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The Manufacturers' Organisation

West Midlands Combined Authority

RAS WEST MIDLANDS

# THE CASE FOR INCREASED ROBOTICS AND AUTONOMOUS SYSTEMS ADOPTION WITHIN THE WEST MIDLANDS PRODUCTION INDUSTRY

# Contents

**Disclaimer:** This report has been independently commissioned and prepared. The findings, interpretations, and conclusions expressed herein are those of the authors and do not necessarily reflect the views or policies of the West Midlands Combined Authority (WMCA).

# Executive Summary

This study is the product of a partnership between the West Midlands Combined Authority (WMCA) and Make UK, the Manufacturers' Organisation. The objective of the work is to explore the potential for enhanced Robotics and Autonomous Systems (RAS) adoption within the West Midlands industrial sector.

Through a comprehensive review of existing literature, survey fieldwork with more than a hundred manufacturers from within the region across all sizes, and qualitative insights from industry stakeholders, this work makes the economic case for expanding RAS integration across the region. Findings reveal significant productivity and labour market benefits associated with RAS, alongside specific challenges and opportunities unique to the West Midlands that should be addressed in order to maximise the potential for future RAS adoption in the region.

## PREVALENCE OF RAS ADOPTION

- **Widespread yet varied adoption:** Approximately **80%** of surveyed manufacturers in the West Midlands report some level of RAS usage. However, the majority of these implementations are basic or entry-level applications, indicating significant potential for more advanced integration.

- **Future investment intentions**
  - **59%** of respondents indicate plans to expand their RAS usage within the next three years, indicating a strong appetite from businesses in the region to progress adoption.
  - **35%** are currently "considering" RAS adoption, indicating that approximately one-third of firms could be encouraged with the right support. Only 6% report no plans for RAS investment, showing broad industry interest in automation.

- **Sectoral and ownership differences**
  - Adoption rates vary widely between sectors; automotive and aerospace lead the way, driven by the high precision and production demands of these industries, but also reflecting the high-volume applicability where RAS can be an ideal intervention.
  - Firms with international ownership report RAS adoption rates of **97%**, compared to **69%** for solely UK-owned companies, indicating a higher propensity for innovation and investment among globally connected firms, while also aligning with the knowledge of historic under-investment in UK-based industrial firms relative to international competitors.

## BENEFITS OF RAS ADOPTION

- **Productivity and quality gains:** The fieldwork reveals that **45%** of respondents rank productivity improvements as the primary benefit of RAS, followed closely by enhanced product quality and consistency. Automation has reportedly enabled manufacturers to meet demanding production schedules and maintain uniform quality standards, particularly in high-output sectors like automotive and electronics.

- **Enhanced workforce skills and job creation**
  - **Half (50%)** of surveyed companies report that RAS adoption has led to workforce upskilling and reskilling, helping employees transition into higher-value roles.
  - **37%** of respondents note that RAS implementation has created new job roles, especially in technical fields such as system maintenance and programming.
  - Only **30%** indicate reduced headcount due to RAS, countering the perception that automation results in job losses and instead highlighting its potential to drive workforce development on balance.

- **Cost reductions and efficiency gains:** Although cost savings rank lower among immediate motivators for RAS adoption, they emerge as a long-term benefit, with reduced material waste, minimised errors, and streamlined production processes.

## KEY CHALLENGES TO RAS ADOPTION

Despite the reported benefits, several barriers have hindered RAS adoption in the region, particularly among SMEs:

– **High initial costs: 48%** of respondents identify the high initial capital investment required for RAS as the top barrier to adoption. For SMEs, these costs are often prohibitive, making external funding support critical.

– **Skills gaps: 47%** of companies report that a shortage of skilled personnel is a key obstacle, particularly in specialised areas like robotics programming, system integration, and maintenance. While the data shows that the West Midlands has a strong general manufacturing workforce, RAS-specific skills remain limited.

– **Uncertain ROI and risk aversion:** Many SMEs report that they are hesitant about RAS investment due to uncertainty over returns. This is shown in the **35%** of firms that are "considering" RAS adoption but remain uncommitted, highlighting a need for clearer business case support and targeted incentives.

## STRATEGIC INSIGHTS AND RECOMMENDATIONS

### SWOT analysis summary

This condensed summary of the report's SWOT analysis identifies the unique strengths and weaknesses of the West Midlands with regard to further potential RAS integration in industry, as well as opportunities and threats that could drive the region's more automated future:

**Strengths**

– The West Midlands' manufacturing base, particularly in advanced manufacturing sectors, provides a good foundation for RAS adoption proliferation. Combined with a central geographic location and well-connected transport links, the region is well positioned to serve as a national hub for RAS.
– Robust institutions across universities, research institutes, and Catapult-type organisations offer industry-tested R&D and implementation advice.

**Weaknesses**

– Financial constraints, particularly among SMEs, limit the ability to invest in RAS technology at firm level.
– The fragmented support structure, combined with a conservative investment culture, is a weak point for RAS integration, where capital commitments are ultimately required.

**Opportunities**

– A dedicated RAS cluster has the potential to catalyse commitment from firms in the region that have been identified to be close to committing to RAS adoption.

**Threats**

– Other UK regions, such as the North West, are also advancing in RAS adoption and may attract greater funding if the West Midlands does not strategically position itself as a leader.
– Given the capital requirements of RAS integration, economic instability threatens to impact both public and private funding for RAS projects, jeopardising progress in automation adoption.

