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Beyond routine: the role of skills, education, and technology in middle-skill occupations

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Contents

Executive summary

This report examines how middle-skill occupations are changing in response to rapid technological development, especially the rise of artificial intelligence (AI). It challenges the common belief that middle jobs are inevitably disappearing, arguing instead that these roles are adapting and continue to play a vital part in the UK labour market.

Middle occupations are positioned between low- and high-skilled work in terms of income and education. They include administrative, secretarial, and skilled trade roles, which together employ around one-fifth of the workforce. Although their overall share of employment has declined, they remain important career routes for both school leavers and graduates. The report finds that these jobs are not vanishing but evolving as their tasks, required skills, and technologies change.

The study focuses on three key areas of administrative work: legal, medical, and human resource administration. It explores how changing skills, educational backgrounds, and new technologies are reshaping the nature and organisation of work within these roles. Using 22 interviews, the research reveals that administrative work is far more varied and less routine than is often assumed. Administrators perform a wide range of tasks requiring communication, empathy, organisation, and adaptability; skills that are not easily automated.

Technological change has already transformed these roles. Paper-based clerical work has been replaced by digital coordination and data management. Administrators now use complex software systems and increasingly rely on digital literacy. Some use AI tools to draft correspondence, summarise meetings, or automate routine documentation. These tools improve efficiency, but most administrators see AI as a supportive aid rather than a replacement for their roles. They emphasise that emotional intelligence, judgement, and interpersonal understanding remain crucial to effective work.

Education also plays an increasingly complex role in these occupations. The proportion of graduates in administrative jobs has nearly doubled since 2011, from 18 to 33 percent, with the largest increase among HR administrators. However, participants stressed that practical experience and interpersonal skills often matter more than formal qualifications. Apprenticeships, vocational programmes, and professional certifications continue to provide valuable entry routes, even as higher education becomes more common.

The report concludes that middle-skill occupations are evolving, not disappearing. While automation is reshaping certain tasks, much of the work still depends on human decision-making and relationship-building. Policymakers, it argues, should recognise the diversity of these roles and support lifelong learning, flexible career pathways, and educational systems that bridge vocational and higher learning. Understanding how technology transforms, rather than replaces, middle-skill work is essential for understanding the labour market in the age of AI.

Introduction

Work is changing rapidly as a result of new digital technologies and in particular, generative Artificial Intelligence. Experts try to predict how the application and development of these technologies will shape the future of work. More specifically, the question of which occupations will see a rise and which will decline has received a lot of attention in policy circles, popular media, as well as academic literature. Here, automation enabled by new digital technologies is identified as a major force reducing the need for specific roles, as employers now use these technologies to perform tasks and processes once carried out by human labour.

Automation is, of course, far from a new development. Economists have found that over recent decades, workers in routine and manual jobs have been particularly susceptible to automation, as technologies tend to specialise in performing routine cognitive (such as data entry, scheduling, customer service chat and generating reports) and non-cognitive tasks (such as packing, assembly line work, stocking, and cleaning) (Autor et al. 2003; Acemoglu and Restrepo, 2018; Acemoglu and Restrepo 2020). Highly skilled (professional) workers are thought to rely on non-routine cognitive skills, which offer protection against automation, as their abilities complement new technologies and have seen a strong rise in demand (Autor et al. 2003; Kürer and Gallego 2019). Low-skill non-routine manual workers such as workers in care and hospitality) are likewise less directly affected by these new technologies.

Technological change has reportedly contributed to skill polarisation, characterised by growing demand for high-skilled workers and certain low-skilled, non-routine roles, alongside a decline in middle-skilled employment. The concept of routine-based technological change has become central to understanding labour market shifts in recent decades (Goos and Manning 2007; Goos et al. 2014; Hicks 2018). As technological advances increasingly automate routine tasks, both cognitive and manual, primarily concentrated in mid-level occupations, some have described the result as an 'hourglass' labour market, where middle-skill, middle-wage jobs shrink relative to growth at the top and bottom ends of the pay and skill spectrum. This dynamic has led to what many refer to as the 'hollowing out' of the middle of the labour market (Autor et al 2006; Goos et al 2014).

This report looks at these middle occupations, i.e. the jobs that occupy the centre of the distribution of occupations in terms of skills or incomes, nestled in between the low-skilled and high-skilled workers and assumed to involve routine cognitive and routine manual tasks. Yet there is a need to better understand what is happening to these middle occupations. Although there is a large body of evidence on the influence of previous IT-based technological change (Card and DiNardo, 2002; Englehardt, 2009; Kristal, 2020), it is unclear how the implementation and use of AI will impact these occupations. We know that AI is different from earlier IT technologies as skilled workers are also exposed to automation and many have become vulnerable. AI can automate routine and repetitive tasks, such as data entry and document processing. But we also know that AI is affecting many high-skilled occupations. AI can perform non-routine cognitive skills and it excels at more complex functions such as large-scale data analysis, pattern recognition, and language-related tasks, including content generation and natural language processing. There are various examples of AI moving into domains defined by specialised knowledge and judgement, such as medicine, law, finance, and design (Brynjolfsson & McAfee, 2014; Susskind and Susskind).

Middle roles are too often assumed to be easily automated based purely on technological capability. They are frequently dismissed as obsolete or irrelevant to the future of work. However, such assumptions are likely overstated and overlook how occupations evolve. This perspective fails to recognise the adaptability and enduring value of these roles within changing workplace contexts. About a fifth of workers are employed in these roles, which remain significant labour market destinations for both school leavers and graduates (Brown and

Tholen, 2025). Also, considerable heterogeneity within and between middle occupations, such as administrative roles, technical roles, and skilled trades occupations, is likely to exist. First, we need to know more about the work itself. We need to understand the tasks and skills used in middle occupations. Do they indeed rely on routine tasks? To what extent can the skills needed in these roles be taught in a college/university setting? What is the role of technology in middle workers' jobs? Do workers expect automation to make their work more insecure in the future?

Second, what is the role of education in these occupations? We know that many working in the middle are university graduates. For instance, in 1991, 3.8% of those in administrative and secretarial roles were university graduates. This has risen to 32.5% in 2021. The graduatisation of the labour market has been most apparent in these middle occupations. Whereas traditionally, further education (FE) colleges and apprenticeships may have prepared these workers, middle workers may now have other educational trajectories. To what extent have FE credentials been replaced with university degrees in accessing these occupations (graduatisation)? How do FE-qualified workers differ from HE graduates in terms of skills, experience, and career progression within middle-skill occupations? What is the role of lifelong learning in alleviating the risk of declining job opportunities? Is overqualification an issue? What are the implications of changes in middle-skill occupations for the education system, including vocational education and training?

