that their organization uses automated systems that record information such as absence and digital reading of CVs. Not only is information recorded automatically; employees are also able to request information and vacation days, for example, through such self-service E-HRM systems, meaning that they do not have to contact the HR department anymore. The main reason for automation according to the alumni is to work more efficiently and to be able to deal with the shortage on the labour market. Some professionals that were employed in the sector of HR systems and operations noted that the implementation of HR systems goes up and down. They

indicated that there is a rise in the use of larger HR systems, but once these grow too cumbersome, organizations will start building smaller applications to work alongside those bigger HR systems to be more flexible. Another result of the use of digital HR systems is that companies need to standardize HR processes, like for example the process of recruiting new talent. This requires HR professionals to (pro)actively monitor the needs of the organization as well as the employees to see whether their requirements are met.

In addition, technological developments create room for a more internationalized workforce and therefore another change indicated by alumni is the rise of remote working and consequently working together with many different cultures. For HR professionals this means that they should be aware and should be able to manage different cultures, also remotely. More generally speaking, HR professionals should be able to develop an HR-vision and strategy for the future of an organization and they should be able to decide what choices should be made to accomplish the vision and strategy using HR policies and practices. One element according to alumni is strategic workforce planning, because an organization might require less employees due to the impact of these developments regarding certain processes. This requires that HR professionals possess skills to manage changes and translate the impact of these changes into concrete actions that are necessary in work. Specifically, they should be able to identify changes, oversee them, and provide evidence-based solutions, to guide an organization in the process of technologization of work, which requires a more strategic role of the HR professional. [Appendix C](#) includes an overview of quotes that support these developments.

4.2. How do higher HRM education programs integrate technological developments that affect the HR function in their curricula?

4.2.1. Results of the universities of applied sciences

Results of the document analyses and interviews with program coordinators and teachers of UoAS show that all bachelor programs HRM at UoAS in the Netherlands follow the National Educational Profile HRM 2020+, developed by the association of all Dutch universities of applied sciences ([LOOHRM2020, 2019](#)). In this profile, six core competencies are developed by the association of UoAS which are created based on the recent developments that affect the HR role and herewith related competencies. The task of the UoAS is to develop and assess these competencies that students need to possess after finalizing their bachelor's program ([LOOHRM2020, 2019](#)). These competencies focus on (1) working with a professional attitude and personal leadership, (2) develop, implement and evaluate policy in an organizational and societal context, (3) realize HR products and services that initiate, facilitate and implement change processes in organizations and other partnerships, (4) develop individuals, teams and organizations, (5) realize the desired match between demand and supply of labor at micro, meso, and macro levels, and (6) purposefully collect and analyze HR data ([LOOHRM2020, 2019](#)). The third and sixth competency referred to above are most relevant when it comes to the impact of technological developments. More specifically, changes in work due to technology require HR professionals to possess change management competencies (competency 3), and the use of technology and analyzing data require HR professionals to purposefully collect data and use these for decision making (competency 6). All bachelor programs develop their program in such a way that they incorporate these competencies. However, how they organize and incorporate these competencies, and what emphasize they place on certain competencies, differs per program. Below we zoom in on how the UoAS programs are organized and we discuss how the knowledge and competencies are incorporated based on the document analysis and interviews.

The program of Case UoAS-A consists of eight semesters of half a year in which a certain theme is central. In the first semester, the focus is on work and organizations, in which students get to know the profession and gain basic knowledge and skills. In the second semester, HR policy and execution is central. In this semester, students learn how to advice on a tactical level and focus on two HR practices, namely recruitment and performance management. In the third semester, students focus on strategic HRM and the international level of HRM. Next, students go into practice and execute HR related tasks on operational and tactical level. Afterwards, in the fifth semester, students perform research on strategic level. In the sixth semester, students can choose their own minor to broaden their knowledge but also to specialize in a certain area. In the seventh semester, the focus is on change and research. Students learn how change affects organizations. Finally, in the last semester, students learn how to advice and implement. Within this program, five learning lines are developed, focusing on (1) internships that students execute during their studies, (2) the integral line where assignment and practice come together, (3) the conceptual line, in which the more general body of knowledge is developed, (4) the competencies line, and (5) the study career guidance line in which students develop their professional attitude.