### High-level operating model for a West Midlands RAS cluster

To address the challenges identified in the report and to leverage regional strengths, the study proposes a high-level operating model for an RAS cluster in the West Midlands. This model includes:

1. **Industry and academic collaboration:** A collaborative approach between industry and academic institutions with interventions adjusted to local industry needs. Establishing knowledge hubs and shared resources would help SMEs access cutting-edge technology that they are reported to under-access.
2. **Skills development and workforce training:** Developing targeted RAS upskilling programmes, apprenticeships, and professional development initiatives will address skills shortages and promote the local labour market in being prepared for a more automated future.
3. **Financial support and access to technology:** Expanding RAS-specific grants, incentives, and technical advisory offerings tailored for SMEs would lower entry barriers and enable more firms to explore and implement RAS.
4. **Market development and networking:** Regular industry events, networking opportunities, and outreach programmes will raise awareness of RAS benefits and connect manufacturers with potential collaborators and resources.
5. **Central governance and oversight:** Establishing a multi-stakeholder council to oversee the cluster would ensure coordinated efforts and alignment with regional economic goals, helping the West Midlands become a leading UK region for industry-led RAS innovation.

# Part I: Literature Review

In this literature review we aim to explore the economic case for Robotics and Autonomous Systems (RAS) partnerships in the West Midlands by addressing the following key objectives:

- **Assessing the advantages of RAS adoption:** The review will analyse the competitive strengths of the West Midlands that make it a suitable environment for the greater adoption of RAS. It will identify opportunities for the region to position itself as a leader in RAS, supporting a thriving ecosystem that is attractive to investors and innovators.
- **Analysing current RAS appetite and barriers to adoption:** A significant focus will be placed on understanding the current levels of interest and barriers faced by companies, especially manufacturing SMEs in the West Midlands, in adopting RAS solutions. Factors such as cost, skills shortages, and technological challenges will be examined to identify the main obstacles that hinder wider adoption.
- **Identifying the potential for a West Midlands RAS cluster:** The review will investigate the feasibility of establishing a robotics and automation focus on the region, across different sectors, which would support industries in adopting multi-modal robotic systems and create a unified community of suppliers, integrators, users, and research institutions. The aim is to outline the benefits of developing a cohesive RAS cluster that can drive innovation, collaboration, and economic growth within the region.

This analysis will provide a comprehensive overview of the region's readiness and potential to become a leader in RAS, highlighting both the opportunities and the challenges involved in achieving this goal. The findings will offer strategic insights into how the West Midlands can leverage its industrial strengths to build a robust RAS ecosystem. In this literary review we look at what RAS are and what impact they can have on the local and the wider economy.

## WHAT ARE RAS AND WHAT IS THE IMPACT OF THEIR IMPLEMENTATION?

### Defining RAS

Robotics and Autonomous Systems (RAS) include machinery and physical systems that can act independently of human control by sensing, reasoning, and adapting to a given situation or environment. In contrast to more traditional machines that have a single, predetermined purpose, RAS applications are able to understand what is happening in their sphere of operation and tailor their behaviour to particular circumstances, with varying degrees of decision-making autonomy.[1]

RAS refer to the integration of robotic systems and automation technologies into industrial and commercial processes to enhance efficiency, productivity, and precision. RAS encompass a range of solutions, from automated manufacturing lines and robotic arms to advanced software systems that control and optimise these processes. The goal of RAS is to reduce human error, increase production speeds, and lower operational costs while enabling businesses to scale their operations with greater flexibility. In recent years, RAS have evolved significantly, driven by advancements in artificial intelligence (AI), machine learning, and Internet of Things (IoT) technologies, making it a transformative force in modern industries.

[1]Economic impact of robotics and autonomous systems (RAS) across UK sectors

RAS are increasingly essential to the UK economy and are a driving force behind Industry 4.0. RAS technologies offer significant opportunities for businesses aiming to reduce costs and improve efficiency. The economic potential is immense, with advanced robotics projected to create a global impact of $1.7 to $4.5 trillion annually by 2025.[2] The market for non-military RAS products alone was estimated to be worth £70 billion between 2020 and 2025. A further study in 2019 suggested that a 30% boost in robot installations by 2030 could increase global GDP by 5.3%, translating to an additional $4.9 trillion annually.[3]

For the UK, RAS could contribute around 15% to Gross Value Added (GVA), more than £200 billion, and boost productivity in manufacturing by up to 22%. It also has the potential for long-term employment gains of up to 7%.

New RAS developments are combining robotics with AI and IoT-based sensors, leading to technologies like autonomous forklifts and collaborative robots. These "smart mobile robots" can work in flexible, non-standardised environments, helping to reduce the costs of fixed infrastructure. Collaborative robots (or cobots) are also emerging to support human workers with specific tasks, enabling safer and more efficient workflows (Collaborative Robotics, 2019).

While the UK missed out on earlier robotics waves and lagged behind in industrial robot adoption, RAS was identified by the previous UK government as one of the "Eight Great Technologies" in 2013. Robotics has been highlighted in the UK's 2017 Industrial Strategy as a key area alongside AI and data analytics. And it continues to be a crucial technology for the current government, as seen in the Industrial Strategy Green Paper. The UK suffers from lower uptake rates of traditional industrial robots – data from the International Federation of Robotics shows that industrial robot installations in the UK are relatively low when compared to the likes of Germany, the US, or China: around 2,500 industrial robots are estimated to have been installed in the UK in 2020 (0.5% of an estimated world total of 520,900). This compares to estimates of around 6,000 (1.2% of world total) in France, 8,500 (1.6%) in Italy, 25,000 (4.8%) in Germany, 55,000 (10.6%) in the US, and 210,000 (40.3%) in China. Despite being low on the World Robotic Index, the UK stands in a strong position to leverage new RAS technology, with world-class robotics research and innovative companies.

