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Nurturing Data-Savvy Talent in Digital Transformation of Projects

Eleni Papadonikolaki, Ph.D.¹; Yan Liu, Ph.D.²; Kirk Maritshane³; and Paul Chan, Ph.D.⁴

Abstract: Digital transformation in projects disrupts how project-oriented organizations recognize and value skills and expertise of new data-savvy talents. Existing research on digitalization in projects has focused mainly on technologies that can help organizations and people achieve, without connecting the implications these technologies have on human and social capital in project environments. This research goes beyond this dominant technocratic view to examine talent management for project management professionals operating in an increasingly digitalized and data-rich world. Through a purposive sample of 24 semistructured interviews with diverse project management experts across industry, academia, and professional institutions, our findings extend talent management scholarship in two ways. First, unlike scholarship on talent management that hitherto has emphasized identification and recruitment of talents, our interviewees placed more attention on developing and retaining talents. Second, whereas talent management scholarship can identify pivotal roles that can secure competitive advantage, our research highlights the importance of data-savvy expertise to interact with nondigital project management expertise in order for such pivotal roles to succeed in project contexts. Strategies are proposed for new directions in talent management practices based on our proposed buy–lease–make model for talent management in project-oriented organizations. DOI: [10.1061/JMENEA.MEENG-6047](https://doi.org/10.1061/JMENEA.MEENG-6047). © 2025 American Society of Civil Engineers.

Author keywords: Digitalization; Talent management; Project professionals; Human resource management.

Introduction

Project work is everywhere, from traditional capital construction projects to knowledge work in information and communication technology (ICT), and research and development (R&D), and frequent organizational change across sectors. The projectification of society brings projects to the forefront as a fundamental driver of economic action (Jensen et al. 2016; Schoper et al. 2018). This rapid increase in projectification is accompanied by a parallel increase in digitalization and datafication. With the accelerated development of digital technologies and data science, the idea that “data is the new soil” (McCandless 2010), in which data are a fertile medium that can produce rich insights, wise decision-making, and intelligent actions (Marnewick and Marnewick 2022), is gaining traction. Massive quantities of data are now available, and the capacity to capture, store, process, share, and visualize data is advancing. This carries implications not only for firms but also for projects, in finding new ways to cope with dynamic change, control performance,

and enhance their capabilities (Papadonikolaki et al. 2022). In addition, new sources of talent are entering the field of project management (PM) from other sectors, changing the character of the workforce in projects. This study investigated how the data-rich era and this emerging pipeline of new data-savvy talent entering the market are influencing projects and how the project profession is shaping the data-savvy talents.

Digitalization and datafication are radically affecting project management, particularly in project delivery (Liu et al. 2024; Whyte 2019). Whereas datafication seeks to represent social life such as subjects, objects, and practices as quantifiable data to facilitate mathematical analysis (Mayer-Schönberger and Cukier 2013), digitalization refers to a more comprehensive transformation in which organizations switch their information management systems from analog to digital (Ross 2017). Digitalization of project information management, including data modeling and analytics, automation, cloud computing, and artificial intelligence (AI), has been argued to support project organizing by addressing increasingly growing complexity and uncertainty in project environments (Whyte et al. 2016). In turning toward an information-processing approach (Papadonikolaki and Jaskula 2023), digitally-enabled project delivery models need integrated digital solutions and relationships across supply and demand sides, and the importance of digital workflows and analytics over traditional document-based workflows is increasing (Whyte 2019). Whereas previous studies have emphasized the technical possibilities of digitalization and datafication for the management of projects, this study focuses the attention on human and social sides of such transformation.

Digitalization and datafication are still in a nascent stage of development in terms of their use in projects. In a recent bibliometric analysis of 478 articles, Marnewick and Marnewick (2022) found that project management still is not yet digitalized. Unsurprisingly, studies in projects to date have focused on how digitalization and datafication have been disrupting practices in these sectors, emphasizing reasons for slow uptake and providing recommendations for wider adoption. For example, Papadonikolaki (2018) observed in

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multiple case studies in the Dutch construction industry that the adoption of building information modeling (BIM) was much stronger when contractors had a clear internal vision for BIM implementation than in cases in which contractors simply complied with external pressure to use BIM from the project networks. Lo and Kam (2022) recognized the importance of external (e.g., government policies, regulations, and client demand) and internal (e.g., strategies and business models for staying competitive) stimuli that drive the innovation adoption, noting the importance of employee engagement in technological advancements. Gao et al. (2023) investigated how institutional pressures can create the impetus to digitalize by influencing individual employee's perceptions of the usefulness of digital technologies; the stronger the perceived usefulness, the stronger employees identify with digital technologies, thereby increasing their adoption of such technologies in practice (Gao et al. 2023). Past studies thus have focused on the technological readiness of individuals and organizations by examining how to increase technology adoption (Sukanthan Rajendra et al. 2022).

A common theme in previous studies of digitalization and datafication in PM is that employees' buy-in is critical in encouraging technology adoption. However, to date scholars have privileged technology over humans (Xu et al. 2022) by centering attention on human acceptance of digital technologies. This technocentric view downplays the ongoing development of people and the management of new talents in novel developments of digitalization and datafication. Furthermore, demographic changes such as technically-skilled employees entering the market are already profoundly changing PM practices (Stier and Herzberg-Druker 2017). The changes lead to new jobs and roles, new professional accountability, and greater integration and collaboration across professional functions and teams (Jaradat et al. 2013; Papadonikolaki et al. 2019). The widening digital divide calls into question how we attract, develop, and retain the future workforce of projects (Liu et al. 2024). Nurturing a diverse and skilled workforce is a key element of the project management profession's long-term agenda for change (Locatelli et al. 2023; Sauer and Reich 2009). Therefore, this study raises the following research questions (RQ):

- RQ1: How do project management professionals understand and experience the trends of the data-rich era in project environments and talent management?
- RQ2: What are the opportunities and obstacles for managing project management talents to deliver projects in the data-rich era?

We focused on both demographic and technological changes, particularly the relevance of the fields of human resource management (HRM) and project management, and the potential to develop new empirical insights, theoretical development, and research directions. The rest of the paper is organized as follows. The next section presents the theoretical background of the work. In the third and fourth sections, the methodology and data are presented, respectively. The paper concludes with a discussion of findings, including theoretical contributions, practical implications, future research directions, and concluding remarks.

Theoretical Background

Human Resources Management in Projects

HRM is the process of managing an organization's workforce to achieve its goals and objectives (Amit and Belcourt 1999). This involves recruiting and selecting employees, providing training and development opportunities, organizing them, managing performance,

and compensating and rewarding employees. HRM also involves ensuring that employees are treated fairly and in accordance with relevant laws and rules. By supporting the organization's overall business strategy, HRM helps it achieve its objectives. HRM is strategic for a firm because the workforce helps create competitive advantage (Amit and Belcourt 1999).

The literature on HRM in projects indicates that effective management of project team members is crucial for project success (Belout and Gauvreau 2004). HRM in project settings is more challenging than mainstream HRM because the function is affected by the dynamic nature of projects, and project-oriented companies need to assign and disperse people to projects outside the project-oriented company and link project assignments to career development (Huemann et al. 2007). This involves properly defining roles and responsibilities, setting clear goals and expectations, providing adequate resources and support, and regularly communicating and engaging with team members and partners at an interorganizational setting (Samimi and Sydow 2021). Effective HRM also involves assessing and addressing conflicts and issues within the team and providing feedback and recognition. A key function of HRM is talent management. Talent management is the collection of HRM practices and processes, including attracting, developing, and retaining people with the required skills and aptitude to meet current and future needs (Lewis and Heckman 2006). Although there is no exact and unified definition of talent management, it increasingly has become associated with organizational practices aimed at anticipating and meeting the talent needs for strategically important roles (McDonnell and Wiblen 2020). Thus, talent management provides the basis for shaping capabilities that, in our context, enable project management organizations to stay competitive in the market (Zhang et al. 2020).

