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THE IMPACT OF AI ON THE COMPETENCIES OF EMPLOYEES IN COMPANIES ENGAGED IN SOFTWARE DEVELOPMENT IN THE IT SECTOR

Abstract: *The rapid proliferation of artificial intelligence technologies, particularly generative AI and large language models, is fundamentally reshaping the landscape of software development. This paper aims to examine the multifaceted impact of AI on employee competencies within software companies, drawing upon recent empirical research, industry reports, and practitioner insights from a decade of IT management experience. The analysis reveals a critical paradox: while AI accelerates code generation and automates routine programming tasks, it simultaneously elevates the importance of human competencies that machines cannot replicate. The findings suggest that the future software engineer will transition from being primarily a code writer to becoming a systems architect, quality assessor, and ethical guardian. Particularly significant is what this paper terms the "junior paradox" — the observation that entry-level positions face the greatest disruption, while experienced professionals who possess deep domain knowledge, architectural thinking, and the ability to evaluate AI outputs become increasingly valuable. The paper concludes with recommendations for competency development frameworks that balance technical AI literacy with the cultivation of uniquely human capabilities such as critical thinking, ethical reasoning, and cross-functional collaboration.*

Keywords: artificial intelligence, large language models, employee competencies, software engineering, human-AI collaboration, digital transformation, skills gap

1. INTRODUCTION

Artificial intelligence has emerged as one of the most transformative technological phenomena of the current decade, occupying a dominant position among disruptive technologies and acting as a connective force across multiple sectors (Păvăloaia & Necula, 2023, p. 8). In the software engineering domain specifically, AI tools are already reshaping the profession, partially or fully substituting traditional coding tasks and replacing them with higher-level responsibilities centred on reviewing and verifying AI-generated outputs (Betz & Penzenstadler, 2025, p. 136:2). The release of large language model-based platforms from late 2022 onwards marked a significant inflection point in public awareness of generative AI, accompanied by an eightfold increase in AI investment flows across sectors ((*/The-Future-of-Jobs-Report-2025*, 2025, p. 10) Whether this trajectory represents a transient technological cycle or a structural transformation of knowledge work remains a central question for both research and practice. This paper fundamentally addresses this phenomenon through the lens of the impact of large language models (LLMs) on the operations of IT software companies — organizations that will, irrespective of organizational readiness, be among the first to experience the full force of this technology, along with the paradoxes that inevitably accompany it. The central paradoxes are, on one hand, the declining demand for junior positions and, on the other, a growing demand for senior developers with deep domain expertise in specific disciplines (Westby & Modestino, 2025, p. 1).In operational terms, the impact of LLMs is already visible through assisted coding and automated testing across all phases of the software development lifecycle (Qiu et al., 2025, p. 121:2). The fundamental question running through all of these phenomena remains one of operational security and data governance — particularly the need for transparent, traceable, and auditable AI usage aligned with ethical and regulatory principles (Singh et al., 2026, p. 89) — and above all the safeguarding of domain knowledge as intellectual property(Vezeteu & Năstac, 2024, pp. 843, 844) As model capabilities continue to advance, the absence of adequate

security safeguards and competency frameworks represents a critical organizational risk. Accordingly, this paper examines these phenomena both through the lens of academic literature and through practitioner insights drawn from a decade of experience as a manager in an IT software company.
AI and other disruptive innovations lead to job losses, but simultaneously create new and appealing forms of employment; those performing routine tasks are most affected, and educational systems and employers must urgently adapt curricula and training programmes to new technologies (Păvăloaia & Necula, 2023, p. 18). 86% of employers expect AI and information processing to transform their business by 2030, and AI and big data have been identified as the fastest-growing skills over the next five years, ahead of cybersecurity and digital literacy(*/The-Future-of-Jobs-Report-2025*, 2025, p. 10,32).