The program coordinator of the HR program indicates that the topic of technological developments and specifically digitalization is a topic of discussion. However, in the current version of the program, this topic is not explicitly incorporated. There is one course that focuses on the future of work, but this course focuses more on work in general, in which the topic of digitalization is one element. In addition, the teachers argue that the impact of digitalization is mentioned and referred to in the programs, but the competencies that come with it are not specifically integrated. The program coordinator indicates that they are currently developing their curriculum. One of the aims is to give the topic of technological developments a more prominent place in the program. Finally, alumni of the HR program also indicated that technological developments were not explicitly integrated in the HR program. They argue that it would have helped them if the HR program paid more attention to technological developments, such as developing sensitivity in terms of anticipating how developments will affect work and the HR related consequences of this so that they can take an active role in managing these developments and the roles of other actors (e.g., line managers, work council, employees, etcetera). However, they do indicate that they developed themselves to a certain extent by participating in internships and skill development workshops such as working with digital tools.

The program of Case UoAS-B consists of four learning lines throughout the program. The first one is the conceptual line, where courses such as economy, psychology, law, sociology, financial management and people management are part of. Also, more HR related courses such as strategic HRM, management of diversity, recruitment, talent development and the work of work are part of this line. In the second line, the competency line, students develop their writing, presentation, and communication skills, next to their

analytical skills. Furthermore, coaching and advising, English and HRM conversations are part of this line. In the integral line, students learn how to conduct research, they focus on change management and sustainable employability, and performance management. In addition, in the reflective line, students explore, develop, and manager their talent, by doing an internship. Finally, in the graduation assignment, students conduct their own research assignment, from designing until providing the advice.

The program coordinator argues that digitalization is an important topic of discussion, but currently not so integrated in the program. There is one course, named the world of work, in which one lecture is dedicated to the impact of digitalization and robotization. However, the teachers and coordinator stated that they consider this topic to be much more important and relevant, and that they therefore are currently redeveloping their curriculum, in such a way that the impact of technological developments will be incorporated in more detail and throughout the program. Moreover, alumni indicated that the topic of technological developments and how this impacts the HR function could be integrated more in the program. Specifically when it comes to competencies related change management, since alumni indicate that HR plays a major role in the change management aspect before, during and after the technological development impacts work, and herewith workers and the organization in general.

Finally, the program of Case UoAS-C starts in the first year with content courses focusing on onboarding, change in organizations, healthy work in organizations, employees in development, and assessments related to competencies. In the second and third year, students follow a minor program, conduct a business partner internship, and follow a course on change management. In the fourth and last year of the program, students follow courses related to sustainable HRM (diversity and inclusion), learning and development, and perform their graduation assignment. The program coordinator argued that they have recently redeveloped their program, and that, amongst others, based on the strategy of the UoAS, the focus in their program lies on working with a professional attitude and personal leadership (competency 1), and purposefully collecting and analyzing HR data (competency 6). They incorporate these competencies by focusing on analytical thinking and personal leadership. In addition, the teachers argue that there is a lot of attention for the use of data in organizations, with a focus on people analytics. They also offer a minor on data driven business. Within the program, two courses, 'good work for all', and 'learning and development', emphasize is placed on the impact of technological developments. Throughout the entire HR program, emphasize is placed on people analytics. For example, in the previous mentioned courses, but also in the business partner internship that all students participate in. Table 2 provides an overview of the UoAS cases including their findings regarding vision or mission of the school, the goal of the program including their set-up, the attention paid to technological

Table 2
Overview results universities of applied sciences.