We need to understand a) the changing nature of work and skill requirements for middle occupations, and b) the educational needs and trajectories of those working in middle occupations. To explore these issues, the report examines three categories of administrative roles—medical, legal, and human resource administration.

What are middle occupations?

The concept of middle occupations originates from occupational analyses, which offer insights into patterns of job growth and decline and serve as a foundation for labour market forecasting. In recent decades, experts have examined the changes in occupational structure resulting from factors such as new technologies and globalisation. Occupational analysis underpins the notion of the hourglass economy, with growth in both high-skilled and low-skilled (interactive) occupations. Here, middle workers are understood to perform mainly cognitive routine tasks that follow clear, rule-based procedures and are often involved in repetitive tasks such as data entry, basic bookkeeping, processing invoices, and scheduling appointments.

Within the UK classification, one key group of middle workers is those involved in Administrative and Secretarial Occupations, which are defined by the Office for National Statistics as occupations that

> undertake general administrative, clerical and secretarial work, and perform a variety of specialist client-orientated administrative duties. The main tasks involve retrieving, updating, classifying and distributing documents, correspondence and other records held electronically and in storage files; typing, word-processing and otherwise preparing documents; operating other office and business machinery; receiving and directing telephone calls to an organisation; and routing information through organisations [ONS, 2025, p.209].

Table 1 displays the subgroups that the Standard Occupational Classification (SOC) 2020 occupational distribution applies to Administrative and Secretarial Occupational sub-groups, which give a useful overview of some of the key types of occupations within this group.

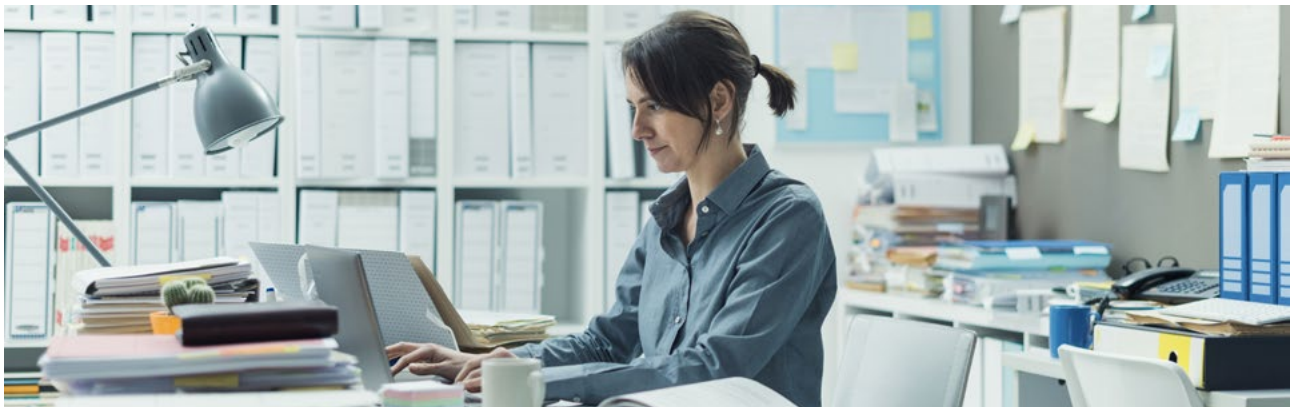
Table 1: Administrative and Secretarial Occupational sub-groups

Sub-Major Group	Code	Description	Example Roles
Administrative Occupations	411	General office support roles	Clerical officers, records assistants, office administrators
Secretarial and Related Occupations	412	Roles providing direct support to individuals or departments	Personal assistants, executive, medical, legal secretaries
Administrative Occupations: Finance	413	Finance-focused administrative positions	Payroll clerks, accounts clerks, finance assistants
Administrative Occupations: Records	414	Roles managing information and documentation	HR assistants, library assistants, PAs in education and healthcare
Other Administrative Occupations	415	Customer-facing or data-related administrative roles	Receptionists, call centre agents, data entry clerks

Another key group of middle workers are the Skilled Trades Occupations, defined as

> occupations whose tasks involve the performance of complex physical duties that normally require a degree of initiative, manual dexterity and other practical skills. The main tasks of these occupations require experience with, and understanding of, the work situation, the materials worked with and the requirements of the structures, machinery and other items produced [ONS, 2025, p.232].[1]

Table 2 shows the distribution of occupations using major groups from the SOC 2020. Administrative and Secretarial Occupations and Skilled Trades Occupations both have seen relative decline as a smaller share of the workforce is employed in them. The absolute decline is less remarkable with administrators and skilled trade workers groups both dropping from 3.2 to 3 million between 2011 and 2024.



[1] Skilled Trades Occupations can be categorised into four distinct sub-major groups based on their specialist trade areas. The first, Agricultural and Related Trades Occupations (511), includes roles that focus on cultivating and maintaining natural environments, such as farmers, gardeners, and groundskeepers. The second group, Skilled Metal, Electrical and Electronic Trades (512), comprises technical and mechanical roles involving the fabrication, installation, and maintenance of metal and electrical systems, including electricians, fitters, and toolmakers. The third, Skilled Construction and Building Trades (513), involves skilled manual work in the construction sector, covering roles such as bricklayers, roofers, plumbers, and carpenters. The final group, Textiles, Printing and Other Skilled Trades (514), encompasses a variety of craft-based and production roles including printers, tailors, and butchers, where technical proficiency and attention to detail are essential.

Table 2: Change in employment using major occupational groups, 2011 and 2024 (% of total occupations)

Sub-Major Group	2011	2024	growth (%)
Managers, Directors and Senior Officials	10.1	10.9	7.5
Professional Occupations	19.7	26.3	33.7
Associate Professional and Technical Occupations	13.5	15.2	12.0
Administrative and Secretarial Occupations	11.1	9.1	-17.6
Skilled Trades Occupations	10.9	8.8	-19.8
Caring, Leisure and Other Service Occupations	9.1	8.7	-4.1
Sales and Customer Service Occupations	8.3	6.2	-25.3
Process, Plant and Machine Operatives	6.4	5.5	-13.9
Elementary Occupations	10.8	9.3	-14.4

Source: LFS (Labour Force Survey), Jan-March survey for both years. Weighted

Who is classified as being in the middle of the labour market is not fixed; it shifts in response to changes in the occupational structure. Neither is it always clear which occupation belongs in which group. Some occupational groups have been re-classified in the different groups between different versions of the Standard Occupational Classification. In terms of skill and income levels between groups, there is considerable overlap. How we define middle-skill workers depends on how high- and low-skilled workers are classified. For instance, some roles within the associate professional category may be regarded as middle-level occupations, even though this category is typically classified as high-skilled.