Against the backdrop of dynamism, temporality, and the intra- and interorganizational character of HRM in project-oriented companies (Huemann et al. 2007; Samimi and Sydow 2021), talent management is necessary to ensure that the project profession thrives in the ever-changing environment. However, to date talent management has not received a great deal of attention in project studies. Havermans et al. (2019) and Alkhudary and Gardiner (2021) stated that projects and the PM profession do not have clear career pathways. Project managers often fall into the role by accident, and generally do not progress to executive positions because good project managers are hard to find (Havermans et al. 2019), so organizations tend to keep good project managers within the project management function rather than promote them upward. Likewise, project managers typically enjoy the excitement of running projects, and do not want to move up the corporate hierarchy themselves (Havermans et al. 2019). Project managers traditionally are seen more as generalists than as specialists (Hutcheson 1984; Lalonde and Brunet 2016), which may hamper their career progression in highly technical contexts. Because digital work often is seen as more technical, there is scope to examine how such a specialist position can affect talent management in the more generalist field of projects.

Strategic View of Digital Talent Management in the Management of Projects

Much has been written on how digital technologies are making it easier for project managers to plan, execute, and monitor projects (Whyte 2019), and to facilitate collaboration and communication between team members (Papadonikolaki et al. 2019). Data analytics and reporting tools provide valuable insights for decision-making and continuous improvement (Wijayasekera et al. 2022).

In project environments, general-purpose technologies have received attention (Steen et al. 2022), including

- PM software: digital tools that help project managers plan, organize, and manage projects more efficiently, e.g., Asana, Trello, and Basecamp;
- collaboration and communication: digital platforms that facilitate communication and collaboration among team members, clients, and stakeholders, e.g., Slack, Microsoft Teams, Zoom, and virtual or augmented reality (V/AR) devices;
- data analytics and reporting: tools that help project managers track and analyze performance (progress, cost, and timeline), e.g., Tableau, Power BI, and Google Analytics; and
- AI and machine learning: digital technologies that help project managers automate certain tasks and processes, such as scheduling and resource allocation (Wijayasekera et al. 2022), such as AI-powered PM platforms, e.g., Microsoft Project and PlanGrid.

Thus, although talent management raises questions of a strategic nature (McDonnell and Wiblen 2020), scholarship on digital technologies has tended to focus on operational rather than strategic concerns. There has been a legacy of the PM profession to be more concerned with operational rather than strategic concerns (e.g., Morris 2013). This emphasis on the operational also occurs in studies of HRM in project environments, in which the management of people is more task-oriented. For example, Bredin and Söderlund (2011) examined different roles and interactions between HR specialists, line managers, project managers, and project workers in large engineering firms in Sweden that have a significant project management function. In contrast with the growing emphasis on strategic HRM, Bredin and Söderlund (2011) found that project managers tended to take on more HRM responsibilities at the operational level.

To address the talent gaps resulting from digital transformation, there is an increasing need to address digital talent management as a strategic and not an operational concern. Outside of the PM field, research is beginning to show how digitalization is impacting strategically on the recruitment of new talents. For example, Donald et al. (2022) interviewed 36 career advisors and graduate recruiters, and noted that digital maturity was seen in terms of positive employer branding, which can aid in attracting new early-career talents.

Digital transformation has a key influence on talent management. Montero Guerra et al. (2023) distinguished between attracting talents and retaining talents, and considered the development and deployment of talents to be connected to both attracting and retaining talents. Their structural equation model and survey of 314 Spanish firms found that more emphasis has been placed on retaining than attracting talent. They found that the new talent determines the recruitment strategy of the firm and has the power to restructure existing business processes (Montero Guerra et al. 2023). Thus, digital talent management is more strategic than task-oriented or technical.

In orienting digital talent management as a strategic concern, there is a need to consider the connections between business strategy and the management of human resources (Boxall and Purcell 2022). This shift toward a more strategic perspective calls into question the need for project management organizations to integrate digital strategies into their core HRM functions, thereby providing the impetus for identifying and recruiting pivotal positions, roles “where a change in the quantity or quality of individuals who fill them leads to the biggest gains in strategically relevant outcomes” (Cascio and Boudreau 2016, p. 111) (see also Cascio and Boudreau 2010). Thus, digital talent management for PM ensures the creation of pivotal roles that can leverage the full potential of

digital capabilities to enhance project outcomes and secure competitive advantage for the project profession (Zhang et al. 2020).

However, developing such pivotal roles for digital talents in the management of projects goes beyond the identification and recruitment of individual talents. There also is a need to consider how such talents are developed collectively within organizations. For example, Guinan et al. (2019) conducted a multilevel study of 60 firms, including fieldwork across 5 firm sites and 130 interviews with senior IT professionals, to understand how a digital project team is created. Talent management is one of four critical levers found to aid in developing innovative project teams—talent management focuses mainly on scaling up digital competencies through, e.g., creating hubs, reverse mentoring, and promotion of digital leadership. They found that instead of focusing on technical skills, there is a need to pay more attention to other abilities, e.g., the ability to be open-minded and to continuously learn and develop (Guinan et al. 2019). The other three levers include creating a diverse and targeted team composition (including ninja teams that can provide fluid cross-functional support and T-shaped individuals), promoting agile ways of working that emphasize iterative goal setting, self-managed teams, servant leadership, and promotion of continuous learning.

In a similar vein, applying Q-methodology to a sample of project managers’ outlooks on digitalization in South Africa, Marnewick and Marnewick (2022) found that respondents placed more emphasis on social competences (communication and collaboration), rather than on the technical aspects of digital intelligence. This recognizes the impact of digitalization on the human and social capital of projects beyond task-oriented considerations. Studies also have considered the importance of how digital talent needs to coexist with other nondigital (or less digital) roles. For example, Huang et al. (2020) reported significant changes in the connectivity and communality of social capital in projects resulting from information systems. Gillberg and Wikström (2021), building on literature on inclusion and exclusion and focusing on a case study of a manufacturing firm to highlight the experiences of more mature people (such as those above 40 years of age), found possibilities in which digitalization can either include or exclude senior workers. For example, assuming that senior workers are less capable of dealing with digital work and therefore deploying them to product lines that are due to be discontinued can backfire because senior workers have other valuable skills to offer. Gillberg and Wikström (2021) underscored the importance of considering not only the experiences of digital talent, but also the interaction between such talent and other roles within the organization. This calls into question the interactions between digital natives and digital immigrants.

Synthesis of the Knowledge Gap

Studies of digital transformation to date have focused on what technologies can do for us, and often neglect how they can radically change what the workforce does (Robinson et al. 2016). By going beyond the dominant technocentric line of thought in which digital technologies such as BIM often are viewed as tools to support work, this study examined digitalization as a broader sociotechnical systemic change (Papadonikolaki et al. 2019). In so doing, we call into question how the management of talent—both in terms of new (digital natives) and existing (digital migrants) workforces—is navigating and exploiting the data-rich era. This study examined talent management initiatives to investigate how new (digital natives) and existing (digital migrants) workforces in projects can exploit the inherent advantages of the data-rich era.