2. METHODOLOGY

This study employs a systematic review of relevant academic literature. The primary search was conducted using Web of Science (WoS) and Scopus, applying the following keyword combinations — in WoS: "artificial intelligence" AND "software engineering" AND "competencies"; "AI" AND "software development" AND "skills"; "large language models" AND "IT sector"; and in Scopus: "artificial intelligence" AND "software engineering" AND ("competencies" OR "skills"); "generative AI" AND "software development"; "large language models" AND "employee competencies" — yielding a combined total of 76 results. Inclusion criteria required that studies directly addressed the impact of AI or LLMs on employee competencies, roles, or skills within the software development or broader IT sector, and were published in English from 2020 onwards. Studies were excluded upon full-text review if they were unrelated to the research focus, regardless of keyword match. Following this screening process, 62 records were removed, and 13 articles were retained for in-depth analysis. Two additional studies directly relevant to the topic of junior developer displacement was identified through Google Scholar and included in the final corpus, bringing the total to 15 analysed works (see Annex A). The findings are further contextualised through relevant legal frameworks, most notably the EU Artificial Intelligence Act adopted in 2024. Practitioner insights drawn from a decade of IT software development management are incorporated as a complementary perspective and are clearly distinguished from findings derived from the literature review.

3. THE IMPACT OF ARTIFICIAL INTELLIGENCE ON BUSINESS OPERATIONS

Explaining the impact of AI on business operations could easily become a list of examples that exceeds the reasonable scope of this paper. It is safe to say that virtually every instance of human intellectual activity ever documented on the internet has served as an ingredient for machine learning — a resource for training models to understand how humans think about particular topics or tasks. Given this, LLM-based tools enable developers to delegate routine coding tasks and focus on critical business logic, thereby augmenting productivity across everyday operations (Qiu et al., 2025, p. 4)Considering the pace at which LLM applications are evolving, two distinct trends emerge. The first is the use of AI tools as aids in day-to-day work, which manifests primarily in increased individual employee productivity. Empirical evidence indicates that productivity gains in software development can be substantial: a controlled experiment with GitHub Copilot demonstrated that developers using the AI pair programmer completed a standardised coding task 55.8% faster than those without access to the tool (Peng et al., 2023, p. 2), while self-reported estimates from practitioners suggest perceived gains of approximately 35% (Peng et al., 2023, p. 7).This is driven by the automation of certain project management processes, faster response times, easier written communication through LLM-powered translation tools, automatic meeting note sorting, email responses, and similar tasks — all the way to assisted coding, which undeniably saves time, though it also represents the most sensitive area of operations as it demands the highest degree of oversight.
On the other hand, when considering companies as whole entities, the adoption of LLMs still appears to be finding its footing in a truly commercial sense. While company-customised agents are a practical reality, broader corporate-level deployment is not advancing as quickly as individual productivity gains. Examples of current use include automatically generated AI chatbots, the development of proof-of-concept solutions, agent-guided system architecture, and the automation of corporate communications, meeting minutes, parking and conference room reservations, and similar tasks. More substantive deployment is visible in the significantly faster analysis of large data volumes, and in agents closely tied to a company's specific domain — for instance in accounting or legal firms. In IT companies specifically, the most impactful applications are assisted programming, agents used to generate proof-of-concept solutions, market data analysis, and the verification and enrichment of domain knowledge.

4. THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HUMAN RESOURCES ACTIVITIES

The impact of AI on HR activities carries particular weight, as organisations are arriving at a point where functions that are fundamentally human, most notably HR itself, can increasingly be assumed by automated systems. This is primarily reflected in large companies through the automated processing of vast amounts of résumés, specifically the initial screening phase based on set criteria. A widely documented case is that of Amazon, which between 2014 and 2017 developed an AI-powered recruiting tool trained on a decade of résumés submitted to the company. Since the technology sector is predominantly male, the majority of that training data came from men, resulting in a system that systematically favoured male candidates and penalised résumés containing references to women's organisations or all-women colleges. The project was ultimately abandoned when it became clear that bias could not be reliably eliminated(Jeffrey Dastin, 2018). Such bias caused significant upheaval in the understanding of both the ethical and practical usability of AI models in recruitment operations. From a practitioner perspective, drawing on the author's decade of experience in IT software development management, AI proves genuinely valuable in employee evaluation processes, feedback collection, training and onboarding assistance, and particularly in the processing of statistical data obtained through internal HR surveys.