Denmark, which established the original RAS cluster in Odense, serves as a benchmark. Ranked 12th globally in robotic density, Denmark has more than 300 companies in the sector, employing 8,500 people and with a turnover of €2.4 billion. Despite having no automotive or electronics sectors, Denmark's successful robotics industry demonstrates the potential for the UK.[4]

Key research centres such as the Bristol Robotics Laboratory, Dyson Robotics Lab, Remote Applications in Challenging Environments (RACE), and the Edinburgh Centre for Robotics, along with industry leaders like BAE Systems and Rolls-Royce, are at the forefront of developing advanced robotics and automation solutions.[5]

The application of RAS has become particularly relevant in the manufacturing sector, where it helps in automating repetitive tasks, improving production accuracy, and managing supply chains more effectively. Beyond manufacturing, RAS is finding applications in logistics, healthcare, agriculture, and even service-oriented sectors. Its ability to streamline operations and drive productivity growth makes it a critical component of the ongoing Industry 4.0 revolution.[6]

The government is planning to release the ten-year Smart Machine Strategy Plan, a pivotal document designed to shape the future of innovation and technology adoption following the consultation with industry leaders and stakeholders. The strategy aims to ignite both supply and demand ecosystems, develop the essential skills and scientific groundwork, and establish a regulatory framework that fosters societal trust and meets public needs.[7]

[2]How Robots Change the World - What automation really means for jobs, productivity and regions
[3]How Robots Change the World - What automation really means for jobs, productivity and regions
[4]West Midlands RAS Cluster Launched
[5]Made Smarter Review - GOV.UK
[6]Economic impact of robotics and autonomous systems (RAS) across UK; Industrial Process Improvement by Automation and Robotics (mdpi.com); Applications of Robotics & Autonomous Systems (RAS) sectors.
[7]Robotics Growth Partnership Strategy Consultation - Innovate UK Business Connect

# THE BENEFITS OF ADOPTING ROBOTICS AND AUTOMATING PROCESSES

Automation and adoption of robotics and other new digital technologies offers a range of valuable benefits for manufacturing, including improved flexibility, greater labour efficiency, and better use of resources. By integrating digital technologies with automation, production facilities can become more adaptable and productive, driving real gains in output and performance.

Many businesses report that automation not only makes them leaner but also increases profitability, improves utilisation rates, and provides better visibility into the supply chain. It can even reduce the demand for labour, making companies more resilient to workforce fluctuations.

In terms of adoption, around 36% of businesses planned to replace a portion of their processes with tech, automation, and data-driven systems by 2025. In 2023, according to Make UK's Automation report,[8] 47% had already automated up to 10% of their processes, while 16% had achieved a 25–50% automation rate. However, only a small number, about 1%, had automated all manufacturing processes. Still, there was significant potential for further automation, as most manufacturers (63%) had automated only some processes. With additional investment, more manufacturers aimed to automate more than 50% of their operations within two years, although, at the current pace, this level of automation may impact only 16% of the industry by the end of the year.

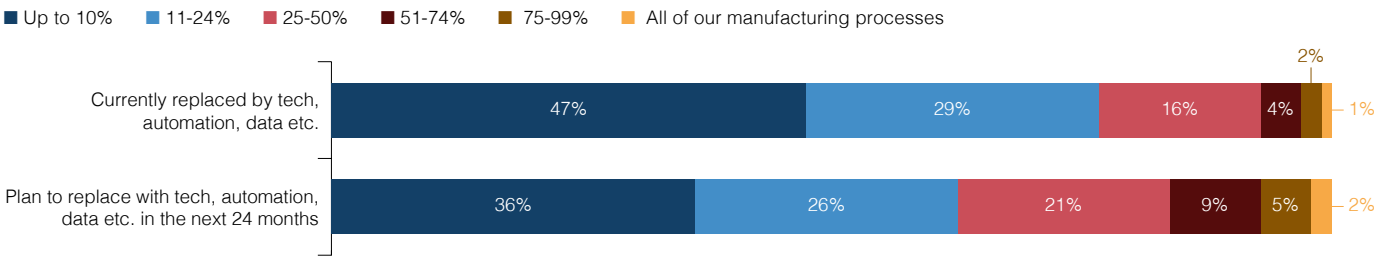
In 2022, when Make UK asked manufacturing businesses what technologies they prioritise and invest in, they reported that advanced planning and scheduling applications are highly valued by manufacturers, with 85% considering them essential or significantly impactful for boosting productivity. Closely following are cloud computing, Manufacturing Execution Systems (MES), and cybersecurity, which almost 80% of manufacturers recognise as impactful. Technologies like the Internet of Things (IoT) and robotics are also valued, with 70% of manufacturers finding them beneficial.[9]

Looking specifically at automation, the majority of manufacturers (60%) reported that automation brings improved productivity to the business. This is followed by improved labour efficiency (50%) and improved quality (49%) to complete the top three. Similarly, manufacturers adopting digital technologies more generally reported more production flexibility, labour efficiency, and better use of resources. Though digital technologies can make production facilities more flexible, these technologies coupled with automation can bring about real productivity gains. Businesses also indicated that automation brings benefits to resource use efficiency, making business leaner, increasing profitability, bringing higher utilisation rates and better supply-chain visibility, and even reducing demand for labour.

The report highlights that automation not only boosts labour efficiency but also significantly enhances the quality of products and services by reducing errors and increasing consistency in production processes.