	Case UoAS-A	Case UoAS-B	Case UoAS-C
Label	Technology in development	Technology-conscious	Technology future-proof
Vision or mission of the school	Ensure that thinking and doing come together	Provide inspiring, challenging, and high-quality higher professional education and conduct practice-oriented research that is meaningful to society	Together for the future
Goal HR program	Educate all round future HR professionals	Connecting people and work	Getting the best out of people and organizations
General set-up program year 1	Work and organizations HR policy and execution	World of work & HRM Matching employers and employees Talent development Organizing human capital	Organizational change Employee journey – onboarding Health work in organizations Employees in development
General set-up program year 2	Strategic (international) HRM Internship	Vitality and workplace happiness Sustainable organizing	Internship Change management Minor of choice
General set-up program year 3	Research on strategic level Minor of choice	Internship Minor of choice	Minor of choice Internship
General set-up program year 4	Change and research Advice and implement in graduation assignment including internship	Graduation assignment including internship	Decent work Learning and development Graduation assignment
Attention devoted to technological developments according to program coordinator and teachers	The influence of technological development is a topic of discussion, but not explicitly incorporated throughout the program. One course is dedicated to the future of work, in which technological developments is a theme discussed.	The topic of technological is discussed in the world of work course, but not throughout the entire HR program. There is focus on HR analytics skills.	The impact of technological developments is discussed throughout the program, and specific attention is dedicated to competency 6 (collect and analyze HR data).
Reflection alumni on the integration of technological developments in HR program	Technological developments were not explicitly integrated in the HR program, although alumni do indicate that they developed themselves to a certain extent by participating in internships and skill development workshops such as working with digital tools.	The technological development topic could be integrated more in the program, specifically when it comes to knowledge and competencies about technological developments.	No alumni interviewed that graduated from Case C
Link to constructs discussed in theoretical framework of the paper	No specific focus, although the program incorporates elements of digital work.	No specific focus, although the program incorporates elements of digital work and digital employee management.	Main focus is on digital employee management, digital work, and digital employees.

developments according to program coordinators and teacher as well as the alumni interviewed.

After comparing and contrasting the findings of the cases, we defined a typology that represents the three cases based on the extent to which they incorporate knowledge and competencies related to technological developments in their HR program. Case UoAS-A is labelled as *'technology in development'*, given that the results of the document analysis and interviews showed that technological developments are seen as important to incorporate in the HR program, but more could be done throughout the program to establish this. We labelled case UoAS-B as *'technology-conscious'*, since they pay attention to developments related to technology, although the program coordinator, teachers and alumni indicated that this could be done more strategically. Finally, UoAS-C is defined as *'technology future-proof'* as this HR program integrates technological developments in different phases and in a variety of ways throughout the program.

4.2.2. Results of the universities

We now turn to the results related to the three master HR programs at university level. The focus of Case U-A lies on creating a balance between organizational performance and employee interest and is specialized in the relationship between work, well-being, and performance. The one-year program covers a number of mandatory courses, such as seminar in HR studies, HR analytics and organizational change. Furthermore, students can specialize themselves in particular HR areas, by participating in one elective that focus on human resource development; performance management; HRM, work-design & technology, positive institutions, or cultural diversity management. In addition, students select two electives that focus on international HRM, inclusive HRM, positive psychological interventions in organizations, active aging at work, compensation and benefits, or leadership in organizations. Next to this content, the program stimulates students to prepare a "credible activist" mindset, meaning that they prepare the future HR professional to be both credible by possessing the knowledge, but also active, in terms of that they possess the competencies that belong to the professional attitude. The academic director of the program argues that the importance of technological developments is included in particular (mandatory, like HR analytics and electives, such as work-design & technology and inclusive HRM) courses of the program, and that they pay attention to competencies such as strategic thinking, working with data, communication skills and academic writing skills. Alumni of the program indicated that impact of technological developments is incorporated in the HR program, although more attention could be devoted to the topic throughout the HR program. More specifically, they indicated that attention is paid to these developments in certain courses as mentioned above, but the course organizational change and seminar in HR for instance could also integrate this topic more in depth since students work on a business case that could help them develop their competencies further.