It also is important for firms to recognize and value the skills and expertise of the new data-savvy employees, and integrate their

knowledge and insights into organizational decision-making. This can foster a culture of innovation, and ultimately can lead to improved project and business outcomes (Liu et al. 2024). The recognition and valuing of skills and expertise of the new data-savvy employees, and the integration of their knowledge and insights into organizational decision-making necessitates taking a strategic view of talent management. In strategic HRM, this entails addressing tensions between searching for universal best practices in the market and finding the best fit by matching resources with the specific local organizational context (Boxall and Purcell 2022). Striking a strategic balance between best practices and best fit also is reflected in the characterization of strategic HRM as either an outside-in (following a Porterian view of competitive advantage) or an inside-out (following a resource-based view) approach (Paauwe and Farndale 2017), mirroring the classic strategic question of whether to make in-house or buy from the market. These strategic considerations shape the core of the knowledge gap and our intended contribution.

Methodology

Rationale and Research Stages

The scope of this study focused on how the workforce and operational talents create value in project environments of the construction and information technology (IT) sectors and beyond, drawing upon fieldwork between June and December 2022. We followed a mixed methodology of interviews and focus group discussions to benefit from diverse data and perspectives aimed at exploring how the PM profession views talent management in the data-rich era. The multimethod approach was followed to address the complexity of human, social, and organizational perspectives of the research questions and to use methodological pluralism to understand them (Williams and Kennedy 2000). In addition, according to Creswell (1994), triangulating different data sources enhances research accuracy. Combining interviews and focus group discussions offers a multifaceted approach to capturing the depth of individual experiences and the breadth of collective views, which is essential for developing effective management strategies and understanding the impact of technological changes. Stages 1 and 2 focused on addressing RQ1 and RQ2, respectively.

Data Collection Methods

Stage 1: Interviews

The analysis of how the data-rich era is transforming the talent pipeline was based on a qualitative step featuring semistructured interviews that took place between June and November 2022. Interviewing industry experts increased data richness (Creswell 1994) because interviews are an appropriate means to capture their input. The questions involved the following topics: (1) background of the interviewee, (2) experiences and perspectives of digitalization in the PM profession, (3) organizational perspectives of digitalization and PM, (4) digital talent management, and (5) external support for the digital transformation of the PM profession. A purposive sample of 24 diverse participants was interviewed, recruited from the authors' professional networks from three main stakeholder categories: industry, academia, and professional institutions, such as the Project Management Institute (PMI), the Association for Project Management (APM), and the International Project Management Association (IPMA). Industry interviews focus on specific organizational contexts, offering deep insights into particular practices, case studies, and innovation examples. Academia interviews offer theoretical expertise and provide insights from the educational

perspective. Professional institutions that set standards and collect best practices can aggregate experiences and insights from a wide range of practitioners across different sectors, sizes, and geographical locations. This broad perspective can reveal overarching trends, common challenges, and widely adopted best practices, providing a comprehensive view of the industry. Their involvement can ensure that the research aligns with industrywide expectations and addresses topics of widespread professional significance.

Saturation is key for qualitative studies with purposive sampling, and it is ensured when no new information is being collected to add further to the analysis (Bazeley 2013). Saturation can be reached between 9 and 16 interviews (Bazeley 2013; Hennink et al. 2017), but because we wanted to have a balanced and representative sample from industry, academia, and professional institutions, we exceeded this threshold. The profiles of the interviewees are presented in Table 1. The interviewees were a mix of novices and people experienced in projects from a variety of countries and companies. All interviewees were familiar with digitalization and datafication in project management practice, and their organizations were leading in relevant efforts. Most were interviewed online, and the interviews were recorded and transcribed. All interviewees were briefed appropriately about the study in advance through the participant information sheet and interview guide, and all signed consent forms allowing audio recording. The data collection followed the ethical guidelines of the first author's university at the time of research project funding acquisition.

Stage 2: Focus Group

To strengthen the research rigor and evaluate the relevance and accuracy of the preliminary findings, we also ran a focus group for validation to triangulate the results and overcome the shortcomings of monomethod studies (Sarantakos 2005). There are different types of research validation, such as construct validity (whether the study explores what it claims to explore), internal validity (whether data analysis was accurate, involving the research subjects), and external validity (involving new subjects external to the research) (Boudreau et al. 2001). We focused on both internal and external validation to understand the reflections of interview participants and external academic experts on the results.

Focus groups improve and align the mental models of participants to achieve consensus on how things work and discuss potential ways to engage the group (Bérard 2010). The focus group took place in December 2022, and lasted 2 h. The purpose of the discussion was to present early impressions from the interview data on attracting, developing, and retaining digital and data-savvy talent in projects, and to identify ways in which academic institutions, industry, professional institutions, and government can help in harnessing the opportunities and overcoming the obstacles of digitalization and datafication. The focus group workshop was conducted online via Zoom using Google Jamboards (online collaboration whiteboard) to engage participants and document and cluster their input. The focus group attracted four interview participants [Interviewees (Ints) 5, 7, 13, and 17]. Additionally, four academics familiar with the topic also were included. However, due to time constraints, none of the interviewees from professional institutions were available. The focus group participant profiles are presented in Table 2.

The focus group was organized as follows. Following a brief introduction and early findings from the interviews, participants were asked to express whether these early impressions resonated with them, and if there were further remarks they would like to add. Thereafter, participants were asked to engage with the Google Jamboard and add virtual notes about recommendations they would make in terms of what academic institutions, industry organizations,

Table 1. Interviewee profiles

Interview No.	Country	Current role	Company	Years in industry	Interview duration (h:min:s)	Recording
1	UK	Project manager	Design and engineering consultancy	5	00:31:35	Yes
2	Netherlands	Digital transformation coordinator	Contractor	5	00:36:01	Yes
3	Croatia	Vice Dean and professor	Academia	20	00:43:49	Yes
4	UK	Project manager	Contractor and consultancy	6	00:41:36	Yes
5	UK	Risk manager and data analyst	Contractor and consultancy	6	00:57:48	Yes
6	Netherlands	Project manager	Engineering consultancy	7	00:37:08	Yes
7	UK	Head of projects (project manager)	Design, engineering and PM consultancy	20	00:56:03	Yes
8	UK	Specialist project manager (data analytics)	Design and engineering consultancy	20	00:38:30	Yes
9	UK	Professional researcher	Design and engineering consultancy	8	00:48:49	Yes
10	Netherlands	Information manager	Engineering consultancy	14	00:29:03	Yes
11	UK	Associate director	PM consultancy	13	00:57:24	Yes
12	Croatia	Civil engineer	Railway company	>10	N/A	No
13	UK	Technical director railways	Engineering consultancy	42	00:40:58	Yes
14	UK	Service director	Engineering consultancy	17	00:32:09	Yes
15	Netherlands	Ph.D. Candidate	Academia	1	02:17:00	No
16	Netherlands	Associate professor	Academia	2	01:21:00	No
17	Netherlands	Assistant professor	Academia	4.5	02:20:00	No
18	Netherlands	Assistant professor	Academia	2	00:47:00	No
19	Netherlands	Structural engineer and assistant project manager	Design and engineering consultancy	2	01:00:00	No
20	Global	Vice president	Professional institution	20	00:32:34	Yes
21	UK	Project delivery director	Professional institution	>20	00:38:04	Yes
22	UK	Project manager	Professional institution	45	00:45:00	Yes
23	Netherlands	Consultant on information management	Design and engineering consultancy	1	00:40:09	Yes
24	Netherlands	BIM modeler	Contractor	4	00:38:37	Yes

Table 2. Profiles of focus group participants, including interview no. (Table 1) if applicable

Participant No.	Country	Current role	Company	Years in industry	Interview No.
1	UK	Head of projects (project manager)	Design, engineering and PM consultancy	20	7
2	Sweden	Professor construction informatics	Academia	25	N/A
3	Austria	Head of department	Academia	20	N/A
4	UK	Technical director railways	Engineering consultancy	42	13
5	UK	Lecturer in engineering project management	Academia	5	N/A
6	UK	Risk manager and data analyst	Contractor	6	5
7	UK	Associate professor in construction project management	Academia	18	N/A
8	Netherlands	Assistant professor in AI	Academia	4.5	17

professional institutions, and the government could do to exploit opportunities and overcome obstacles of attracting, developing and retaining digital and data-savvy talents in PM. A plenary session then took place in which the virtual notes were clustered jointly between all focus group participants, and a discussion ensued, which was recorded and transcribed verbatim.