**Chart 1: Manufacturers' plans to automate more processes over the next two years**

% companies citing current and future plans for automation

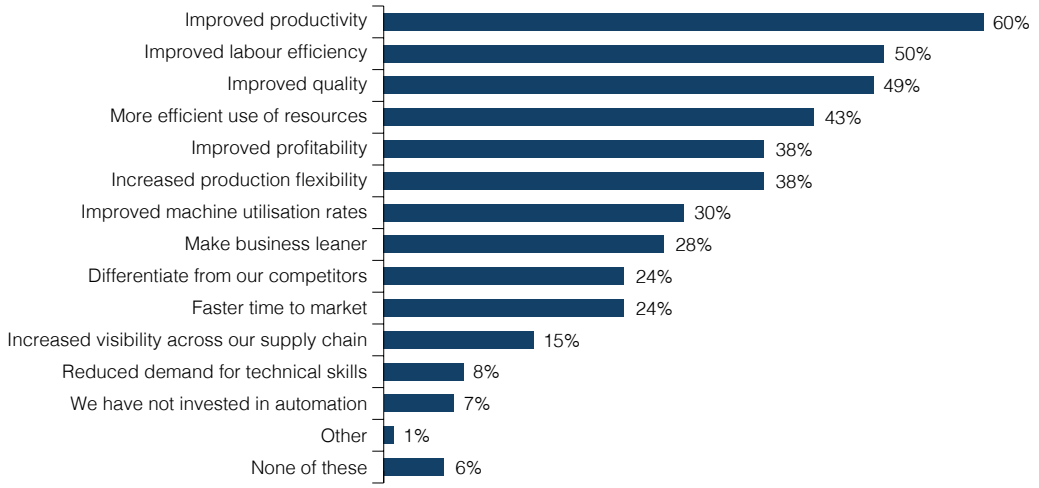



Source: Make UK/Infor, Automation Survey (2023)

[8] Manufacturing and Automation | Make UK
[9] Digital Adoption: The Missing Link in Productivity Growth | Make UK

**Chart 2: Automation brings productivity, labour efficiency, and improved quality**

% companies citing the benefits of automation to their business




Source: Make UK/Infor, Automation Survey (2023)

However, digital adoption has its challenges. A 2021 survey found that just under half of manufacturers had experienced cyber-attacks in the previous year. For those affected, 63% reported losses of up to £5,000, while nearly one-quarter incurred costs between £5,000 and £25,000. Unsurprisingly, one in eight manufacturers cite cyber threats as a barrier to adopting digital tools.

Manufacturers are increasingly aware of the impact that digital infrastructure can have on productivity. MES software, for instance, provides visibility into operations by tracking live data on products, quality, and timing, which significantly boosts efficiency. Cloud computing supports this shift by securely storing large volumes of operational data. Digital technologies are shown to improve productivity, labour efficiency, profitability, flexibility, resource use, and quality. Robotics, IoT, and additive manufacturing (like 3D printing) further enhance productivity by using live data to operate efficiently. One manufacturer observed, “The robot is over two times faster on high-volume production than a manual welder,” highlighting the potential of automation to transform production speed and quality.

Despite the tough post-Brexit, post-pandemic landscape, productivity in UK manufacturing has risen, partly due to digital investments.[10] Around 78% of manufacturers saw a productivity boost between 2021 and 2023, with 35% of SMEs reporting productivity increases of between 10% and 25%. This trend underscores the value of digital adoption as a key driver in improving efficiency and competitiveness in the sector.

[10]Digital Adoption: The Missing Link in Productivity Growth | Make UK

# REGIONAL LANDSCAPE AND STRATEGIC POTENTIAL OF RAS IN THE WEST MIDLANDS

The West Midlands, once at the heart of the Industrial Revolution, is a region with a rich history of driving economic growth through innovation. Today, governed by the WMCA, the region has set ambitious goals for a "green revolution", seeking to leverage digital innovation and sustainability as cornerstones of regional growth. Its strategy emphasises job creation in digital sectors, with the aim of revitalising the local economy and enhancing the quality of life for residents.

The region has made strides as a testing ground for technologies such as autonomous vehicles and 5G. Additionally, the presence of the Energy Systems Catapult positions the area as a notable player in the UK's transition to low-carbon energy solutions. Science, energy, and technology parks in the region bring a level of competitive strength, though these developments are yet to fully position the West Midlands as a clear leader compared to other innovation hubs in the UK and beyond.

WMCA's agenda for economic restructuring includes ambitious plans in digital innovation, building a net-zero economy, and boosting green manufacturing jobs. There is also a focus on maximising local job benefits from high-profile projects like HS2 and enhancing the region's digital and transport infrastructure.

For these initiatives to effectively transform the West Midlands into a sustainable economic powerhouse, the region needs to see increases in productivity across all sectors, including manufacturing, but also construction, public services, and more. The WMCA's approach is to leverage historic strengths and its strong manufacturing base to overcome modern challenges, such as meeting the net zero plans, labour shortages and the skills gap.[11] The benefits of increased focus and strategy for RAS in the region can have a significant positive impact in the future.