Growing educational attainment also makes classification challenging. We also know that an increasing number of workers in all categories are educated to university degree level. Traditionally, middle occupations defined themselves in educational terms as moderately educated. Under 4 percent of Administrative and Secretarial workers were graduates in 1991, yet in 2021 this had grown to almost 1 in 3.

Some have argued that the middle occupations have been merely re-classified/defined. Many associate professional and technical occupations can be previously positioned as middle jobs yet are increasingly classified as professional jobs (e.g. technicians, healthcare workers). Anderson (2009) found that occupations classified as intermediate, based on level three qualifications/skills (typically attained through A-levels, NVQ Level 3, or Applied General Qualifications such as BTECs) have maintained a relatively stable share of total employment between 1984 and 2004. This group spans a broad range of roles, from mid- to high-wage occupations, suggesting a possible disconnect between jobs defined as intermediate in terms of skill and those that occupy the middle of the wage distribution. Anderson notes how associate professional and technical occupations 'are caught up in the mass expansion of higher education' and widening definitions of graduate work. At the same time, skilled trade occupations are progressively locked into academic and policy-making debates around the Modern Apprenticeship framework and its relationship to the social inclusion agenda, potentially promoting a downward shift' (p.117). In other words, the perceived decline of middle occupations may be largely the result of reclassification. Brown and Tholen (2025) argue that the middle is not disappearing but has changed its character. If we define the middle as those who earn between 75-150% of the median income,

the composition of the middle group alters. In 2001 the middle workers were spread over all occupational groups but were particularly likely to work in administrative occupations. In 2021, the composition of this group is more concentrated around professional and associate professional occupations. This means that using this definition, the middle has not been hollowed out, nor are its workers necessarily defined by semi-skilled roles. Within a graduating labour force, how can we understand the relationship between jobs, skills and education within the middle of the occupational structure?

Role of technology in middle occupation

Economists have consistently identified a strong link between technological advancements and shifts in occupational structures. Goos and Manning (2007) analyse the impact of technological change on different types of work. They argue that routine tasks characterised by clear, rule-based procedures are particularly vulnerable to automation through computer technologies. Consequently, occupations dominated by such tasks tend to experience declining employment as technology advances. The key argument here is that technological change has contributed to wage polarisation, a phenomenon where employment and wage growth concentrate at the high and low ends of the wage distribution, while mid-level jobs decline. A central framework for understanding this is Routine-Biased Technological Change (RBTC), an economic model that explains how technological advancements, particularly in information and communication technologies (ICTs), reshape the labour market (Autor et al., 2003; Acemoglu & Autor, 2011; Acemoglu & Restrepo, 2018). RBTC posits that technological progress primarily displaces workers engaged in routine tasks, activities that are repetitive, predictable, and easily codifiable, many of which are concentrated in middle-wage occupations. As these tasks are more susceptible to automation, their displacement contributes to the "hollowing out" of the occupational structure. In contrast, demand increases for non-routine work, which requires problem-solving, creativity, judgement, and interpersonal skills (Autor et al., 2006; Goos & Manning, 2007).

This task-based view of technological change marks a partial departure from the earlier *Skill-Biased Technological Change* (SBTC) hypothesis, which suggested that technological progress primarily benefits highly educated, high-skilled workers while replacing low-skilled labour (Katz & Murphy, 1992; Goldin & Katz, 1998; Autor et al., 2003). RBTC, however, shifts the focus from educational attainment to the nature of tasks, arguing that it is not formal education alone, but whether work involves routine or non-routine tasks, which determines exposure to automation risk. As a result, workers in routine occupations often face stagnant wages and declining job security. Meanwhile, those in non-routine analytical or interpersonal roles - such as designers, managers, or care workers - are seeing rising demand and higher wages (Autor, 2015). Importantly, RBTC suggests that technological change does not uniformly reward the most educated, but rather favours workers whose tasks cannot be easily codified or automated.

Yet recent advances in artificial intelligence (AI), particularly large language models and generative AI, challenge some of the task-based assumptions underpinning RBTC. These technologies have begun to automate elements of non-routine cognitive work, such as summarisation, translation, and aspects of creative writing, previously thought to be resistant to automation (Brynjolfsson & McAfee, 2014). According to the OECD (2023), AI has made significant inroads into non-routine cognitive tasks associated with high-skilled roles, including those of business professionals, managers, executives, and scientific and engineering professionals. This raises questions about the continued validity of the routine/non-routine dichotomy as AI capabilities expand into traditionally human domains.

Nevertheless, RBTC remains a powerful lens for analysing the labour market effects of digital automation. The introduction of AI and digital technologies has transformed task structures across occupations.

Role of education

Middle occupations are typically associated with intermediate levels of education, generally around Level 3 to Level 4 qualifications. Common Level 3 qualifications for middle occupations include A-Levels, BTEC Nationals, NVQs, Advanced Apprenticeships, and the newer T Levels. At Level 4, qualifications include Higher National Certificates (HNCs), NVQ Level 4, Foundation Degrees, and professional certifications (such as AAT for accounting or CIPD for HR).

Their perceived decline, comparable to the displacement experienced during earlier waves of technological change, such as deindustrialisation, is often seen as something that can be mitigated through retraining and individual investment in skills. Government reports have observed the impact of automation on middle-skilled cognitive work, often promoting advanced levels of education to improve workers' employability against automation (BEISC, 2019; WPC 2022; House of Commons Library 2022) .

The UK government have maintained that rapidly evolving labour market needs, including digital, STEM and green jobs require skills beyond Level 3, urging clear post-16 progression routes from Level 3 to higher-level opportunities, whether that is university, degree apprenticeships, or Higher Technical Qualifications (HTQs) at Level 4 or 5 (Education Committee, 2023). Skills England (2025) forecasts that 66% of additional employment demand in priority sectors (like digital, engineering, construction) will require Level 4 or higher qualifications, while only 34% will need Level 2 or 3.

Since middle occupations include both white-collar administrative roles and blue-collar technical jobs, it is difficult to generalise the role that education and occupational qualifications play within them. We know from the graduate labour market that the role of education is not fixed but employer- or sector-dependent, and that graduate inflation has occurred in some graduate occupations (Tholen, 2017). Yet we know far less about the role of education in middle occupations.

Methodology

This study explores how to better understand jobs in the middle of the occupational structure by analysing their key characteristics, including the role of technology, the skills used at work, and the impact of education. More specifically, this study aims to answer the following research questions:

- How have the educational composition and work characteristics of those in middle occupations changed over time?
- How do workers in middle occupations understand the skill demands and the role of technology in their jobs?
- How do these workers understand the role of education in their job?