Data Analysis Methods

Stage 1: Interviews

The data were analyzed via qualitative data analysis and by combining deductive and inductive coding (Saldană 2009), which is known as a blended approach (Graebner et al. 2012) or abduction (Alvesson and Kärreman 2007). The interviews discussed examples of PM professionals, their changing work, and impacts on project-based businesses and organizations. The hybrid coding method of both deductive (theory-driven) and inductive (data-driven) codes provided rigor and approached the phenomenon holistically (Fereday and Muir-Cochrane 2006).

The data were analyzed in two main cycles of coding by different researchers. In the first cycle of coding, the third author

coded the data deductively following the codes of attracting talent, developing talent, and retaining talent, which are the three pillars of talent management practices (Lewis and Heckman 2006). Then, to analyze in greater depth the opportunities and obstacles to attracting, developing, and retaining talent, the data were coded inductively by the first author to identify new patterns that inform the thematic codes (first-order and second-order codes) the experiences of working in a data-rich environment (RQ1) and how to harness the opportunities and address obstacles when managing digital and data-savvy talent in delivering projects (RQ2). The second cycle of inductive coding helped to create higher-level categories from the first coding cycle (Gioia et al. 2013) as an anchor of support for the findings. Fig. 1 shows the coding process. The interview data were coded and analyzed in the web version of Atlas.ti that allowed for collaboration among researchers.

Stage 2: Focus Group

The participatory method of the focus group engaged the experts and created a powerful and action-oriented research design to minimize the researchers' bias (Cornwall and Jewkes 1995). The focus

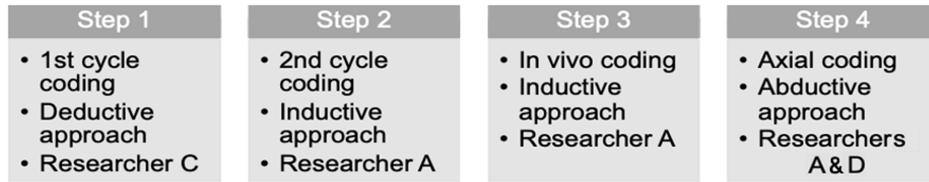


Fig. 1. Steps of coding process of Stage 1 interview data.

group was facilitated using an online whiteboard tool (Google Jamboards). This was used to present the preliminary findings in a structured way, and allowed for interaction. The online whiteboard environment was structured in the three areas of attracting, developing, and retaining new talent, and the aim was to design interventions from a multistakeholder perspective for managing the talent pipeline of project workforce. Due to the structured nature of the online focus group, the data analysis took place as thematic analysis using the three themes of attracting, developing, and retaining new talent as deductive codes.

This methodological synergy of interviews and focus group discussions allows for triangulation, enriching the analysis by validating findings across different data sources and enhancing engagement. Particularly valuable in exploring complex issues such as digital transformation in project management practices, this approach ensures a nuanced understanding of both personal experiences and group dynamics, which is crucial for developing effective management strategies and understanding technological impacts in the engineering domain.

Findings

Attracting Digital and Data-Savvy Talent

New Talent Coping with Growing Complexity in Project Delivery

Digitalization and data-driven PM was recognized by the interviewees as a growing trend reshaping the HR function as digital tools and data analytics change HR practices by informing the selection practices by which HR managers learn about new essential digital skills in recognizing new talent (Ints 5 and 7). Emerging digital and data-driven technologies have been acknowledged as enabling data intelligence in making the delivery of projects “more efficient and effective” (Int 9) and contributing to the “[prediction of] the project outcome, based on different [and previous] projects” (Int 10). The promising impacts of digitalization on improving intelligence for enhancing project controls also were identified (Ints 5 and 7). In addition to the trend in which built environment firms work increasingly with high-tech companies and the digital tools they offer (Int 1), there also was recognition that the new generation of professionals has grown up as digital natives, and the work needs to be adjusted to make it more appealing to attract them, particularly in sectors such as construction and engineering that face increasing pressures on recruitment. However, the digital and data-savvy talent oftentimes perceive remuneration in the construction industry to be low (Int 14), hence negatively impacting the attraction of new talent.

Interactions between Digital Natives and Digital Immigrants

In recruiting new digital and data-savvy talent, consideration is given to how digital natives can interact with digital immigrants.

Although traditional PM departments deliberately invest in digital technologies (Int 9) and attract talent from other disciplines, such as data engineers, data scientists, data analysts (Int 20), statisticians (Int 7), and software developers, there also was a recognition that this is not always successful (Int 5). As Int 13 noted

Those who are native to this technology cannot understand why we’re not just fully implementing it . . . and I think that sometimes means they get disillusioned.

Unsurprisingly, all interviewees recognized the chasm between established project managers who, as digital immigrants, are reluctant to embrace digital and data-driven technologies, and those who are early-career digital natives. We also found a more nuanced explanation of this gap between digital natives and digital immigrants concerning the different mindsets that digital natives and digital immigrants bring to project delivery. Although there is a recognition that data analytics and digital technologies can help in providing greater transparency when dealing with the growing complexities of the PM world (Ints 3 and 10), there also is a changing composition of project-oriented firms due to the interaction between digital natives and immigrants, as Int 12 remarked

And also we attract different profiles. For example, at first, in our department we had only civil engineers, but now we have also data engineers, people who work only with data. And it can be project management data, but also technical data within projects. And it helps to change the company to being more data-driven.

It is crucial to consider how digital and data-savvy talent can be brought into projects so that project managers can harness the power of digital technologies and data analytics in enabling the talent to appreciate everyday complexities of project delivery.

Sourcing Talent from Elsewhere

A key theme in attracting digital and data-savvy talent is that relying on traditional routes of recruitment is not sufficient. Recognizing that the competition for talent can be fierce, there is a need to cast the net more widely, and this can involve going abroad and engaging with different universities to search for talent and bring the relevance of digital skills forward (Int 24). For some interviewees, midcareer workers who also have some practical industry experience in addition to being data-savvy were desired (Int 14). For others, apprentices (Int 14) and early graduates (Int 24) were more appealing, because companies tried to train and develop them from the ground up. Nevertheless, sourcing talent from outside the traditions of the PM field, such as software engineering (Ints 4 and 19) is fraught with strategic and operational challenges. According to Int 4

We are also integrating software developers with the project management skills teams and project management office (PMO) . . . that we are not being . . . really successful yet.

In some cases, our interviewees reported that project-based organizations recruit digital and data-savvy talent as external consultants from abroad, in countries such as India (Int 1). This brings into question how organizations configure their workforce, and what is regarded as part of the strategic core. There also are practical operational challenges of dealing with cultural (e.g., working practices across national and professional cultures) and geographic differences (e.g., time zones) (Ints 22 and 24).