# THE MANUFACTURING POWERHOUSE

The West Midlands holds a unique position within the UK's economic landscape due to its rich industrial heritage and strategic geographical location. Historically known as the heart of the UK's manufacturing and automotive sectors, the region is home to leading industrial hubs, research institutions, and innovation centres. This positions the West Midlands as an important player in driving the nation's shift towards advanced manufacturing and automation.[12]

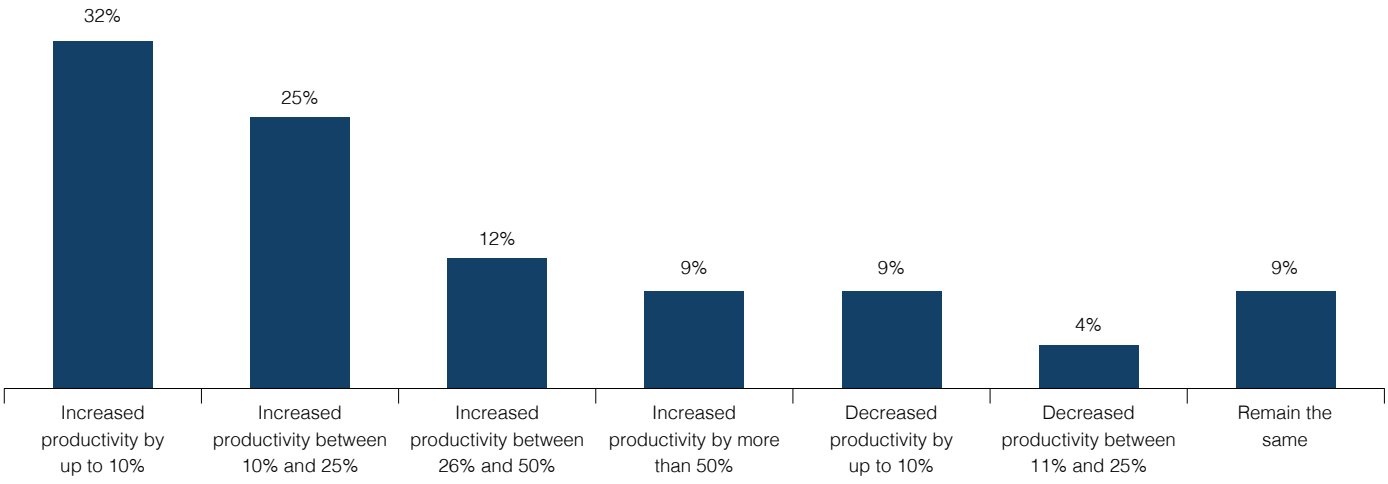
The region's focus on manufacturing, alongside its strong digital infrastructure and transport links and access to skilled labour, makes it a good location for the further adoption and development of RAS. The West Midlands also benefits from government initiatives and investment strategies aimed at fostering innovation and technological adoption, creating a fertile ground for the growth of RAS solutions.

Manufacturing sits strongly in the region's economy, contributing significantly to the UK's overall manufacturing output. The region has a strong industrial workforce: there are 12,700 manufacturing businesses in the region, with a higher-than-average concentration of jobs in manufacturing compared to other parts of the UK. This workforce is increasingly being upskilled to meet the demands of modern, automated manufacturing processes, supported by local training programmes and initiatives.

[11] West Midlands Combined Authority
[12] Industry 4.0 Green manufacturing: an enabler | Make UK

**Chart 3: Increase of productivity among manufacturers that automated their processes**

% companies citing productivity gains as a result of automation




Source: Make UK/Infor, Automation Survey (2023)

According to the Office for National Statistics (ONS), the manufacturing sector's Gross Value Added (GVA) across English regions in 2021 was as follows:

| Region | Manufacturing GVA (£ million) |
|---|---|
| North East | 7,500 |
| North West | 25,000 |
| Yorkshire and The Humber | 20,000 |
| East Midlands | 18,000 |
| West Midlands | 22,000 |
| East of England | 15,000 |
| London | 5,000 |
| South East | 20,000 |
| South West | 12,000 |

Source: ONS (April 2024)

As we can see, the North West and West Midlands are the top contributors. The North West reported a manufacturing GVA of £25 billion while the West Midlands follows closely at £22 billion, highlighting the region's strong industrial base. Yorkshire and The Humber, along with the South East, each contributed around £20 billion, reinforcing their roles as key players in the sector. In contrast, London's manufacturing GVA was substantially lower, at £5 billion, reflecting its focus on service industries over manufacturing. These figures underscore the importance of manufacturing in regional economies, particularly in the West Midlands and North West.

In Make UK's recent Innovation Report,[13] we can see the impact of automation on productivity reported by manufacturing firms.

The data shows that productivity changes among companies vary widely, with a significant number reporting positive gains. About one-third of the companies saw productivity increases of up to 10%, while nearly one-quarter experienced improvement of between 10% and 25%. Notably, some firms achieved significant productivity boosts, with smaller groups reporting increases of between 26% and 50% and more than 50%. On the downside, a small percentage of companies reported declines in productivity, most notably of up to 10% reductions, while a few saw drops of between 11% and 25%. Interestingly, a small number of firms noted no change in their productivity levels, indicating stability despite market shifts or operational adjustments.

[13] Future Factories Powered by AI | Make UK

## HISTORICAL SIGNIFICANCE IN MANUFACTURING

The West Midlands has a long history as the heart of the UK's manufacturing and industrial sectors and was often referred to as the "Workshop of the World" during the Industrial Revolution. This legacy has created a manufacturing-centric culture deeply engrained in the region's fabric. The area's historical prowess in sectors such as automotive, aerospace, and heavy engineering has evolved over the decades, adapting to the latest technological advancements and innovations in automation.

This strong industrial base is a crucial factor in the area's potential to lead the adoption of advanced RAS technologies. Businesses in the region have already made positive strides in embracing Industry 4.0 principles, integrating automation and robotics into their operations to enhance productivity and remain competitive globally; as we can see in the quantitative research, 80% of West Midlands manufacturers have invested in RAS. The evolution from traditional manufacturing to smart manufacturing models highlights the region's adaptability and readiness to invest in the future of automation.[14]

Historical expertise in and strong advanced manufacturing in automotive and aerospace sectors positions the West Midlands well to integrate new robotic technologies into its production lines. The automotive industry, in particular, has been a major driver of automation adoption, with firms like Jaguar Land Rover leading the way in implementing robotic solutions for production efficiency and quality control. However, as we can see from the Make UK survey (2024), SMEs are lagging behind the large global manufacturing giants.