The study focuses on administrative occupations, a large group within the occupational middle segment.

Administrative and secretarial roles, classified as Group 4 of the nine major groups in the UK's Standard Occupational Classification (SOC 2020), represent essential middle-tier jobs. This is a sizable occupational group, comprising over 3 million workers across the UK. Despite its size, the group has seen a significant decline.

The case study draws on qualitative interviews with individuals working in these occupations, with a focus on three distinct types of administrators. These groups were selected to capture variations in occupational characteristics, as well as differing patterns of growth or decline over the past two decades (see Section 1):

- *Legal Administrators:* Employed primarily in the legal sector.
- *Medical Administrators:* Typically employed in the National Health Service (NHS), though some work for private healthcare providers.
- *HR Administrators:* Found across a wide range of organisations and sectors.

Job titles among participants included secretary or administrative assistant (e.g. legal secretary, medical secretary, HR assistant).

Data collection and sample

Data collection took place between December 2023 and March 2025. A total of 22 administrators were interviewed. Participants were primarily recruited through LinkedIn and snowball sampling, with a small number contacted via publicly available email addresses on organisational websites.

The sample included:

- 12 legal administrators
- 7 HR administrators
- 3 medical administrators

Some of the administrators in the study had 'legal secretary', 'medical secretary', or 'administrative assistant' as job titles.

Of the 22 participants, 15 were female. The group represented a wide range of ages and levels of experience. Most participants lived and worked in the South of England.

All interviews were conducted online and lasted between 35 and 80 minutes. The interviews were designed to explore how administrators understand the skill demands of their roles, the impact of technology, and the role of education in their career paths. Additional topics included access to the occupation, day-to-day responsibilities, and career trajectories. As a sign of gratitude, the participants received a £40 shop voucher. Pseudonyms have been used in this report to protect confidentiality. All interviews were audio recorded, transcribed, and analysed using thematic analysis.

Ethical approval for the study was secured from City St George's University of London.

Methodological considerations

We recognise the limitations of relying on a single data source when studying occupations. Including interviews with employers or other stakeholders would have added additional layers of insight. Likewise, observation would yield data that can provide a much fuller understanding of the work of administrators. Furthermore, relying solely on self-reported experiences introduces potential biases, including socially desirable responses. Nevertheless, the interview data provides valuable firsthand insight into how administrators experience and interpret their work. In this report, we do not distinguish medical administrators from medical secretaries, and legal administrators from legal secretaries. In practice, they are not used consistently or used interchangeably.

Administrators in context

The study looked at three types of administrators that are distinguished within the latest occupational classification (SOC2020), They are: 'legal secretaries' (4212), 'medical secretaries' (4211) and 'human resources administrative occupations' (4136).

According to SOC2020 guidance, legal secretaries are responsible for filing and maintaining legal and other records, transcribing notes and dictation into typewritten documents, and performing a range of routine clerical duties within legal practices. Their work includes typing letters and legal documents such as wills and contracts, maintaining court and client records, managing diaries, and scheduling appointments. They also handle enquiries, directing clients to the appropriate legal experts as needed. In addition, legal secretaries may attend meetings to take notes and keep records of proceedings, as well as deliver and collect legal documents. Their duties often extend to sorting and filing correspondence and performing general clerical tasks to support the smooth operation of a legal office (ONS, 2025: 226–227).

For the occupation of medical secretary, it states that they play a key administrative role in medical settings such as hospitals, surgeries, and clinics. They manage correspondence, schedule appointments, respond to patient queries, and maintain both medical and administrative records. Their tasks include transcribing dictation, filing correspondence, managing diaries, and coordinating appointments. They also organise and attend meetings, take minutes, and handle logistical arrangements such as booking rooms, ordering refreshments, and maintaining office supplies (ONS, 2025: 226–227).

Lastly, according to the guide 'Human resources administrative occupations' provide essential support for HR functions within organisations. They assist senior HR personnel in the development and implementation of HR and industrial relations policies. Their responsibilities include placing job advertisements, supporting recruitment and selection processes by managing applications, arranging interviews, and ensuring interview panels have the necessary documentation. They also handle the administration of training programmes and work placements, and are responsible for implementing and maintaining HR record systems (ONS, 2025: 220–221).

Administrators in numbers

The introductory section highlighted a decline in employment in administrative occupations over recent decades. However, when focusing on the three administrative occupations examined in this study, a more varied picture emerges. Table 3 presents both the absolute and relative growth of human resources (HR), medical, and legal administrative roles. Over the last decade or so, HR administrators have experienced significant growth, both in absolute numbers and relative to the overall workforce. In contrast, the number of medical secretaries has declined sharply, while employment levels for legal administrators have remained relatively stable.

Table 3: Absolute and relative growth for three administrative occupations between 2011/2012 and 2023/2024

	absolute growth (%)	relative growth (%)
Legal secretaries	-0.2	-12.3
Medical secretaries	-33.1	-41.3
HR administrative occupations	25.9	10.6

Source: ONS Labour Force Survey 2011,2012, 2023 and 2024, Jan-March survey for all years. Weighted.

Administrative work has traditionally exhibited a strong gender imbalance, skewed towards women. As shown in Table 4, the administrative workforce remains predominantly female, although this has been gradually shifting over time.

Table 4: Share of female workers in 2011 and 2024

	2011	2024	change
Managers, Directors and Senior Officials	33.4%	39.4%	6.0%
Professional Occupations	48.8%	50.2%	1.4%
Associate Professional and Technical Occupations	42.5%	49.8%	7.2%
Administrative and Secretarial Occupations	**77.8%**	**73.1%**	**-4.7%**
Skilled Trades Occupations	8.9%	11.2%	2.3%
Caring, Leisure and Other Service Occupations	82.0%	79.1%	-2.9%
Sales and Customer Service Occupations	64.5%	60.2%	-4.2%
Process, Plant and Machine Operatives	11.0%	12.6%	1.6%
Elementary Occupations	46.1%	49.0%	3.0%
Total	46.8%	48.6%	1.8%

Source: Labour Force Survey, Jan-March survey for both years. Weighted

With the expansion of mass higher education, an increasing proportion of the workforce now holds university degrees. Graduates unsurprisingly dominate professional and associate professional occupations, but over time, they have also moved into a wider range of roles, including those in middle occupations. Table 5 shows that the share of graduates has increased across all major occupational groups between 2011 and 2024. Notably, in administrative occupations, the proportion of graduates has nearly doubled, from 18% to 33% over this period.