Developing Digital and Data-Savvy Talent

Modes of Learning and Development

Developing data-savvy talent was a prolific topic among interviews. The discussions revolved around two main areas: (1) the individual level, and (2) the collective level. At an individual level, data-savvy talent were not always recruited directly, but they were already in-post and had a passion for digitalization and were self-taught in coding and programming for data analysis (Int 20). Only after proving the value of these new digital methods did they attract a company budget to grow their department (Int 2). However, most of the development was conducted either through in-house training (Ints 1 and 20) in masterclasses or webinars (Ints 10 and 24), or training staff internally was outsourced to externally hiring trained consultants (Int 4), continuous professional development (CPD), or vocational education (Int 9).

At a collective level, the preceding discussion underscores the need for making strategic decisions in organizations that will change the course of action of HR departments (Int 22) to deliberately invest in training and development (Ints 8 and 23). Several organizations were developing communities of digital natives (Int 21) using internal online platforms with special interests for people to learn from one another in a collaborative and organic way (Int 1). Developing people in digital technologies and data-centric ways of working also would lead to developing collaborative teams (Int 23). Emphasis was also placed on balancing digital with soft skills within teams (Int 2) to create high-performing teams (Int 21). Int 1 explained the interdependences between the attraction of new talent and its embeddedness and development

So it's really about finding the people with the skills is still a challenge and I think the other challenge is really changing the way people work and providing enough training for them.

Value of Digital Tools-In-Use

A recurring theme in balancing skills in the team was about interactions between project management expertise and data-savviness. Often, there is the tendency to position digital and data-savvy skills against traditional PM practices, with the former seen as progressive and advanced, and the latter framed as traditional. However, as Int 14 noted, the challenge lies not in positioning one against the other, but rather in integrating both digital and data-savvy skills and traditional PM practices

When you've not got that integration, you've got communication issues, you've got people not understanding where the data sits, not really understanding how the models work, all sorts of, you know, people think they know what they're looking at. The reality is that they don't, they've not understood it.

In integrating new data-savvy skills with PM, there also is a need to shift attention away from focusing on tools to focusing on demonstrating the value of the tools-in-use. As Int 13 noted, a range of tools is available on the market, and the challenge is to convince the PM function to invest both time and money ahead of time to

switch from nondigital to digital tools, especially when project budgets are increasingly squeezed. Our interviewees also presented contradictory perspectives on the value of digital and data analytical tools-in-use. There is recognition that digital tools and data analytics can provide a holistic view for managing projects and remove biases in senior project managers (Int 8). PM is about ongoing negotiations with stakeholders, and the ability to communicate and influence other actors in navigating the complexities of project delivery; such complexities cannot always be reduced by oversimplifying through data analytics (Int 7). Thus, developing digital and data-savvy talent also involves generating two-way interactions and understanding between those with strong digital and data-savvy skills and those with knowledge and experience about projects in practice.

In using digital technologies and data analytics, the interviewees emphasized the need to differentiate between the use of digital technologies and data to communicate, collaborate, coproduce, centralize, and control (Ints 1 and 4). This is not always about digital tools and data analytics replacing business-as-usual PM practices. Rather, it involves how such technologies and techniques can supplement and complement what project managers do in influencing an array of other human actors and the outcomes of project delivery. It involves demonstrating the usefulness of digital tools and data analytics, and at times, the translation of those tools to the everyday practice of managing projects.

Learning across Disciplines and from Other Sectors

The interviewees stressed the importance of demonstrating the value of digital tools and data analytics by bringing together people from different disciplines through internal events (Int 9) to showcase the power of different digital tools and data analytics in terms of how these can influence communication, coproduction, and collaboration throughout different phases of the project (Int 3). It is through coaching both the new talent and the established project managers that a learning-by-doing culture can be fostered (Ints 7 and 11). The challenge is to encourage people in general, whether digital natives or digital immigrants, to step out of their comfort zone to engage with and learn from others who are external to their immediate work and organizational role who might be from a different city, country, or industry sector (Int 1). Thus, asking the right questions is more critical than seeking answers through digital tools and data analytics.

Retaining Digital and Data-Savvy Talent

Questioning What Is Core to the Business

While acknowledging the growing importance of digital technologies and data-savvy talent, data-savviness still is considered to be secondary to traditional PM skills, and fostering human relations with clients and other stakeholders are considered to be more important (Int 9). Data-savvy talent that has been recruited from the software industry is demotivated in more traditional industries such as construction and hard to retain because there are few ways to apply their skills (Int 4). Making an impact with their digital skills and bringing immediate value (Int 4) were found to be equally if not more important in retaining the data-savvy talent than higher pay, according to (Ints 3 and 17). Some companies take the retaining of new talent very seriously (Int 24) and try to keep data-savvy talent happy by involving them in pilot projects (Int 23) or rotating them through different projects to gain more experience and remain stimulated in project work (Int 14). Staying in the company for a relatively long period is seen as an enabling factor in innovating and creating the positive change by applying digital technologies in projects (Int 4).

Diversifying and Embedding Digital and Data-Savvy Talent

Retention of data-savvy talent raises a broader challenge that lies in the nonfinancial rewarding of such talent: embeddedness. In this respect, organizational structures and hierarchy often are seen as a barrier to embedding such talent in PM organizations. As Int 4 stated:

That is also what I see in my company. Even if people are young and digitally native, but they go in an environment that is traditional, and because they are younger or they have less seniority they don't apply their skills, so they don't bring their innovative things. Again, it's really driven by the organization culture I believe.

It was acknowledged that senior managers and particularly executives in the C-suite are not always well-versed with the power of digitalization and data to transform their businesses. Thus, there is a need to foster more interactions between those typically early-career employees with expertise in digital technologies and data analytics and C-suite members so that a two-way dialog can ensue to enable a true digital transformation in PM practice. This requires adjusting current people-focused PM practices to incorporate more digital platform-based communication practices (Ints 6, 20, and 22), which is seen as another opportunity in providing a more democratic platform and equitable media to different project stakeholders (Int 8), thereby increasing the potential for encouraging diversity. The interviews were conducted after the COVID-19 global pandemic period when there was a public debate across countries over the shortage of personnel, both in digital and traditional roles. Thus, retaining talent is an increasingly critical challenge. However, it still is unknown whether bringing digital skills is making organizations more diverse (Int 1).

Lack of new talent retention is broadly attributed to misalignment between company and employee. For Int 14, often the new talent "because they're so different to the people around them, they just leave, because they don't feel at home." When discussing the retention of digital and data-savvy talent, Interviewees 14 and 23 also recognized broader intergenerational concerns in the management of HR. Compared with the generation of those who occupy senior positions, there is recognition that old ideas of organizational hierarchy and command-and-control structures that lend themselves more to micromanagement gradually are giving way to flatter, more agile and responsive organizational structures that embrace diversity of perspectives (Int 23). According to Int 23, such different work values are key to addressing the retention challenge:

I would say the major challenge that I see is the simultaneous presence of different generations that are having different also work values. For our generation, it was sufficient to get a job. Nowadays you have, for the last generations, you have to negotiate the personal needs with work that you may like and you may change frequently your job.

Addressing Opportunities and Obstacles of the Data-Savvy Talent Pipeline

Reflecting on early impressions from interviews, the focus group identified the embedding of digital and data-savvy talent in PM practices as key in the ongoing digitalization of projects. This subsection presents recommendations arising from the focus group of ways to address the opportunities and obstacles of attracting, developing, and retaining this new talent. These discussions are summarized in Table 3.