The program of Case U-B consists of a one-year program in which the focus lies on HRM in the public sector context. Next to some more general courses, such as strategic human resource management; HRM and employees; and research seminar in HRM, the program also emphasizes the public dimension of SHRM in one course. In addition, attention is paid to academic and professional skills, in which students can choose between developing consultancy skills, labor law, management skills, project management skills, coaching in organizations and pitfalls in governance and management. The academic director of the program argues that there is no specific attention in the program to the role or impact of technological developments. In some courses, attention is paid to the topic as a context factor, but no specific topic is dedicated to this theme. Alumni of the program indicated that there is no specific attention for technological developments in the program, although the role of organizational change more generally is incorporated explicitly. They indicate that it would have helped them if more attention was paid to the data literacy aspect, since HR professionals need to speak the language of HR and the use of data.

Finally, the HR program of Case U-C is part of the master business administration, in which students can specialize by following a HRM track. The focus of this program is on international, high tech, innovative businesses, and digital transformation. The track consists of four courses: HRM and innovation; Strategic HR analytics, global talent management, and HRM and technology. The last three courses have a direct focus on technological developments, since they include issues such as how to use data, how technology plays a role in talent management, and master certain theories about the use of technology and how to implement technological developments. The academic director of the program highlights that the university has a clear focus on technology in its strategy, and therefore the program, and particular HR track, also emphasizes the role of technology and digitalization. This is supported by their focus on competencies such as working with data and data driven decision making, but also advising and reflecting on the implementation of technology-related changes. Alumni of this program also indicate that the focus in the HR courses is mainly on the influence of technological developments which has helped them a lot in their role as HR professional and they indicate that when it comes to this topic, they felt well prepared.

In sum, results show variation in how higher HRM education programs adopt the topic of technological developments in the HRM curriculum. Among the three universities and three UoAS we found that some are very focused on technology (Case UoAS-C and Case U-C) and its impact on work and specifically the HR function. This university and UoAS have technology and innovation in the vision of the entire institute. Therefore, we labelled Case U-C, like Case UoAS-C, as *'technology future-proof'*. For example, out of four HR courses that are offered in the HRM track, three of them contain an element of technologization, such HRM and technology design, strategic HR analytics, and global talent management. Other cases integrated little on this particular topic in their program. For example, two programs (Case UoAS-A and U-B) have integrated technology mostly in the way that it is a context factor like many others. Therefore, we have labelled Case U-B, like Case UoAS-A as a case in which *'technology is in development'*. However, they indicated that if students want to do more with this subject, they are allowed to integrate this when they write their thesis. Two other HR programs (Case UoAS-B and U-A) have integrated technology in several courses as an important context factor, but also designed one or more compulsory courses or elective course(s) regarding for example HR analytics and implementing technology in work. Therefore, we have labelled Case U-A, like Case UoAS-B, as *'technology-conscious'*. One education director indicated that they discovered in consultation with HR professionals that there was a demand for such a subject as the elective was popular by HR students

immediately. Table 3 provides an overview of the university cases including their findings regarding vision or mission of the school, the goal of the program including their set-up, the attention paid to technological developments according to program coordinators and teacher as well as the alumni interviewed. In addition, based on the findings of the interviews, Fig. 1 is created to present a graphical overview of the level of strategic focus on integrating technological developments in the HR programs and the degree of knowledge and skills included per program which is distilled from the findings.

4.3. Key knowledge and competencies regarding technology development for HR professionals and HR education

One key finding of the interviews with alumni is that HR professionals often do not possess an active role when it comes to involvement in and translation of developments around technology. This is oftentimes considered difficult, since HR professionals are not always involved in (strategic) conversations that discuss how technological developments affect work in organizations, or only at a later stage, for example when technology is about to be implemented. One way for HR programs to prepare future HR professionals to be involved before and during the implementation of technological developments is to incorporate knowledge and competencies related to technology-focused change management. For example, by educating students to anticipate how the technological development is going to affect employees and their work.