Table 5: Educational composition of major occupational groups in 20211 and 2024

	2011						2024					
	Degree or equivalent	Higher education	GCE, A-level or equivalent	GCSE grades A*-C or equivalent	Other qualifications	No qualification	Degree or equivalent	Higher education	GCE, A-level or equivalent	GCSE grades A*-C or equivalent	Other qualifications	No qualification
Managers, Directors and Senior Officials	36%	12%	23%	17%	7%	4%	52%	8%	20%	13%	3%	3%
Professional Occupations	69%	15%	9%	5%	2%	1%	77%	7%	9%	4%	1%	0%
Associate Professional and Technical Occupations	38%	12%	24%	18%	5%	2%	51%	8%	24%	12%	3%	1%
Administrative and Secretarial Occupations	**18%**	**9%**	**26%**	**35%**	**8%**	**4%**	**33%**	**7%**	**28%**	**23%**	**4%**	**2%**
Skilled Trades Occupations	6%	7%	44%	20%	13%	10%	13%	7%	42%	19%	11%	6%
Caring, Leisure and Other Service Occupations	11%	11%	32%	29%	10%	5%	24%	10%	31%	20%	9%	5%
Sales and Customer Service Occupations	12%	6%	27%	34%	11%	10%	22%	6%	24%	31%	7%	8%
Process, Plant and Machine Operatives	4%	4%	21%	28%	28%	15%	10%	5%	23%	29%	18%	11%
Elementary Occupations	7%	4%	19%	29%	21%	19%	13%	5%	21%	31%	14%	15%
Total	28%	10%	24%	22%	10%	7%	43%	7%	22%	16%	6%	4%

Source: Labour Force Survey, Jan-March survey for both years. Weighted

When we examine the three types of administrative roles more closely, it becomes clear that graduatisation within administrative work is uneven. Table 6 shows the highest qualification of the three administrative occupations in this study. Medical and legal secretaries have maintained a relatively low share of graduates between 2011/2012 and 2023/2024, albeit with significant growth over the period. In contrast, HR administrators experienced a significant shift, with the proportion of graduates doubling from 25% to 48% over the same period.

Table 6: Education distribution on HR administrators, medical secretaries and legal secretaries

	2011 + 2012						2023 + 2024					
	Degree or equivalent	Higher education	GCE, A-level or equivalent	GCSE grades A*-C or equivalent	Other qualifications	No qualification	Degree or equivalent	Higher education	GCE, A-level or equivalent	GCSE grades A*-C or equivalent	Other qualifications	No qualification
Human resources administrative occupations	25%	10%	27%	28%	7%	48%	8%	23%	17%	3%	3%	3%
Medical secretaries	11%	10%	24%	45%	7%	19%	11%	32%	29%	8%	1%	0%
Legal secretaries	10%	7%	17%	51%	11%	14%	12%	40%	28%	4%	6%	4%

Findings and discussion

All interviewees, offered detailed and thoughtful perspectives on their roles, shedding light on both their responsibilities and experiences. This section presents five key themes that together provide a comprehensive overview of how they entered the profession, what their roles involve, how they experience their day-to-day work, and their future career aspirations. First, the analysis examines the skills employed in administrative roles, drawing on participants' perspectives. It then explores the role of education within these occupations, including how formal qualifications and vocational training shape access, progression, and perceived expertise. Following this, it examines the emerging role of artificial intelligence (AI) within the organisation that administrators work in. The discussion then turns to career trajectories, and finally, the analysis addresses change within the occupation.

Skills

In the interviews, administrators talked in detail about the wide range of skills they felt were needed to perform their roles. Some of these were directly related to the technical skills required for administrative tasks, such as proficiency in using software packages. More often, however, participants emphasised the transferable skills that enable effective use of technical abilities, such as attention to detail, which was frequently mentioned.

Other skills and personal characteristics that were highlighted as important were being reliable, responsible, responsive, and time management. For Legal Secretary (LS) 3, it was 'being adaptable, resilient, and eager to learn'. These are not merely desirable personal traits but essential prerequisites for obtaining and performing effectively in the role.

She explained

> So, those are the skills that I think a legal assistant must have to be able to survive in this environment. Otherwise, you'll just, I've seen people cry and, you know, not been able to carry on while, not me, I feel blessed. I've done a lot of work on myself, by the way, on self-development, which makes me much more resilient than a lot of other assistants I know (LS3).

This brings us to the social skills. Most administrators deal with people on a daily basis. These can be team members, clients, but also, in the case of legal administrators, lawyers and solicitors whom they assist in their work. Social skills are considered essential for performing the job effectively. Administrators need to be able to communicate effectively:

> I think communication is really important [...] it's really nice if you know your consultant and your consultant knows you. Because I think that's really the key to working very well together and getting things done in, in the way it should be done, and benefiting the people that you're looking after [...] So, yeah, I think it's, I think that's one of the main important keys of working with people – communication - I think it's top of the list actually (Medical secretary (MS) 1).

> You know, the key skill is communication. You know you need to be able to communicate, in a clear and concise manner. The key skill is listening. You have to have good listening skills because you'll be interacting with a lot of people [...] it's team work, and you won't be working on your own, so you need to have a good communication skill (HR administrator (HR) 3).

Another key social skill mentioned is sympathy. Understanding the emotions of others and acting upon them.

> understanding them [...] they need somebody to either let off steam to or speak to (MS 1).

> clients can get really upset. I have never, I've never gone a full day without hearing about some client on the phone being very upset, conveyancing, especially every single client would complain at some point throughout their matter. It felt like in litigation, it all depends on how good their case is, obviously, if they've got a bad case and they are paying a lot of money, then they are going to be upset when things don't work out for them. But if they've got a great case and don't need to spend much money to get a settlement, they're all so very happy immediately (LS4).

Relatedly, many spoke about being gentle and understanding with others, also because of the personal issues that they may have to deal with:

> You need to be patient with people, especially within the employment law firm side of things, people are quite nervous. It's redundancies, it's painful situations, and people have never gone through a lot of the processes that they're about to. So just being super patient, being more human, as opposed to corporate, and guiding them through the process. Yeah, honestly, that's the biggest thing (LS5).

> But also I feel like having a personality, like being patient, for example, especially in our role where we're dealing with people that are bereaved, or we're dealing people that our vulnerable you really do need to have patience and kindness, because people have called on the phone very angry, very upset, because, of course, they've lost a loved one, or they're dealing with something in terms of core protection (LS8).