Attracting Talent

Academic and professional institutions as well as industry and the government have a role to play in recognizing the emerging significance of digital and data-savvy talent and preparing the talent pipeline, because attracting talent often starts there. From updating educational curricula and programs to introduce more computational methods in PM, to recognizing digital and data-savvy skills in job specifications, entry requirements to professional membership, and selection criteria by public clients, the focus group participants all agreed on the need to embrace the trend of digital transformation and the power of data analytics. However, a common theme arising from the recommendations lies in fostering a two-way dialog between digitalization and datafication and PM practices. Educational courses not only should focus on training on the tools, but should contextualize them in relation to PM practices. Job descriptions not only should highlight new requirements for digital or data skills, but should show how these are valued and will be embedded within the organization by showcasing career progression opportunities. There also is potential to consider reverse mentoring, which often runs from senior, more-experienced to early-career employees. With the proliferation of digital tools and data analytics, there also are opportunities for early-career employees to mentor their senior colleagues on how these developments can transform communication, coproduction, and collaboration practices.

Developing Talent

Cross-disciplinary and cross-sectoral learning and collaboration is a central theme in recommendations for developing digital and data-savvy talent. It was recognized that academic institutions play a critical role in translating ongoing developments in digital technologies and data analytics to explain their relevance in the application to PM practices. It is important that academic knowledge is communicated in a practically useful manner, rather than through dense academic jargon. Based on the point of reverse mentoring, industry organizations can facilitate learning across generations and facilitate interactions between those with expertise on digital technologies and data analytics and those with expertise on PM via internal workshops and events. A safe experimental environment also can be developed through the notion of sandboxes, in which the impacts of digital technologies and data analytics on PM outcomes can be measured and communicated. Professional institutions can play an active role in sharing lessons learnt from different industries, so that organizations can be empowered to take the next step in adopting digital and data-savvy skills. Government policy (e.g., subsidizing developments, or attenuating immigration policies in a globalized workforce context) also can support the development of such talent.

Retaining Talent

Retention of these new talent is seen as the responsibility of industry firms. The focus group participants found limited possibilities for academic institutions to be involved in this. A main theme lies in industry organizations making the strategic decision about whether and how digital and data-savvy skills are regarded as core to their business, because this influences how such talent is attracted and mobilized in PM contexts. Here, there is a tension between strengthening the significance of digital and data-analytical expertise (e.g., in job descriptions and career progression pathways) and embedding such talent in business-as-usual settings. To support talent retention, organizational structures need to be adjusted to encourage a more inclusive approach in which voices of often early-career digital and data-savvy talent can be translated into impacts on PM practices to influence strategic decisions made by the C-suite. More widely, professional institutions and the

Table 3. Summary of strategies for managing data-savvy talent pipeline

Category of relevant actors	Attracting data-savvy talent	Developing data-savvy talent	Retaining data-savvy talent
Academia	<ul style="list-style-type: none"> • Balance between digital skills needed and time • Development of new MSc courses • Industry-relevance in academic subjects needed 	<ul style="list-style-type: none"> • Use of accessible language in communicating research • Industry-relevant research • Cross-disciplinary courses • Life-long learning and continuous professional development (CPD) development 	N/A
Industry	<ul style="list-style-type: none"> • Focus on an inclusive employee value proposition with clear career pathways • Awareness about corporate digital vision and objectives, e.g., sustainability, affordability, and so forth • Alignment of job • Advertisements with existing digital frameworks • Include specific digital skills as job requirement and test digital aptitude • Translation between digitalization and project context 	<ul style="list-style-type: none"> • Use of online platforms to develop data literacy skills • Integration with current workforce, e.g., through reversed mentorship or buddy or colocation systems • Articulate clear workplace learning pathways including new technology • Allow sandboxes to experiment with data outside projects • Recognize digital technology development in project success • Balance the timing of the implementation of digital tools in the project context 	<ul style="list-style-type: none"> • Keep up with digital technologies • Recognize digital talent in traditional project sectors through better salary and advancement • Promote digital learning opportunities inside and outside project work • Formulate conscious business strategy and show commitment around digitalization • Focus on inclusivity in the employee value proposition to retain digital talent • Senior leadership as ambassadors for digital skills • Creation of clear career paths for digital specialists • Integrate digital skills within competence frameworks • Organize digital-driven innovation events for industry learning • Recognize digitalization in project success stories • Emphasis on roles of Chief Technology Officers (CTOs) • Maintenance of large digital infrastructure systems • More funding opportunities for businesses active in digital innovations
Professional institutions	<ul style="list-style-type: none"> • Connect workforce with industry • Change in traditional trade organizations, e.g., from professional bodies to operating as professional services • Outreach to upskill HR and recruiters • Value data skills in professional membership requirements • Public client leadership needed in digital delivery • Incentivize or subsidize relevant investment costs 	<ul style="list-style-type: none"> • Introduce certifications for digital project skills • Disseminate cross-sector digital case studies • Codevelop CPD programs with companies • Recognize existing, relevant external development digital frameworks, rather than reinvent the wheel 	
Government		<ul style="list-style-type: none"> • Remove barriers to global workers (in United Kingdom context) • Policies for the upskilling of digital immigrants 	

government as a major client in the built environment also can signal the importance of digital expertise, e.g., by recognizing the need to specify specialized opening related to digital and data-analytical technologies and by opening more positions in this arena, respectively.

Holistic View of the Talent Pipeline

Therefore, we outline a strategic framework for project organizations to navigate their unique digitalization and datafication needs; the buy (hire)–lease (consult or contract)–make (train internally) framework.

- Buy (hire): Hiring full-time digitally savvy staff is advisable when the organization has a continuous stream of digital initiatives that justify a full-time position. This option is best suited for organizations for which digital transformation is integral to their business model and strategic goals, requiring dedicated personnel to drive these initiatives. A key consideration is the ability to provide a career path that is rewarding and allows for professional growth, ensuring the retention of talent.
- Lease (consult or contract): Utilizing consultants or contractors is an excellent choice for organizations that encounter sporadic needs for digital expertise. This could be for specific projects for which specialized knowledge is required temporarily, or when external insights can catalyze innovation. This option provides flexibility and access to a broad skill set without the long-term commitment of full-time hires.
- Make (train internally): Developing internal capabilities through training can be a cost-effective solution, especially for organizations with existing staff who have the aptitude for digital skills. This not only enhances the skills within the organization but also promotes a culture of continuous learning and adaptation. Internal training might not replace the need for advanced expertise from external sources, but it can significantly empower teams to manage and utilize digital tools effectively.

Discussion

Talent Management and Managing Projects in the Digital Era

The combination of interviews and focus group discussions enriched our research by providing a comprehensive view. In this section we synthesize the findings from the preceding section. Specific attention is also paid to the interactions between digital natives and digital immigrants, terms coined by Prensky (2009), to describe individuals born during and before the digital era, respectively.

Attracting Digital Talent

In relation to recruitment and selection, there was recognition among interviewees that as projects become more complex, particularly in decision-making, in which there is a greater need for harnessing the power of integration across disciplines and organizations, digital methods of working and managing data become a critical competence in maintaining a thriving PM profession (Zhang et al. 2020). Although digitalization and datafication for handling higher levels of complexity is an opportunity, the interviewees also saw attracting new talent as a challenge in current PM practice; problems with integration across disciplines and organizations are long-standing challenges that have confronted the PM profession, and the addition of digitalization adds to this integration challenge.