Innovation metrics underscore the West Midlands' readiness to develop a thriving RAS ecosystem. The region has shown a consistent increase in investments in research and development (R&D), particularly in manufacturing and engineering. Reports indicate that 73.7% of businesses in the region have already invested in some form of automation technology, which is higher than many other regions in the UK.[15] This proactive investment approach demonstrates a robust appetite for technological advancement and automation.

## INVESTMENT IN AUTOMATION

Considering investment trends, Make UK research shows that approximately two-thirds of UK manufacturers have invested in some form of automation to increase output and improve efficiency, with 20% of businesses beginning to explore its benefits. Only a small portion (9%) have not yet taken steps towards automation but are planning to do so. On average, in 2023, manufacturers spent 4.1% of their annual turnover on automation technologies, which is lower than investments in other areas like plant and machinery (typically around 7%).[16]

[14]STEM Assets in the West Midlands: Digital Adoption: The Missing Link in Productivity Growth | Make UK
[15]The-role-of-universities-in-driving-overseas-investment-into-UK-Research-and-Development.pdf
[16]Digitalise to Decarbonise Report | Make UK

# REGIONAL ECONOMICS – WEST MIDLANDS

As RAS drive productivity in manufacturing, it is worth exploring the West Midlands' strategic potential for RAS adoption, leveraging insights from key reports on automation and digitalisation.

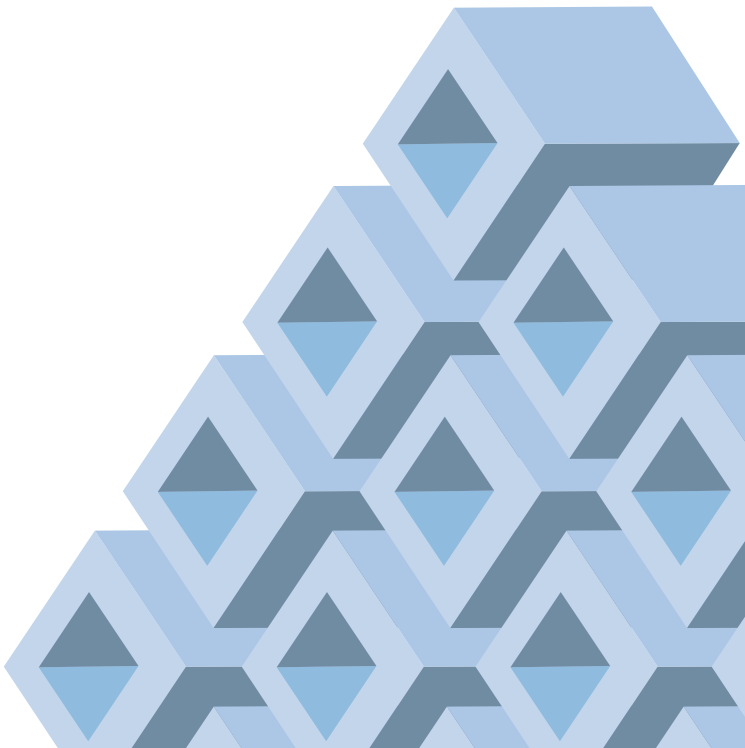
Productivity in the West Midlands has shown gradual improvement, but the region still trails behind the UK average, with levels typically ranging from 0% to 15% below the national benchmark. A few areas stand out, however: Solihull leads the region, with productivity at £45.20 per hour, having experienced strong growth of £15.40 per hour from 2004 to 2019. Warwickshire and Coventry also perform well, with productivity levels at £37.40 and £36.20 per hour respectively. We can presume these bright spots are caused by the presence of Jaguar Land Rover in Solihull and Coventry Technology Park in Coventry with the presence of the Manufacturing Technology Centre (MTC).

Despite these bright spots, the West Midlands as a whole lags behind high-performing regions like London, where productivity sits 26.2% above the UK average, and the South East, which maintains levels 10.8% higher than the national average. These differences reveal a stark productivity gap across the country, with much of the West Midlands facing lower-than-average productivity in many sectors. While some areas in the West Midlands are narrowing the gap, the region's overall position highlights the need for targeted efforts to boost productivity and address these regional disparities.[17]

The West Midlands has a robust technological foundation coupled with a skilled workforce and a well-established infrastructure, which collectively provide a significant competitive edge in the adoption and development of RAS. The region benefits from a network of universities and research institutions, such as the University of Birmingham, the University of Warwick, and Aston University, which focus extensively on engineering, robotics, and automation. These institutions not only drive innovation but also ensure a continuous pipeline of skilled graduates equipped to handle the complexities of RAS.

However, the weakness is the inequality between the strong spots and other subregions, and investment in R&D is uneven. Strong physical and digital infrastructure and access to skills would be beneficial to the success of the whole region.

The presence of innovation hubs and relatively new Innovation Accelerator programme and collaborative centres like the High Value Manufacturing Catapult and the MTC in Coventry further strengthens the region's technological capabilities. These facilities provide essential research, development, and testing environments for RAS technologies, enabling businesses to prototype and scale their automation solutions rapidly. The availability of such infrastructure positions the West Midlands as a focal point for industrial innovation, where companies can leverage cutting-edge facilities to enhance their RAS capabilities.



[17] Closing the productivity gap in the West Midlands - University of Birmingham

## INNOVATION CLUSTERS – COMPETITORS

Manchester and Bristol stand as two vibrant hubs of innovation, each shaping the future of its region through economic and social transformation.