In addition, findings also highlight that employees are often not well prepared for the developments that await them, resulting in employees perceiving resistance and lack of clarity in terms of how these developments will affect their work. Therefore, competencies that relate to making sure that employees are informed, respond to questions from workers about the change in work, and responding to what the change does to employees, is considered crucial according to alumni interviewed for this study. This type of knowledge and skills is mostly present in the *Technology future-proof* cases. These cases have developed an HR program derived from an organizational strategy in which the importance of technological development is directly interwoven, making this topic reflected in most learning lines throughout the program. For the other cases, a more strategic approach could be taken to incorporate the topic into the program. Another way for current HR professionals to be involved in these conversations is to let them participate in lifelong learning and development opportunities. Alumni indicated that they need to keep developing themselves after graduation, for example by following trainings, workshops, and programs on how technological developments impact organizations. For higher education institutions, there

Table 3
Overview results universities.

	Case U-A	Case U-B	Case U-C
Label	Technology-conscious	Technology in development	Technology future-proof
Vision or mission of the school	To develop, transfer, and implement scientific knowledge and skills necessary for its development	Working to make the world a better place	Contributing to a fair, sustainable and digital society
Goal HR program	Develop and create an understanding of the rationale for HR decisions and their impact on work, wellbeing and performance	Working in a changing environment	Become an expert in maximizing organizations' greatest asset: people
General set-up program	Mandatory courses: Seminar in HR studies; HR analytics; organizational change. Electives: positive institutions; HR development; performance management; HRM, work-design and technology; cultural diversity management; international labor law & globalization; compensation and benefits; international HRM; active aging at work; inclusive HRM; positive psychology interventions in organizations; leadership perspectives on HRM	Mandatory: Strategic HRM; HRM and personnel; the public dimension of HRM; research seminar management and organizational science. Electives: consulting management; policy management; management skills; organization dynamics; business operations in the public sector; strategic HRM skills; leadership in an international context; consultancy skills; labor law; project management; coaching in organizations; pitfalls in governance	Entrepreneurial Leadership & Responsible Organizational Design; Qualitative Research and Business Skills; Quantitative Design Methods in Business Research; Business Valuation & Corporate Governance Specialization in HRM: Global Talent Management; Strategic HR Analytics; HRM and Technology Design; HRM and Innovation
Attention devoted to technological developments according to program directors	The topic of technological developments is included in the HR program and covered in the course HRM, work-design and technology and HR analytics	There is no specific attention to technological developments in the HR program. However, in some courses the topic is discussed as a context factor.	The vision of the university includes the importance of technological developments and herewith the HR track also emphasizes the role of technology and digitalization.
Reflection alumni on the integration of technological developments in HR program	The impact of technological developments is incorporated in the HR program, although more attention could be devoted to the topic throughout the HR program	There is no particular role of technological developments in the program, although the role of organizational change more generally is incorporated explicitly	The topic of technological developments is incorporated throughout the entire HR program, specifically in the specialization of the HR courses offered
Link to constructs discussed in theoretical framework of the paper	Main focus is on digital work and digital employee management	No specific focus, although the program incorporates elements of digital work	Main focus is on digital employee management, digital work, and digital employees (to a lesser extent)