A key integration challenge identified by the interviewees lies in the interactions between digital natives (often younger workers) and digital immigrants (often senior workers), although this feature

is not entirely generational. It was recognized that whereas younger workers were more adept at using new digital technologies, senior workers had other skill sets that are critical to delivering projects, such as understanding the collaboration context and the politics of running projects (Gillberg and Wikström 2021). The data stressed the importance of valuing different skill sets and facilitating productive exchange and interactions between digital natives who can find more-efficient ways in digital technologies to transform the ways in which work is done in projects, and digital immigrants who are more intuitive about knowing what works in project practices. These findings resonate with recent scholarship suggesting that technical ability is less important than one's openness to learn from others (Guinan et al. 2019) in attracting data-savvy talent. Moreover, although digital talent may be construed as a pivotal role in the digital transformation and datafication of project management, our findings suggest that such a pivotal role (Cascio and Boudreau 2016) goes beyond the acquisition of digital competence to include consideration of how such competence is relevant to the work of project managers.

It is worth noting the opportunities for recruitment and selection in extending the workforce beyond national borders. Digitalization allows organizations to engage with data analysts based abroad, and although this is regarded as an opportunity to tap into talent elsewhere, this can also bring with it challenges in ensuring a coherent (and colocated) approach to managing human resource strategically. In project contexts in which managing human resources often is more operational than strategic, and in which the project team lacks the autonomy to self-select project team members, opening up the possibility of attracting data-savvy talent from abroad also can be presented as an obstacle.

Developing Digital Talent

For talent development, the data highlight three key lessons. First, training on digital technologies is a topic of concern. Digital immigrants commented that new digital technologies on the market meant that those with skills developed on earlier technologies now found their skills to be less relevant. For example, in managing and analyzing schedules for projects, Power BI has now replaced Microsoft Project and Primavera in Int 5's daily practice. This calls into question the scope and content of training that is required so that project management professionals are sufficiently proficient in using the digital technologies. For example, should training focus on putting the functions of the digital technologies to work, or should the training focus more on the fundamental principles that underpin the functions of the digital technologies? Taking the former approach, there is the risk that software upgrades and the introduction of new digital technologies might render the skills developed for older technologies obsolete or in need of retraining.

The second aspect relating to training on digital technologies is that there seems to be an expectation that skills associated with the use of digital technologies tend to be developed by learning by doing, rather than by following a structured training course. This is the basic question of whether to provide training in-house or to outsource it (Papadonikolaki 2020; Xu et al. 2022) echoing make-or-buy decisions (Williamson 2008). In either approach, there often is a cost (both financial and time or effort) to the parent organization, and there often is a fear that the expertise developed will be lost through the turnover of staff. Digital expertise is well sought after, and this means that retaining staff with strong digital expertise is a challenge.

A third point is the distinction between technology as a tool and technology as a tool-in-use (Orlikowski 2000). Various commercial digital technologies are relevant to PM practice. The findings showed the importance of understanding how tools are used in

practice and the reasons why specific tools are used for specific purposes. Rather than focusing on technology as a tool, taking a technology as a tool-in-use draws attention to demonstrating, translating, and communicating the value of tools. Although digital tools have strong capabilities in generating visualizations, what was most important for experienced project managers was how this translated to simple everyday tools (e.g., an Excel spreadsheet) to facilitate decision-making. It seems that in cases in which collaboration was important, there was more emphasis on complementing the use of digital tools with more-basic forms of technology (such as flip-charts and Post-It notes) in a hybrid manner (Ewenstein and Whyte 2009; Harty and Whyte 2010). This ranges from internal communications, information structuring (Whyte et al. 2016), and workplace learning (Papadonikolaki et al. 2019) to external stakeholder engagement (Ninan et al. 2020), all of which are crucial aspects by which the new talent can be engaged in projects.

Retaining Digital Talent

The interviewees reiterated the challenge of retaining junior workers who often are digital natives. The findings showed that there is a shift from the traditional organizational hierarchy toward flatter structures to embrace the digital talent, although steeper hierarchies can support the alignment of humans, organization, and technology in the early stages of technology adoption (Xu et al. 2022). Providing opportunities for digital natives to grow through continuous professional development and learning about other areas of project work can avoid what Boxall and Purcell (2022, pp. 109–110) called the “talent ghetto” or the “talent blockage”; the former is stagnation as a result of being trained in only one area of specialism, and the latter is the lack of growth and learning opportunities. Given the demand for digital expertise, and the propensity for these workers to change jobs due to better (financial) conditions, our interviewees seemed to place more emphasis on retention than on recruitment of digital-savvy workers. This runs counter to Thunnissen and Gallardo-Gallardo’s (2019) review of talent management scholarship, which places more emphasis on the identification and recruitment of talent than on its development and retention.

Several key strategic and operational challenges need to be considered. First, strategically, it is crucial to establish whether data and digital work is seen as a core part of the business. For some, the growing power of (big) data analysis is something that project organizations (particularly those working in consulting firms) cannot ignore (Whitmore et al. 2020; Whyte et al. 2016). Engaging with data science and digital technologies is a way of dealing with the growing complexity of the project environment. However, as alluded to previously regarding the recruitment of data analysts from abroad, this also raises the question of how to manage these remote workers as a strategic core of the business. This partially aligns with the findings of Montero Guerra et al. (2023) that more emphasis has been placed on retaining than on attracting talent; it shows that retention is a growing issue in digital talent management.

Given the difficulties of retaining talent with strong capabilities in data analytics and digital technologies, the findings question whether these workers should be seen as a core part of the project business. If these workers are not seen as core, then the strategy for retaining such talent is to see them as resources that can be tapped into through outsourcing. This relates to whether and to what extent the project client views data analytics as fundamental to project delivery. Although there is recognition of the power of data analytics and digital technologies to deal with the growing complexity of project decisions, others may view digital technologies as a means to produce oversimplified representations that do not adequately address the complexity of social, cultural, and political dynamics of managing projects.

Finally, it is important to explore how organizations structure interactions between digital natives and digital immigrants to encourage the retention of digital talent. For example, mentoring and links between early-career and board-level executives were seen as ways by which organizations can facilitate desirable communication between early-career and established workers in order to enable cross-generational learning and the feeling of being valued in pursuing organization expertise in digital work (Jacobsson and Linderöth 2021).

The Buy–Lease–Make Framework in Digitalized Project Contexts

PM organizations can optimize integration by structuring their recruitment, training, and retention strategies to bridge the gap between digital natives and digital immigrants. We synthesized the buy–lease–make framework from the data to understand how organizations make strategic decisions regarding talent acquisition, development, and retention. This categorization aligns with the ways in which organizations navigate the challenges of digital transformation and talent scarcity within the project management profession. This framework is inspired by the strategic make-or-buy decisions, which are key for decision-making on outsourcing and strategic supply chain management (Williamson 2008), and make–buy–ally in business ecosystems (Jacobides and Billinger 2006), which is rooted in established management theories, including transaction cost economics (TCE) and the resource-based view (RBV). Such frameworks assist organizations in making boundary decisions, particularly within operations, supply chain management, and strategic decision-making, by balancing internal production with market procurement. Integrating digital talent within project management using the buy (hire)–lease (consult or contract)–make (train internally) framework offers strategic pathways for addressing the complexities introduced by digitalization and datafication:

Hiring full-time digital talent is most effective when the organization has ongoing digital projects that justify such positions, and when digital integration is seen as central to the strategic objectives. For example, the construction industry, facing increasing complexity in projects, requires seamless integration across various disciplines and organizations. Full-time digital professionals can ensure continuous innovation and adaptability, addressing the interaction challenges between digital natives and immigrants, and enhancing the overall project delivery process.