Manchester Innovation Cluster has sparked impressive economic growth, largely attributed to its rich network of universities and research institutions. Since 2023, the University of Manchester alone has spurred ten new spinout companies, underscoring the region's commitment to job creation. Projections estimate a £3.8 billion economic boost and more than 100,000 new jobs as Manchester continues to attract government investment, particularly through the Innovation Accelerator initiative. Beyond economic figures, Manchester's commitment to societal uplift is clear. Health and digital sector advancements are actively working to bridge health inequalities, while educational initiatives are equipping locals with essential skills for tomorrow's workforce.

Bristol Innovation Cluster has distinguished itself with a dynamic focus on high-value sectors like fintech and robotics. This has led to a steady rise in high-skilled jobs, drawing both talent and investment into the area. With robust networks supporting continuous investment, the cluster benefits from affordable incubator spaces provided by the University of Bristol and its Robotics Laboratory, making it accessible to budding entrepreneurs. Socially, Bristol's innovation ecosystem is intrinsically tied to its cultural assets, which attract and nurture creative and entrepreneurial talent. The emphasis on inclusivity within Bristol's growth narrative ensures that its economic and social gains are shared across the community.

Together, Manchester and Bristol's innovation clusters not only drive economic prosperity but also enhance the social fabric of their communities, setting a powerful example of cities committed to sustainable, inclusive growth.

## AUTOMATION AND IMPACT ON JOBS

While there are concerns about the impact of automation on jobs, Make UK's Automation Report[18] suggests that it can lead to a shift towards higher-skilled roles rather than outright job losses. The focus is on redeploying the workforce to more productive and innovative activities that cannot be easily automated. The adoption of automation is seen as a step towards addressing the skills gap in manufacturing, as it can help fill roles that require repetitive tasks and allow workers to focus on value-added activities.

There is a perception that the UK, including regions like the West Midlands, is not currently leading in automation. Around 40% of manufacturers disagreed with the statement that the UK is a leader in automation, indicating that the perception of the UK's competitive edge in this area is weak.[19] This lack of recognition as a leader in automation could negatively impact investment decisions, particularly from foreign direct investment, as investors may see the region as less competitive compared to other Western counterparts.

Manufacturers, including those in the West Midlands, face significant barriers to adopting automation technologies. The primary challenges identified include a lack of technical skills, integration issues, high costs, and cultural resistance to change within organisations. Skills shortages and the need for technical expertise were highlighted as the most critical barriers, affecting the ability of both small and large businesses to integrate advanced automation systems into their processes.

The Make UK report on automation also emphasises the need for region-specific vision and strategy to encourage local businesses to start their automation solutions to take opportunities and increase productivity and profitability and to create good-quality jobs. Enhanced engagement with Catapult Centres and improved access to advisory services are suggested strategies to boost regional adoption rates and at the same time regional gross productivity.

[18]Manufacturing and Automation | Make UK
[19]Manufacturing and Automation | Make UK

## CURRENT RAS ADOPTION TRENDS AMONG WEST MIDLANDS COMPANIES, PARTICULARLY IN MANUFACTURING SMEs

The appetite for RAS adoption among companies in the West Midlands has been growing, especially within the manufacturing sector, which forms a significant part of the region's industrial landscape. SMEs in the sector are increasingly recognising the need to integrate automation to remain competitive in a rapidly evolving market. As mentioned, previous studies suggest that 73.7% of businesses in the West Midlands have already invested in some form of automation, positioning the region above many other areas in the UK in terms of technology adoption.

Despite this progress, the level of RAS adoption varies significantly among manufacturing SMEs. Larger manufacturing firms tend to lead in the adoption of advanced automation technologies due to better access to financial resources and a greater ability to absorb implementation costs. In contrast, smaller businesses often implement more slowly, exploring automation gradually and focusing on lower-cost solutions that offer immediate productivity improvements. This cautious approach reflects the desire to balance innovation with practical budgetary constraints, particularly where returns on investment must be seen swiftly.

## IDENTIFICATION OF KEY BARRIERS TO RAS ADOPTION IN THE LITERATURE

While the interest in RAS adoption is persistent, barriers continue to limit its widespread implementation, particularly among SMEs in the West Midlands. Key challenges include:

- **High implementation costs:** The initial costs associated with RAS technologies are one of the most significant obstacles for many SMEs. The expenses related to purchasing, integrating, and maintaining robotic systems can be prohibitive, especially for smaller firms with limited budgets. Although automation can lead to long-term savings, the upfront investment remains a substantial hurdle for companies not yet fully convinced of its cost-effectiveness.
- **Skills gaps and workforce challenges:** A lack of technical skills and expertise in robotics and automation is another major barrier. SMEs often struggle to find qualified personnel who can operate and maintain complex robotic systems, which limits their ability to maximise the potential of these technologies. Moreover, there is a need for upskilling the existing workforce to handle new roles created by automation, which involves additional training costs and time.
- **Technological limitations:** For some SMEs, the technological complexity of integrating RAS into their existing manufacturing processes poses a challenge. Issues such as system compatibility, scalability, and the need for customised solutions can slow down adoption. Technological barriers are more pronounced in companies that rely on legacy systems, which may require significant upgrades or replacements to support automation.
- **Resistance to change and organisational culture:** Cultural resistance within organisations is a less tangible but equally critical barrier to RAS adoption. Some businesses rely on traditional manufacturing methods, sometimes leading to a reluctance to embrace new technologies. This resistance often stems from fears about job displacement, disruptions to existing workflows, or concerns about the reliability of automated systems.