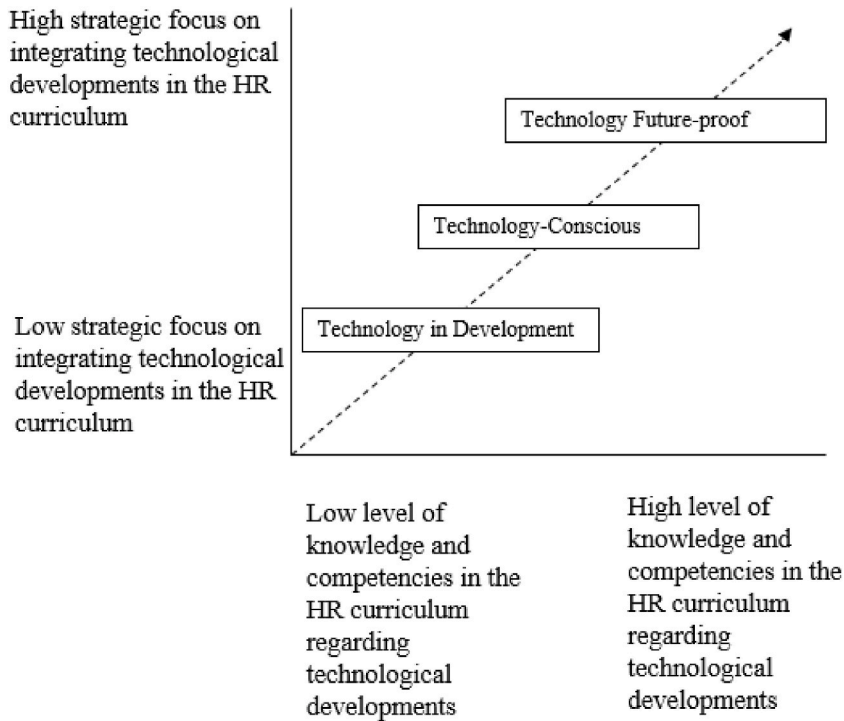


Fig. 1. Plot of Cases for Strategic Focus and Integration of Knowledge and Competencies related to Technological Developments.

is an opportunity to connect with HR professionals and consider offering trainings to help them stay up to date.

Alumni indicated that a related aspect to the change management aspect of technological developments focuses on which tasks belong to the HR profession and which tasks are taken up by (line) managers. Line managers are increasingly responsible for HR-related tasks, supported by digitalized HR systems. This involvement of line managers in the implementation of technological developments results in not only in a change in the HR role and support, but also an adjustment in the role of line managers, who need to implement and manage their workforce and work with technology. Alumni reported that a good digital infrastructure for managers is often still lacking, causing the added value of HR to fade into the background. When this the case, HR professionals can translate digital input into interventions, allowing them to be more of strategic value. These HR processes and herewith analytical skills should therefore also receive more attention in HR programs, in such a way that students learn how to translate data into appropriate interventions, but also map processes and make them more efficient by writing improvement proposals for the management team of the organization. An example provided by the program coordinator of case U–C is that in the HR and technology course, students help an existing organization with determining and solving an issue that relates to implementing a certain technology for HR purposes. In this way, students develop both knowledge and competencies that are valuable in their future HR career.

Finally, HRM education can play an important role when it comes to data literacy and the ethical aspect data usage. Some HR programs, such as the two ‘technology in development’ cases, pay little attention to how to use data and how to make use of data for decision making. However, alumni argued that predicting trends and developments using data is still in its infancy in many organizations, but this is something that HRM education programs can foresee will become increasingly important. Specifically, HR professionals operating in the consultancy industry indicate that there is a transition going on in organizations from more descriptive data analysis to predictive data analysis in which an HR professional can also play a role by proactively working with this if they are sufficiently prepared. Therefore, according to the alumni interviewed, all HR programs should pay attention to the analytical side of HRM. Relatedly, alumni indicate that HR programs also need to indicate and discuss the ethical side of data collection and use, to make students aware of the (undesirable) consequences of data.