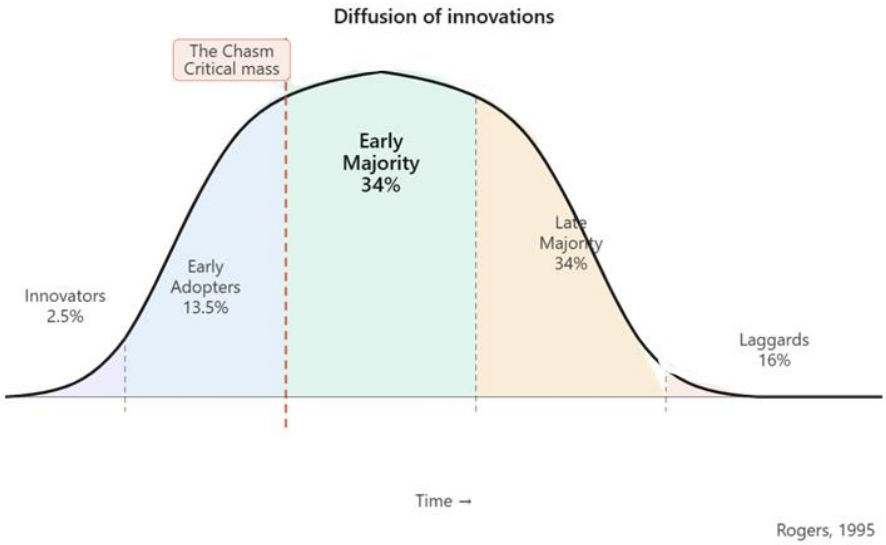
Each of these functions can and already does find practical value through AI tools. However, precisely because mathematical models are here being applied to human beings, it is essential to note the significant constraints the EU has introduced as foundational conditions for the ethical use of AI in HR(Office of the European Union L- & Luxembourg, n.d.). The first condition is transparency — meaning that AI tools may be used, but the configuration of their parameters must be explained in full detail, and those parameters cannot themselves be the product of so-called AI reasoning. Any decision regarding hiring, evaluation, or an employee's overall contribution cannot be validated by an AI model; it must remain the responsibility of a human being. Furthermore, bias of the kind exhibited by Amazon's model must not be embedded in any system, nor must models be permitted to make such decisions automatically. Related to this is the explicit prohibition of social scoring. In essence, the EU AI Act permits AI as an assistive tool in HR processes, while explicitly prohibiting its use as an autonomous decision-maker or parameter-setter.

HR, like all other business functions, must adapt to the new reality. This particularly sensitive and critical driver of every company's performance must be guided by a genuine understanding of the changed landscape on the part of HR professionals themselves. From the author's practitioner perspective, technical literacy among HR professionals — specifically the capacity to understand how parameters are configured in the tools used across all HR processes, as well as the ethical and legal implications and associated risks — is the key competency becoming indispensable for HR staff within IT software companies and beyond..

5. THE GENERAL TRANSFORMATION OF EMPLOYEE COMPETENCIES

As noted in the preceding chapter in relation to the HR department, the general competencies of employees must genuinely keep pace with this trend — not as a matter of employer preference, but as a response to broader market dynamics driven by the absorption of new productivity levels into the economic environment. In this sense, competencies are simultaneously becoming more complex on one hand, while on the other there is a real risk of an operational erosion of domain knowledge if LLM usage proceeds in a manner that bypasses important learning steps within the relevant domain. It is worth noting that this is not an entirely new phenomenon in itself — it is new in the sense of AI entering the business environment, but can we really imagine any position today, including so-called blue-collar roles, held by someone with no basic computer literacy or foundational digital skills? It can therefore be concluded that general competency shifts are a natural progression of events, particularly in the sphere of digitalization, which is genuinely affecting virtually every aspect of human activity.

This means we are currently in a phase of general learning and innovation adoption — a process that can be represented through Rogers' Diffusion of Innovations curve (Rogers, 1995). The model identifies five adopter categories: Innovators (2.5%), Early Adopters (13.5%), Early Majority (34%), Late Majority (34%), and Laggards (16%). Interestingly, just as with individual organizations, this phenomenon can be observed at the level of the general population, where the majority of the working-age population already uses digital technologies — broadening digital access is identified as the single most impactful macro trend affecting businesses globally, with 39% of workers' key skills expected to change by 2030 as a direct consequence(*/The-Future-of-Jobs-Report-2025*, 2025, p. 18). The recommended organizational approach is sequential: first identify the Innovators within the company, then secure senior management support, resources, and authority for them; allow Innovators to attract Early Adopters who see the value; and finally push through the critical "chasm" — the inflection point at which, with a 16% critical mass, the technology moves from niche adoption to mainstream use. This creates a situation in which those who understand the need for transforming employee competencies can, in the medium term, gain a meaningful competitive dvantage.