> navigate and dissolve situations of conflict between colleagues as well. I'd say that's really important from a professional perspective, like within the role, I'd say personal skills you need is being able to handle confrontational situations, and that's somewhere where I personally struggle, because I'm a people pleaser (HR1).

Most administrators believe that social skills can be learnt through work experiences and think they have become better at using social skills in their work over time.

Responsibilities beyond job task

The skills of administrators are, of course, linked to the tasks and responsibilities of their work. They mention a wide range of these depending on the organisation and their seniority. Within an organisation, their role could change drastically over time due to internal personnel changes or reorganisation. HR7 notes that the parameters of their jobs are 'very fluid, yes, very, very, very, very changeable. Very much […] So I can honestly say my role has always been fluid, always changed. The needs always change'.

As a result, the roles of administrators are seen to have expanded, encompassing a broader range of tasks and responsibilities, and potentially including the work of auxiliary workers. MS2 is an NHS administrator at a respite unit for adults with learning disabilities, responsible for managing bookings, referrals, and communication with social workers and families. She handles funding coordination, care plan documentation, and safeguarding protocols. Her role includes facilities oversight, ordering personal protection equipment (PPE) and groceries, maintaining medical equipment, managing petty cash, and ensuring compliance with safety standards. She supports the care team by maintaining systems, scanning documents, and handling day-to-day operations, ensuring the environment runs smoothly and safely for residents and staff alike. She reflects

> I think my job description was quite limited. Actually, it was literally a bit of a glorified receptionist. But obviously, the more you're there, you I mean, my skill set is not admin related.

Legal secretaries' tasks and responsibilities may also depend on the structure of the firm they work in. Some individuals engage in legal work, provided they possess the necessary legal knowledge. The distinction between paralegals and legal secretaries varies across firms: paralegals are often legally trained, chargeable to

clients, while secretaries focus more on administrative support, enhancing fee-earners' efficiency without direct billable time. However, the lines can blur depending on firm structure, cost considerations, and evolving legal career routes.

Autonomy

Another area of significant variation is the level of autonomy administrators have, both in how they carry out their tasks and in how they organise their schedules (i.e. when they complete their work). On the extreme end there are administrators with seemingly endless autonomy, at the other end there are administrators who work under strict procedures and close management within the work process which allows for very little autonomy.

> I prioritise whatever I want, however I want (HR5).

> there's protocols for pretty much everything (LS7).

The role of education

According to the SOC2020 guidance, the educational requirements for administrators can be rather wide. It states that medical secretaries typically enter the field with GCSEs or equivalent and can obtain a diploma in medical secretarial studies through one-year full-time or two-year part-time programmes. They also have access to NVQs/SVQs in administration at levels 2, 3, and 4 (ONS 2025: 226–227). Legal secretaries have no formal academic requirements, though employers may expect a legal secretarial qualification, and administrative NVQs/SVQs are similarly available (ONS 2025: 227). HR administrators also face no set academic requirements, but employers may prefer candidates with a degree and at least GCSE-level qualifications. Relevant certifications are offered by the Chartered Institute of Personnel and Development, alongside NVQs/SVQs at various levels (ONS 2025, pp. 221 220).

Our interviews reveal the ambiguous nature of educational qualifications. Most agree that advanced educational qualifications are not deemed to be strictly necessary to do the job:

> I don't necessarily think that [a university degree] is absolutely necessary… if you apply yourself, you could do it from GCSE level (LS7).

> You don't [need a law degree], in my opinion… They want a law degree, but then ask: Do you have admin experience? Have you worked in an office before? (LS5).

Yet some acknowledged that educational requirements may sometimes serve more to filter candidates than to predict their actual success in the role, although most felt that qualifications did not matter much in the recruitment process. This respondent suggested that education may have been reviewed during hiring, but was not a decisive factor. Instead, they emphasised work experiences and interpersonal communication skills and cultural fit as more important during recruitment:

> I think they probably looked at it on the CV, but I don't think it was, it wasn't a be all, end all. (HR5).

> I don't know. I'm not sure, but I get the feeling that it's probably work experience more so than qualifications, especially with me (MS1).

Others found that education has become a formal requirement for entering the occupation. Whilst several respondents acknowledged that formal education played a role in meeting job entry criteria, in many cases, it was about fulfilling minimum qualification requirements rather than a defining feature of professional competence.

> From the vacancy, there was a minimum education requirement for the role… I think you should have a degree or a CIPD (HR3).

> I literally had to give them all my certificates from my GCSEs up to my degree… even though the role didn't require that (HR7).

Education functions merely as a gatekeeper. A few participants identified education, especially degrees in psychology or business, as directly beneficial to their roles. One respondent (MS2) emphasised how their Master's in Occupational and Business Psychology helped them succeed:

> I already have that psychology knowledge… I believe that every behaviour has a psychological background… which helps me in maintaining good customer service.

Most participants felt that experience carried more weight in hiring and performance. Most of the skills they used were acquired through work experience. A recurring theme was the tension between formal education and hands-on, practical learning. One administrators observed:

> We've had the most qualified on paper people, and they haven't come across very well at all. And then we've had people that have just come out of sixth form or college and gone straight into work full time, and they've made their way up a ladder, and they've come across excellently (HR5).

Education and career progression

Several participants spoke positively about non-traditional routes that develop job relevant skills, such as apprenticeships, placements, and on-the-job learning. These serve those 'who can't learn in a classroom environment' (HR5). Some spoke about the Legal Administrator Apprenticeship, a structured work-based training programme designed to equip individuals with the skills and knowledge necessary for administrative roles within the legal sector. It is typically aligned with the Level 3 Business Administration Apprenticeship. Although its value for employers will depend on the employers, it is understood as an effective pathway into the occupation:

> if you've done a legal apprenticeship that provides evidence of qualification and experience. Whether it would lead directly into a role is going to depend on how much credence the firm gives it. Because, I mean, we are moving away from this idea of apprenticeships being a bit kind of low level and something you do if you're not very bright. And I think people are starting to get the idea that that's not how it works. So, it does at least demonstrate that you've had a particular programme of training (LS1).

In HR administration specifically, the CIPD professional qualification is seen as a useful prerequisite for higher roles.

> Whenever there is like opportunity for career growth, [my manager is] always… highly encouraging… because she knows that I've attained a very good educational certification (HR3).

> If you've got a CIPD level 7, then you're more likely to get, like, a senior HR role… Whereas if you don't have that, it might take you a little bit longer (HR1).

Although the Law degrees are not a prerequisite for legal administrative roles, many in the occupation have completed them, according to legal administrators. Some believe it helps with career progression and boosts one's standing in environments dominated by highly educated professionals.