For construction firms, the use of consultants or contractors can provide specialized digital expertise on an as-needed basis, which is particularly beneficial for project-specific challenges or when experimenting with new digital technologies (Ngo and Hwang 2022). This flexibility allows companies to manage costs and adapt quickly to new digital trends without the long-term commitment of full-time staff. Consultants also can offer valuable insights into integrating digital methods across different project teams and disciplines, helping to navigate the longstanding integration challenges in the industry.

Training existing employees in digital technologies is crucial for the sustainable development of digital skills within the construction sector. Given the rapid evolution of digital tools, such as the shift from traditional project management software to more-advanced data analytics platforms such as Power BI, internal training can help maintain the relevance of skills in the workforce. Furthermore, fostering a learning culture within the organization not only enhances skill adaptability but also promotes the valuable integration of technology as a tool-in-use, ensuring that digital tools are aligned effectively with practical project needs.

Each strategy in the framework addresses specific needs: hiring is essential for ongoing digital strategy implementation, contracting

provides flexibility and external expertise for specific projects, and internal training develops a resilient and adaptable workforce capable of handling the digital demands of modern construction projects and increasing the competitiveness of construction supply chains (Papadonikolaki 2018). Project-based organizations may assess their specific needs, resource availability, and long-term strategic goals to determine the approaches that best suit their context. Sometimes, a combination of these strategies might be necessary to effectively address all aspects of an organization's digital transformation journey. By considering possible strategies of buying, leasing, and/or making digital talent, we go beyond the identification and recruitment of digital talent to also consider how such talent can be developed and retained in project-based organizations. In so doing, we address talent management more holistically, which conventionally has placed more emphasis on the identification and recruitment of talent rather than on developing and retaining talent (Thunnissen and Gallardo-Gallardo 2019). This holistic approach can help construction firms navigate the digital landscape effectively, balancing the need for technical expertise with the strategic management of human resources to tackle the inherent complexities of digital transformation in project environments.

Theoretical Contribution

The theoretical contribution of this paper centers on the challenges and opportunities presented by digitalization and datafication within the project management profession, particularly as projects grow in complexity. The data-rich era provides a pivotal opportunity to reflect on career development in (digital) project management, a focus that hitherto has not been emphasized generally in the field of project studies (Bredin and Söderlund 2011; Havermans et al. 2019). By highlighting the critical need to integrate diverse skill sets across generations, i.e., younger digital natives excelling in technological adaptability and older digital immigrants offering deep insights into project dynamics and politics, we also question what constitutes a pivotal role in digital project management (Cascio and Boudreau 2010, 2016).

Recruitment now can extend globally, leveraging digital tools to tap into international talent, although this approach complicates cohesive team management. The development of digital talent is framed around the evolving relevance of training programs, the balance between structured learning and experiential learning, and the utility of digital tools in practical project management. Moreover, the retention of such talent is a growing concern, because strategic integration of digital skills is essential for navigating the increasing complexity of projects. The buy–lease–make framework underscores the importance of strategic and operational adaptations in human resource practices to harness the benefits of digital advancements while mitigating integration challenges within the project management sector (Liu et al. 2024).

Managerial Implications

The study showed clear managerial directions for further action, echoing voices calling for developing capabilities of PM organizations (Papadonikolaki et al. 2022). Data-savvy talent requires a reconsideration of traditional HRM practices. The attraction and retention of the new talent needs to become more structured and strategic, by training the HR department, allocating a generous budget to data-intensive activities and departments, and consciously embedding the new talent. HR managers, project managers, and line managers can support the entry of new talent in less-data-savvy and traditional environments by providing support and resources to help them integrate into the firm, focusing on both individual

and collective development goals. This involves training and development opportunities to learn about the organization's culture and systems, and introducing them to key stakeholders and decision makers. Organizations can facilitate interactions between the data-savvy talent and their more traditional colleagues through mentoring, get-togethers, or workshops to share knowledge and experiences, and providing support and guidance to help everyone work together effectively.

Project-oriented firms may train their HR departments to develop and implement recruitment and retention strategies specifically tailored for data-savvy professionals. This includes understanding the unique needs and career expectations of digital talent and ensuring that these are aligned with the company's digital transformation goals. It is crucial for organizations to commit adequate budgets to data-intensive projects and departments. Investing in digital tools and technologies not only supports the work of digital talent but also signals the organization's commitment to digital integration, which can attract and retain top talent. Offering training and development opportunities tailored to both new digital technologies and the organization's specific project management methodologies will help bridge the gap between digital natives and digital immigrants. This should focus on enhancing digital skills while also fostering an appreciation of the organization's traditional strengths and practices. By implementing these strategies, construction firms can better manage the integration of digital talent into their workforce, thereby enhancing their capacity to handle complex projects and stay competitive in an increasingly digital marketplace. These actions not only optimize project outcomes but also contribute to a dynamic, adaptable, and forward-thinking organizational culture.

Limitations and Future Research

Despite the new insights and knowledge contribution put forward by this study, there are some limitations. First, whereas we set out to conduct a global study, the sample of the interviews, although diverse in terms of experience of expertise, was not very balanced in terms of gender and geographical distribution, despite small active steps to improve it in advance. This gender imbalance echoed the lack of diversity in project settings (Bridges et al. 2020; Pinto et al. 2017). In addition, the size of the sample was appropriate for a qualitative study aiming to identify and describe new themes (Bazeley 2013; Wutich et al. 2024).

Second, another sampling limitation was access to professional institutions, because only three experts from three different PM institutions were included in the interviews and none of them were available to participate in the focus group. Because we wanted to holistically research the phenomenon of the data-savvy talent entering the project profession, a balance of industry, education, and professional institutions experts was needed, because project management is a highly applied field with an emerging profession and active professional bodies whose body of knowledge is clearly important and shapes industry (good) practice (Morris et al. 2006). Future research will address these shortcomings in the sample size and geographical distribution by evaluating the study findings and the buy–lease–make framework in case studies carrying diverse contextual elements across key countries of origins of our interview participants, such as the United Kingdom and the Netherlands.

Conclusion

Digital transformation changes the status quo in projects. This study departed from the popular technocratic view of applications and benefits of digitalization and datafication in projects and instead focused on people and mainly how HRM, talent management,

and managerial agency can leverage and support people in this transition. It was found that this new data-savvy talent can either grow within firms or be recruited by other sectors, although most talent management practices for recruiting and selecting for digital skills (digital talent management) are unstructured, task-oriented, and lack strategic support (answer to RQ1).

A promising way forward is leveraging the connectivity opportunities of digital technologies to recruit talent from different geographies. Apart from the patchy approach in attracting new talent, retaining the data-savvy talent also is mixed and undeveloped. Our study provides directions for developing talent through in-house activities promoting communication or outsourced training focusing on technology-in-use as opposed to technology as a tool, and learning lessons from other sectors that disrupt the traditional PM sector. Finally, to retain the data-savvy talent, an emphasis on teamwork, project work, and well-being is a promising way forward that can go beyond the individual level of the phenomenon into collective action and impact to project teams (answer to RQ2). This study brings new insights for business leaders, who should make digital talent management a strategic priority to stay relevant, increasing their contribution to bettering society and business.

Data Availability Statement

Interview and focus group data are confidential. Relevant consent forms were signed, and the research complies with the University College London (UCL) ethics committee requirements at the time of data collection.

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