Picture 1: Rogers Curve
Source: Rogers, 1995

Empirical research confirms the importance of this transition: a statistically significant positive correlation exists between the level of employees' AI competencies and the effectiveness of AI tool implementation within organizations. Employees with higher levels of digital and AI competencies achieve measurably better business outcomes when using AI systems (Popa et al., 2024, p. 42). The top three leadership competencies for this era are: (1) technological literacy — understanding AI systems and their capabilities; (2) emotional intelligence — leading teams through technological transition; and (3) data-driven decision-making — the ability to interpret AI-generated insights for strategic decisions. In total, 15 competencies have been identified as required for effective leadership in organizations adopting AI (Myszak & Filina-Dawidowicz, 2025, p. 12).

From an organizational perspective, it is important to understand which competencies are changing in terms of universality — that is, which competencies all employees should possess in the new reality — and what constitutes the domain-specific element that is critical for the particular field in which the company operates. IT skills are currently rated lowest across all competency categories among workers, specialists, and managers alike. The average rating for general IT skills among workers is 2.7/5, and for professional IT skills 2.5/5, confirming a systemic deficit in IT competencies across organizations (Bîrcă et al., 2025, p. 50) . Despite academic recommendations to focus on soft skills, 57.3% of managers prefer developing technical, job-specific skills; among soft skills, managers most wish to develop teamwork, customer-handling, and problem-solving (Bîrcă et al., 2025, pp. 54–55).

General competencies revolve around foundational concepts of AI and LLMs — such as prompting, the use of agents, and an understanding of the key available models — encompassing both the positive opportunities and the risks that business use entails. This includes the legal and ethical implications of usage: what happens, for instance, if an unauthorised model makes an error — who bears responsibility? It is therefore of critical importance that the AI phenomenon is approached with appropriate seriousness in every company. It is far too easy to arrive at certain solutions with a few keystrokes, and the time savings — combined with a general lack of awareness around particular issues — can over time become a stronger driver of behaviour than outright prohibitions. This leads to the conclusion that investing in competency development and AI literacy is a far more effective path than blanket bans, which are likely to prove unsustainable in the face of prevailing market dynamics. Competency management therefore becomes a core responsibility of leadership, and developing the AI competencies of every employee becomes unavoidable.

The counterargument to these theses is the managerial fear that AI is simply a passing trend that will, like many before it, fade with time — and this is genuinely the greatest risk, as the full operational impact of AI on business has yet to materialise in a fully visible way. However, from the author's perspective as an IT practitioner, given the architecture of LLM models and the continuous refinement of machine learning neural networks through vast quantities of training data, AI models are assessed as a permanent rather than transient phenomenon, one that will continue to develop through its own inherent momentum regardless of any specific commercial application. This leads us to the recognition that developing these new AI-related competencies is becoming the rule rather than the exception, and as such represents one of the key factors in organizational survival.

6. SOFTWARE DEVELOPMENT-SPECIFIC COMPETENCY REQUIREMENTS

The practitioner contribution of this paper is rooted in this specific chapter, drawing upon the author's decade of experience as a manager within an IT software development company. It can be argued that a competency transition is already underway, primarily manifested through what is termed the "junior paradox." Prior to the integration of AI models, the standard onboarding for junior positions focused on understanding architecture and coding rules within specific technologies. The act of manual coding, while slower, provided the necessary cognitive space to gradually adopt best practices, while allowing inexperienced engineers sufficient time to acquire broader skills, such as system architecture, project management within large teams, stakeholder communication, and expectation management.

The paradox emerges as clients, increasingly aware of LLM capabilities, demand higher productivity alongside reduced budgets for new engineering hires. Simultaneously, engineering management is pressured by business objectives to maximize this efficiency. Consequently, as processes become automated, the demand for junior developer roles sharply declines. The industry now prioritizes experienced developers who understand architecture, while the foundational coding tasks — previously the cornerstone of proof-of-concept projects where juniors were employed — are no longer required in the same volume.

This shift leads to the conclusion that competencies in software companies, traditionally bifurcated into technical and soft skills, now incorporate a critical "AI dimension." These include: a technical understanding of AI models; the transition from classical programming toward prompting as a new mode of human-machine communication; an awareness of the implications of coding errors resulting from over-reliance on models; and technical security implications, specifically the fact that prompting involves sharing information used for model refinement. From the perspective of soft skills, this technical foundation must be complemented by an understanding of limitations regarding the ethical code, transparency, data governance, and the legal regulations governing AI usage.