> I think that [law degree] helps with almost like progression I guess. I think that again, as I said, I'm already doing paralegal work, and somebody, one of the other secretaries, has been there six or seven years, she said to me, 'Oh, I don't do that', like she doesn't get sent that work. So, I think progression wise, I think it definitely helps. But if you just want to come in and be a secretary and go home, which is what the other secretaries want to do (LS10).

The role of artificial intelligence

Administrators were very aware of the emergence of AI, and in particular large language models (LLMs) and their possible applications. A minority of the interviewees had used AI in their work. HR administrators use AI platforms for generating contracts and letters through simple data input (HR5), while ChatGPT helps with rewording communications and clarifying complex information like Freedom of Information requests (HR5, HR6). Legal secretaries use ChatGPT for proofreading contracts and correcting errors, particularly valuable for non-native English speakers (LS3). Others use AI to record meetings and generate summaries with action points (LS9). In a few cases, their organisation had brought in AI across the organisation-level to help with tasks such as writing.

> I'm very excited that we're just about start trialling Microsoft Copilot (LS2).

In some cases, administrators independently found ways to use applications like ChatGPT to support their tasks, often without guidance and, in certain instances, without their employer's knowledge. These administrators speak very positively about it. These administrators speak very positively about its capabilities:

> I use ChatGPT pretty much every day. Sometimes it's great. You know? [...], especially for me, because I had dyspraxia. So that is, that is quite, quite helpful. And, you know, I use it for all sorts of other things. You know, if something is quite complex and I use it as well (HR6).

> It can make you slides, so you could say, take this meeting and make a slide show summarising it. So, it's making my job faster and more efficient all the time, like another person to delegate to (LS2).

In the organisations of the interviewed administrators, there was an uneven adoption of AI at the time of the interview. A few organisations had begun integrating AI tools such as chatbots, automated document generation, or summarisation software. For these technical skills become necessary to navigate and manage different AI tools. However, most interviewees shared that their organisations did not adopt such technologies.

> Some companies don't invest in stuff like that... and I don't think the company I work for would (HR1).

Administrators were rarely very certain about how AI might affect their work or their organisation. Many thought that AI can serve as a practical tool for improving efficiency, but not yet replace them.

> AI can only really do so much. It can speed up the efficiency of your role, yeah, but it can't replace it (HR6).

Respondents saw opportunities for AI to support their work by handling repetitive or time-consuming tasks. From drafting letters and generating contracts to processing payroll and scheduling meetings, AI is seen as capable of significantly rearrangement of administrative tasks. However, AI's role is seen as largely supportive rather than transformative; it can assist with efficiency but not wholly replace human involvement. This was particularly emphasised in roles where decision-making, contextual judgement, or critical oversight is necessary.

> Ultimately, from a risk management point of view, there has to be oversight (LS1).

Respondents show considerable openness to AI when it complements human labour, particularly for administrative tasks. However, they also appear to believe that many core functions still require human judgment and cannot yet be automated effectively. Administrators frequently pointed out that AI lacks emotional understanding and human connection. They argued that AI is not yet capable, and perhaps never will be, of replicating the nuanced human touch essential in sensitive and social contexts:

> It's the emotional intelligence, the stakeholder management, the bits that you as a human can add the top 10% on (LS2).

> Clients want human feeling… a machine could make you worse (HR3).

As mentioned earlier, transferable skills are seen as foundational to effective work in many administrative and support roles. Interpersonal and communication skills are deemed paramount to work with (professional) colleagues and customers.

Several respondents acknowledged that AI may reduce the demand for administrative staff numbers, particularly where repetitive or rules-based work can be easily automated. However, elimination of administrative roles is unlikely. Administrators take a pragmatic approach that some administrators would always be needed, and a broader anxiety about job security in the face of automation was not present in the interviews, with many not anticipating mass layoffs.

Some think that the higher-skilled administrative roles will survive. AI frees workers from routine chores, allowing bespoke, specialised client and organisational support to flourish. One administrator explained how some of the administrators are shielded from automation:

> It's just going to take the boring work away… So maybe the document producer… won't have a job, but not the secretary […] they'll manage, they basically manage all those other bits, and maybe one of the bits that manages AI, you know. So, it's the docking producer who loses their job, or the person who did the cost drafting, or the person who did the report on planning, but it's not the person who's coordinating all that, because they've got the brainpower to know which tool to use (LS2).

Administrators voiced concerns about the financial constraints and doubts about reliability and data security. Some respondents were sceptical about using AI in their own work:

> It's still quite early on… there's a trust element. How do I know this is going to be right? (HR5).

> I just don't think it's there. I don't think it's going to work out if they invest too much money too early (LS4).

Careers

The administrators in the study represented various career levels, including new entrants to the occupation and experienced administrators. Many saw distinct limits in their career opportunities within their own organisation. For some legal administrators with legal degrees, the admin role could function as a stepping stone. The majority saw their future in administration, often in the same sector that they were currently working in.

> I'm not really one of these people that has a desire to climb the career ladder… climbing up would take more additional stress and emotional energy, which really isn't for me (HR6).

> It's a good job being a legal secretary… you've got stable income, but also time. You can be a parent (LS2).

Some administrators feel that their internal career options are highly specific and not particularly desirable:

> I just want to do this, please… I have no desire even to go to legal assistant […] Because I can't progress in terms of paralegal where I'm at, because they don't do that, they only do it for court protection, and I don't want to do court protection. Although one of the earners said I'd be really good at that area because of how I am, like I said it's dealing with vulnerable people and empathy and so forth. But I just don't want to because I think for me, it's also the sheer amount of cases that I'll be doing. I feel like I'll be too overwhelmed. So there's no point putting myself forward (LS4).

Others have been able to add tasks and responsibilities to their role, which made it more interesting and engaging.

> I developed the role myself. That's why nobody else does what I do (HR5).

It is worth noting that administrators develop sector-specific knowledge and skills, which can enhance their employability within that sector but make it more difficult to transition to others. This often results in them remaining in the same field over time, as one participant noted, 'once you're in legal, people don't tend to leave' (LS12). Those who had prior experience working in the NHS were able to draw on their existing skills and knowledge such as familiarity with NHS computer systems and the ability to work in a fast-paced environment, as demonstrated by this HR administrator, who has worked across different sectors:

> So, there's always that urgency and that fast pace… So compared to other sectors, like the technology and the financial, there is not the urgency like the health sector (HR3).

Career progression, if desired, is strongly dependent on organisational support. Participants emphasised that their ability to grow in a role was highly dependent on the culture of support within specific teams or departments:

> It really depends where you work, how supported you are. From one department, absolutely fantastic… and this one that I've been in 20 years, had no support at all (HR7).