5. Discussion

The aim of this research is to explore how the HR function and specifically HR can translate the impact of technological developments to organizations and how they can be prepared for these developments by educational HRM programs in The Netherlands. We show that HR professionals experience many different challenges that relate to technological developments in their organizations. From the interviews with the alumni, we found that these changes relate to the organization of work (i.e., digital work), and that this affects the role of the HR function when it comes to digital employee management (Parry & Strohmeier, 2014). In previous studies, it is emphasized that keeping up with technological developments is critical for an organization’s survival and competitive advantage (Caligiuri et al., 2020; Freese et al., 2018). This requires HR professionals to understand how technological developments affect work

and their own function, which is also supported by the participants, i.e., alumni of HR programs at universities and UoAS in this study, since they confirm the importance of managing technological developments. Hence, respondents indicated that the implementation of these developments remain people work, since technology is always connected to people (Gratton, 2021). Therefore, according to the findings of this study, technology can be seen as a tool that is supposed to make the work of HR professionals easier, but it cannot replace the human brain and therefore cannot replace people, and one should thus not overestimate technology. This neutralization is in line with the literature, as it is also mentioned that digitalization is used to support the HR function, but it cannot replace human judgement (Bondarouk & Ruel, 2009; Fenech et al., 2019; Parry & Strohmeier, 2014).

Findings show that all educational directors and teachers indicate that there is no way around technological developments for HR professionals. Some program coordinators argued that they realize the important influence of these developments and state that it would be useful to spend extra time on this subject to better prepare their students for the changes these topics might imply. In addition, the program coordinators under study indicated that they do reflect on their curricula through conversations with the industry and alumni, however the connection between the HR study programs and the work field did not really focus on the impact of technological developments and how they affect the HR function. From the document analysis and interviews we distilled three main themes that HR programs and alumni indicated to be influential in preparing future HR professionals for their work. These are technology related change management, data literacy and ethical aspect of data, and line manager involvement in technological developments (Bogdany et al., 2023). Below we discuss how HR programs could integrate these themes in their programs to establish an effective fit with the future role of HR professionals.

This study contributed to previous research on HRM, technological developments, and the role of HRM education in a number of ways. First, we add to the HRM and technological developments literature by studying the role that higher HRM education can play in preparing future HR professionals for their work in the HR field. Specifically, our results show the importance of creating a connection between HRM education programs and the HR function, as a curriculum that incorporates the impact of technological developments can strengthen the degree of preparation and execution of HR professionals' roles. Second, our findings show that HR programs can enhance their curricula when it comes to technological developments, especially by taking into account the extent to which there is attention devoted to digital work, digital employees, and digital employee management (Parry & Strohmeier, 2014). Finally, by using a case study, we were able to provide an in-depth analysis of some of the Dutch HRM programs that prepare future HR professionals. Since this is one of the first studies exploring this topic, we recommend future studies to also focus on bridging the literature streams of HRM, technological developments, and higher HRM education.

5.1. Practical implications

Firstly, we recommend integrating the impact of technological developments more strategically in the HR curricula. Case UoAS-C and U-C are examples in which the organizational strategy includes the importance of technological developments, and in which the HR programs have a clear structure and focus incorporated around this topic. Specific knowledge and skills related to technology change management, data literacy and ethics, and the involvement of management in implementing technology related practices, on top of the more general HR knowledge and skills, is considered vital in these cases. Courses such as change management and HR analytics were therefore highly appreciated by those who participated and requested by alumni who did not have the opportunity to participate. Besides integrating technological developments as a context factor, it is thus suggested that studies also teach more deeper insight in data analytics to learn how to work with and interpret data. It is not necessary to introduce students to a variety of HR systems or data processing systems in depth, since too many systems exist, and students will get to know them once they start working in the HR profession. However, is important to teach them how to decide what type of data is needed to gain certain insights for organizations and by taking into account ethical considerations. In addition, the HR function is not alone in implementing technology. All functions could be more connected and be familiar with technological developments, in which the HR professional could be the connector. Relatedly, for HR professionals who already work in the HR field, offering lifelong learning and development opportunities in the area of the impact on technological development is recommended to make sure that they are up to date when it comes to knowledge and competencies around this topic (Garraway, 2006).