The role of the software engineer is fundamentally changing: with the adoption of LLM tools, software engineers are transitioning from writing code to managing and verifying AI-generated code, while their ethical and social responsibility is growing, as they become accountable for the quality, security, and societal impact of the systems they deliver with AI assistance (Betz & Penzenstadler, 2025, p. 2). Software and application developers remain among the top 10 fastest-growing roles in the global labour market through 2030 (*/The-Future-of-Jobs-Report-2025*, 2025, p. 25). While 92 million jobs may be eliminated by 2030 due to automation, simultaneously 170 million new positions are expected to be created — a net gain of 78 million roles (*/The-Future-of-Jobs-Report-2025*, 2025, p. 18). Furthermore, 85% of employers plan to prioritize employee upskilling, and 50% plan to transition employees from declining into growing roles rather than making redundancies (*/The-Future-of-Jobs-Report-2025*, 2025, p. 52).

In practice, software companies have already devised and initiated comprehensive work on AI-related competencies. The key reason is the fact that, if the impact of AI tools on daily work remains at its current level, the primary resource of these companies will no longer be the number of trained engineers in so-called "traditional" technologies, but rather the actual number of people who will be AI-enabled and understand how to create new digital products using AI.

6.1. Security Challenges in AI-Augmented Development

Among the competencies emerging as critical in relation to AI, security is becoming paramount. Understanding how computer neural networks function, and the algorithms on which AI models are built, leads to important security considerations. From the author's practitioner perspective, communication conducted through publicly available AI platforms may constitute training material for those models. As a result, the sharing of information in a business environment — particularly information relating to technical solutions in a specific business domain — becomes a form of value that can easily be transferred to the model for use without any compensation, if security standards and protocols are not in place. Returning to the junior gap phenomenon — the trend whereby reliance on AI models may in the medium term erode engineers' knowledge depth — we also have justified concerns regarding the reliability and security of the resulting code, and the question of accountability.

The use of publicly available AI platforms (ChatGPT, Copilot, etc.) without adequate security protocols represents one of the greatest risks to the protection of intellectual property and trade secrets. Organizations must develop clear usage policies and equip employees to understand what happens to the data they input into a model (Vezeteu & Năstac, 2024, p. 843). For these reasons, engineering teams working on the creation of digital products must establish clear security standards that themselves constitute a competency — ensuring there is no leakage or disclosure of sensitive information, while simultaneously enabling teams to increase their productivity.

Reflecting further on this phenomenon, it is worth noting that the world's largest technology companies are committing unprecedented resources to data centre investment — Microsoft, Amazon, Alphabet, and Meta alone announced combined capital expenditures of over $300 billion for AI infrastructure in 2025 (Subin, 2025) — and this is certainly no coincidence", since data centres will serve as the repositories for training future models. The data obtained through the use of models themselves — acquired through the appeal of free or low-cost access options — represents the knowledge resource essential for future commercial models. It is easy to conclude that the world's largest technology giants are focused on building the most widely adopted model precisely so that domain knowledge ends up in those data centres.

We conclude that the greatest challenge for knowledge-intensive companies will be precisely how to preserve their intellectual potential for commercial exploitation, and by extension their survival. Consequently, the focus in employee competencies is shifting increasingly towards security awareness, as well as towards the monitoring and enforcement of established rules as a paradigm for market survival.

7. CONCLUSIONS AND RECOMMENDATIONS

As a conclusion to this paper, we can say that we currently find ourselves in a remarkably interesting period of employee competency transition, particularly within IT software development companies. From the perspective of a manager in one such company, we are witnessing a decline in demand for the kinds of profiles that were sought until recently, alongside a growing demand for senior professionals and domain knowledge that, by its very nature, belongs to more experienced engineers and employees. IT software companies are, again by their nature, the first to feel the full impact of the AI phenomenon — but they are equally likely to be the first to chart the path forward, meaning that the competencies of employees in the new reality will most probably take shape first within these very companies.
The recommendation is clear: every company should develop a strategy for the AI transition, which necessarily includes a competency development strategy for its employees. This comes alongside a justified concern for young engineers who are now seeking their place in the market — because entry-level positions continue to exist, but structural demand has contracted significantly: empirical evidence from the U.S. labour market documents a 16.3 percent reduction in the relative proportion of junior- versus senior-level software developer job vacancies in the twelve months following the public release of ChatGPT in November 2022, a decline that has not subsequently reversed (Westby & Modestino, 2025, p. 3), with junior postings falling by 49 percent between September 2022 and January 2025 while senior-level postings proved comparatively resilient (Westby & Modestino, 2025, p. 27). Those who invest in developing the competencies discussed in this paper — both individually and at the organizational level — can expect to compete successfully in the market, and the time to begin that work is now.