> What I seek is someone who is willing to take me under their wing… and allow me to grow (HR1).

Others reported being denied professional development opportunities without explanation ('I wanted to do an NVQ… I was told no' (HR7)). Unsupportive or even harmful work environments restricted progression and undermined well-being. A participant who returned to work after surgery explained:

> When [the manager] was gone, there was no manager there. So it progressively got worse… I was carrying boxes of paper… emptying heavy bins. And I think it all hindered my recovery… which then impacted me emotionally and mentally (HR1).

In contrast, supportive environments enabled others to grow beyond their initial roles, gain confidence, and acquire new responsibilities.

> they got me to do some videos to sort of give me the confidence… they pushed me… they made me put things together and stand up and show the rest of the teams how my job worked (HR7).

While formal qualifications like CIPD or legal training were valued, participants consistently emphasised the importance of hands-on learning and career adaptability. Participants gave similar advice to young people entering the workforce:

> Go for something quite junior… then develop it. Go for as many free courses as possible (HR5).

> Volunteering with charities is a pretty good thing… then you can say, I did X, Y, Z and this is what I developed (HR6).

The changing nature of administrative work

Administrators with considerable work experience reflected on the significant change they experienced within their roles over time, as systems transitioned from paper to electronic versions. The rapid adoption of new technologies means that digital literacy is now a must-have skill in most administrative roles. The professional administrators' work now relies heavily on laptops, mobile devices, and advanced software that allows for real-time collaboration and remote working:

> If you wanted to do a dictation, it was on a tape. So, now everything has changed, so that everyone can collaborate, everyone can cover each other. So, you have digital dictation, you have document management systems, you have electronic finance systems. I have my own laptop. Every secretary in our firm has a laptop. I have a mobile phone. I can work from anywhere in the world (LS2).

In particular, HR administrators expect further automation in the future, especially in recruitment and onboarding. The role of the legal administrator has also shifted significantly from purely administrative tasks towards more specialised support. Whereas administrators spend less time on typical routine tasks and responsibilities other interpersonal and even technological support may become more prominent. Earlier, secretaries were essential for typing and managing correspondence since many lawyers relied on them for these basic functions, such as typing letters and memos. However, proofreading is still largely done manually. A legal administrator reflects:

> a lot more fee earners are now much more kind of technologically literate. So, for smaller pieces of communication, a lot more of that would be done by email. So, you wouldn't typically be expected as a legal secretary to draft emails for people, although you might send emails on behalf of more senior personnel, but there is a lot less of the kind of basic audio typing, copy skills (LS6).

The introduction of case management systems automates many routine scheduling and deadline tasks, but secretaries still need to manage these systems:

> There are fewer legal secretaries now than there were, and they would generally have more kinds of specialist knowledge. So, there's less kind of back office just typing away and that sort of thing. So, how AI has affected this, I don't know, because there's a lot of speculation about how AI is used. And because it's reasonably readily available without phenomenally expensive software packages being purchased, then you could make use of it to do basic drafting, but obviously that would always have to be overseen… But the role has shifted from volume to something a bit more specialised (LS1).

Administrators have seen their roles evolve significantly under the pressures of technology, regulation, and organisational change. Their work has shifted away from routine clerical duties towards more specialised responsibilities in decision-support and coordination, where technological competence is now essential. While repetitive processing has become less central, administrators remain vital to organisational functioning, with their value increasingly found in managing change, making effective use of technology, and ensuring that systems and people work together smoothly.

Conclusions

This report seeks to better understand the future of middle occupations by examining one of their key constituent groups: administrators. Generative AI is reshaping a wide range of work, including traditionally high-skilled occupations typically performed by university graduates. While middle occupations are certainly affected, the nature of this impact differs from that seen in previous waves of IT-driven technological change. Instead of widespread job displacement, current changes often involve the transformation and redefinition of existing roles in unexpected and unpredictable ways, depending on how AI technology is implemented. This challenges some of the assumptions of the routine-based technological change (RBTC) theory.

There are several reasons why the effects of AI on middle occupations, and administrative roles in particular, demand closer scrutiny:

1. Their work is not always predictable. Administrative roles are often assumed to be highly routine and thus easily automated. However, while these roles may not always require high-level creativity or problem-solving, the work is only partially routine. Many administrators report significant autonomy in deciding how and when to perform their tasks.

2. Administrative teams have already been downsized. Many organisations have streamlined administrative departments, resulting in smaller teams. This has made administrative roles more varied, and often more central to organisational operations.

3. Transferable skills remain essential. Administrators frequently interact with employees, managers, and clients. Many note that their communication and interpersonal skills are key to their effectiveness. The relational and human aspects of their roles are not easily replicated by AI systems.

4. Administrators are not overly concerned yet. Although this is not to say their roles are safe from change, most administrators in the study anticipate that their jobs will evolve rather than disappear. They expect to see modifications in tasks and responsibilities, rather than wholesale replacement.

Administrative work is far from uniform. One common misunderstanding is the assumption that administrative work is homogeneous. In reality, there is substantial variation in tasks and responsibilities. Differences exist not only across sectors such as medical, legal, or HR administration, but also between organisations, which vary significantly in their expectations, demands, and support for administrative staff.

The role of education

The study highlights the wide variation in educational attainment within the administrative workforce. Many administrators have entered the profession through diverse pathways, including apprenticeships, temporary contracts, or by developing practical skills suited to administrative tasks. While university education does not dominate the field, a growing proportion of administrators hold degrees, particularly in HR roles. There are also emerging opportunities to utilise the skills of degree-holding administrators better, suggesting potential for role development and career progression.

Policymakers

Governments have implicitly argued that higher skills through investment in higher qualifications might avoid the declining fortunes of middle workers. There is little evidence to suggest that the UK government has given much thought to how to educate or assist them in dealing with changes, other than retraining.

The future of middle occupations

Despite the overall decline in the number of people employed in middle occupations, this category of work is unlikely to disappear in the near future. Although there are growing technical possibilities for replacing (part of) such roles, the reality is far more complex. Employers must first decide to invest in these technologies and weigh the perceived costs against the expected gains. Moreover, much of the work performed in middle occupations is not routine, making automation more challenging. The uptake of new technologies can also be unpredictable, varying across sectors and organisations.

Workers themselves also have agency in how, when, and why they adopt AI technologies. Evidence from the study suggests that the nature of these roles will evolve rather than vanish, but the precise trajectory remains uncertain. This study provides only a snapshot of ongoing changes. Further research is needed to understand the processes involved in the introduction of AI technologies, as well as the role of other key stakeholders, such as managers, in shaping these developments.

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