In addition, this study highlights the importance of keeping track of developments that impact the work of HR professionals and the design of the curriculum accordingly (Shrivastava et al., 2022). Previous empirical studies, as well as the alumni and organizational directors of the studied higher HRM education programs, implied that keeping a close connection to the work field is essential (Everwijn et al., 1993; Giannantonio & Hurley, 2002; Shrivastava et al., 2022). One way to do this is for educational programs to stay in regular contact with their alumni, not solely for keeping track of the developments, but also for feedback on how the study currently connects to the work of HR professionals. In addition, the UoAS used the national education profile HRM (LOOHRM2020, 2019) which is updated every four years to determine what knowledge and competencies are considered key for (future) HR professionals. In this way, all UoAS integrate key competencies into their program, which is based on scientific as well as practical insights from the HR field. The program directors of universities under study indicated that they do reflect on their curricula through conversations with the industry and alumni, however this is done in a less formal and structured way. It is therefore recommended that this contact is upheld in-depth more regularly and formal, to make sure that the content of the HR programs reflect the current role of the HR professional (Leathwood & Phillips, 2000). For example, by defining a profile that the university considers the HR professional to be and act upon and to create a curriculum in which all aspects are taught in courses that ultimately educates the student to develop this profile.

5.2. Limitations and future directions

This research has a number of limitations that should be considered for future research regarding this subject. First, the sample that was used consisted of three Dutch HR master programs and three universities of applied sciences. However, not all master programs had the same structure, as one program had an HR track integrated in a broader (one year) master program and the other programs were full (one year) HR-related masters. During the interviews, it was indicated that this might have had an impact on the width of HR knowledge that was provided by the respondents. Another limitation regarding the sample was the year of graduation of the alumni. There were a few participants involved with roughly a year of work experience, this made it difficult for them to answer some of the questions, as they were still in the fairly operational HR positions, instead of the more strategic HR positions that the educational programs train their graduates for. However, since we also included alumni with more work experience, we were able to draw from these findings to provide recommendations. Examining a larger sample and including more alumni with a minimum of a few years working experience could be beneficial. Hence, the insight of the recently graduated respondents gave a clear reflection on the study programs and what they were taught in the program specifically and this was also essential to this study.

As mentioned in the theory section of the paper, it is important that research on HRM and education helps shape and suggest improvements that could be made by HR curricula to improve the connection to the work field. Therefore, further research could be done regarding the competencies that organizations are looking for in new employees compared to the competencies that are taught in the educational programs. This is also part of the *digital employee* label of Parry and Strohmeier (2014), which was not found to be prominent in the analyses of the interviews. Another aspect that might be interesting could be to investigate the entire educational route of alumni. In this study, we only focused on the preparation of HR professionals by higher HRM education, while professional learning is also important when HR professionals work. We also restricted ourselves to the university of applied sciences and master HR programs in the Netherlands. However, there are also HR professionals active in the HRM field that do not have a background in HR studies. Therefore, we recommend future studies to also investigate lifelong learning and development activities of HR professionals and to study how HR professionals that do not have a background in HRM can train themselves in the topic under study (Shrivastava et al., 2022).

6. Conclusion

This study examined the extent to which (future) human resource (HR) professionals feel prepared to translate the impact of technological developments on organizations and work and how Dutch higher HRM education prepares future HR professionals for this role. Findings show that technological developments influence how HR work is organized and that HR professionals play an important role in managing these developments in organizations. Overall, our observations stress the importance of integrating the topic of technological developments in higher HRM education programs since they can prepare future HR professionals by building a curriculum that integrates knowledge and competencies they need to cope with these rapid changes. However, there is room for strategic development and integration of the topics of technology change management, data literacy and ethics, and multidisciplinary collaboration (including the role of management) in implementing technology related practices, to enhance the strategic focus on integrating technological developments in HR curricula.

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Author contributions

All authors contributed to the study conception, study design and material preparation. Data collection and analyses were done by JB and SG. The first draft of the manuscript was written by JB and IB. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Declaration of competing interest

The authors have no competing interests to declare that are relevant to the content of this article.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijme.2023.100916>.

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