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Annex A: Overview of Analysed Works

The following 15 works were retained for in-depth analysis following the systematic search and screening process described in Section 2. Studies are listed in the order in which they appear in the manuscript.

#	Author(s) & Year	Title	Study Type	Rationale for Inclusion	Used in
1	Betz & Penzenstadler (2025)	With Great Power Comes Great Responsibility: The Role of Software Engineers	Conceptual / literature-based	Directly addresses how LLM adoption shifts the SE role from code writing to oversight and ethical guardianship	Sections 1, 6
2	Bîrcă et al. (2025)	The Assessment of Employees' Competences on the Labour Market in the Context of the Development of Artificial Intelligence Systems	Empirical survey	Provides quantitative data on IT skill deficits and managerial preferences for technical vs. soft skill development	Section 5
3	Myszak & Filina-Dawidowicz (2025)	Leaders' Competencies and Skills in the Era of Artificial Intelligence: A Scoping Review	Scoping review	Identifies 15 leadership competencies required in AI-adopting organisations; supports analysis of managerial dimension	Section 5
4	Popa et al. (2024)	Identifying Sufficient and Necessary Competencies in the Effective Use of Artificial Intelligence Technologies	Empirical / quantitative	Establishes statistically significant link between AI competency levels and effectiveness of AI implementation	Section 5
5	Păvăloaia & Necula (2023)	Artificial Intelligence as a Disruptive Technology — A Systematic Literature Review	Systematic literature review	Frames AI as a cross-sector disruptive force; provides baseline on job displacement and the need for curriculum adaptation	Sections 1, 3
6	Qiu et al. (2025)	From Today's Code to Tomorrow's Symphony: The AI Transformation of Developer's Routine by 2030	Comparative analysis / conceptual	Analyses AI impact across all SDLC phases and projects the transition of developers to orchestrators of AI-driven ecosystems	Sections 1, 3
7	Peng et al. (2023)	The Impact of AI on Developer Productivity: Evidence from GitHub Copilot	Controlled experiment	Provides empirical evidence of 55.8% productivity gain with AI coding assistance; key quantitative anchor for productivity claims	Section 3
8	Vezeteu & Năstac (2024)	Artificial Intelligence Integration in Business: Study of Employee Competences in Relation to the Organisational Needs	Empirical study	Addresses IP protection risks arising from use of public AI platforms and the need for security-oriented competencies	Sections 1, 6.1
9	Singh et al. (2026)	Towards a Responsible AI Adoption/Adaptation (RAA) Ecosystem: Vision and Model to Keep Socio-Technological Balance	Conceptual / framework	Provides the RAI framework underpinning arguments on transparent, traceable, and auditable AI usage in organisations	Section 1
10	Westby & Modestino (2025)	The Impact of Generative AI on Job Opportunities for Junior Software Developers	Labour market analysis (Google Scholar)	Delivers empirical evidence of 16.3% decline in junior postings and 49% fall in entry-level vacancies post-ChatGPT release	Sections 1, 7
11	The Future of Jobs Report 2025 — WEF (2025)	The Future of Jobs Report 2025	Industry report	Provides macro-level data on AI-driven skill change projections, job creation/displacement forecasts, and upskilling priorities	Sections 1, 5, 6
12	Rogers (1995)	Diffusion of Innovations	Theoretical model	Provides the Diffusion of Innovations framework applied to explain organisational AI adoption dynamics and the role of innovators	Section 5
13	Office of the European Union (n.d.)	Regulation (EU) 2024/1689 — Artificial Intelligence Act	Legal/regulatory document	Establishes the EU legal framework governing ethical AI use in HR and organisational processes; informs constraints on AI decision-making	Section 4
14	Jeffrey Dastin (2018)	Amazon Scraps Secret AI Recruiting Tool That Showed Bias Against Women	Investigative report (Reuters)	Provides a documented case study of algorithmic bias in HR, illustrating the ethical risks of autonomous AI in recruitment	Section 4
15	Subin (2025)	Tech Megacaps to Spend More Than $300 Billion in 2025 to Win in AI	Industry/media report	Contextualises the scale of Big Tech investment in AI infrastructure and its implications for data sovereignty and IP risks	Section 6.1