Addressing these barriers requires a multifaceted approach that combines training, financial incentives, and strategic partnerships. Potential solutions include:[20]

- **Training programmes and workforce development:** Investing in skills development is crucial to overcoming the technical skills gap in the West Midlands. Training programmes focused on robotics, automation, and digital technologies can help build a talent pool capable of supporting RAS adoption. Such initiatives include the Made Smarter programme, which aims to enhance digital skills in manufacturing and provide a structured pathway for companies to upskill their workforce, making them better prepared to handle new technologies.
- **Change management strategies:** Overcoming resistance to change requires a shift in organisational culture that emphasises the benefits of RAS, such as improved productivity, quality, and competitiveness. Engaging employees in the transformation process through transparent communication and training can reduce fears about job losses and highlight the new opportunities that automation can create. Leadership plays a crucial role in driving this change, promoting a forward-looking vision that aligns with the long-term goals of the company.
- **Government incentives and financial support:** To alleviate the high costs associated with RAS implementation, government incentives and subsidies play a vital role. Tax reliefs, grants, and low-interest loans for SMEs looking to invest in automation can significantly reduce the financial burden. Expanding initiatives such as the Made Smarter programme across the West Midlands would not only encourage digital adoption but also make RAS technologies more accessible to smaller firms.
- **Collaboration with technology providers:** Building partnerships with technology providers, research institutions, and industry associations can help companies gain access to affordable RAS solutions and expert guidance. Collaborative efforts, such as those facilitated by the High Value Manufacturing Catapult and the MTC in Coventry, enable SMEs to test, prototype, and integrate automation technologies in a cost-effective manner. These collaborations also provide opportunities for knowledge sharing and co-innovation, helping companies stay at the forefront of technological advancements.

## OPPORTUNITIES FOR A WEST MIDLANDS ROBOTICS AND AUTOMATION STRATEGIC PARTNERSHIP

Establishing a robotics and automation centre or strategic partnership – a body that will hold a vision for and oversee the needs and potential of the region in the West Midlands – shows potential to drive regional economic development and technological innovation. Research suggests that these partnerships, commonly known as clusters, can serve as significant drivers of industrial growth by concentrating expertise, resources, and infrastructure in one region, which accelerates innovation and enhances productivity.[21] Industrial clusters provide a structured environment where businesses can engage in collaboration and competition, leading to a shared knowledge base and a stronger, more resilient economic framework.[22]

The region's existing infrastructure and proximity to leading universities and research institutions further enhances the viability of such a cluster. Regions with established clusters of innovation tend to outperform those without, largely due to the benefits of agglomeration economies that facilitate the exchange of knowledge and expertise.[23] These conditions create a fertile ground for the development of a robotics and automation cluster that can leverage the West Midlands' industrial strengths and talent pool.

[20] Digital Adoption: The Missing Link in Productivity Growth | Make UK
[21] https://doi.org/10.17059/ekon.reg.2023-1-12.
[22] Full article: The dynamic impact of industrial cluster life cycle on regional innovation capacity
[23] xxxxxxxxxx

# ASSESSMENT OF A COORDINATED CLUSTER SUPPORTING MULTI-MODAL ROBOTIC SYSTEMS

A coordinated robotics and automation cluster in the West Midlands would significantly support the development and integration of multi-modal robotic systems. By creating a cohesive community that includes suppliers, integrators, and users, the cluster would facilitate streamlined communication and collaborative problem-solving. Research highlights the importance of clusters in fostering environments where interconnected firms and institutions can rapidly iterate on innovations, enhancing overall technology integration.

The presence of such a strategic partnership can also act as a catalyst for the development of new technologies by enabling businesses to pilot multi-modal systems in real-world applications, reducing time to market and increasing adoption rates. RAS can positively impact growth in sectors like Med-tech and increase efficiency in public services and social care alike. The dynamic nature of industrial clusters allows for adaptation to emerging technologies, making it possible to support a broad range of robotic solutions.

RAS clusters offer significant benefits to high-growth sectors, enhancing productivity, efficiency, and innovation. RAS technologies, such as autonomous robots and IoT sensors, have cross-industry applications in sectors like manufacturing, healthcare, and logistics, where they automate complex tasks and drive productivity gains.

Clusters foster collaboration, allowing sectors to co-develop tailored solutions, accelerate innovation, and share talent pipelines, particularly in engineering and AI (cited by Special Interest Group on Robotics and Autonomous Systems, 2014). RAS also strengthens supply chains through automation in inventory and logistics, benefiting sectors like retail and hospitality. Additionally, autonomous systems improve safety, especially in high-risk industries such as construction and energy.

Overall, RAS clusters establish regions as technology hubs, attracting investment and creating a competitive advantage for high-growth sectors by embedding cutting-edge, productivity-enhancing technologies into the local economy.

The role of the local authority, and in the West Midlands a combined authority, is crucial in supporting and governing RAS clusters in the region. Here are some ways they can help:

- **Facilitate collaboration:** Local authorities can bring together key stakeholders, including businesses, universities, and research institutions, to foster collaboration and innovation within the RAS cluster.
- **Provide funding and resources:** They can offer financial support through grants and incentives to encourage the development and adoption of RAS technologies. This can include funding for research and development, as well as support for startups and small businesses.
- **Develop infrastructure:** Investing in the necessary infrastructure, such as high-speed internet and advanced manufacturing facilities, can create an environment conducive to RAS innovation and deployment.
- **Promote skills development:** Local authorities can work with educational institutions to develop training programmes that equip the workforce with the skills needed for the RAS industry. This includes both technical skills and broader competencies like project management and innovation.
- **Regulatory support:** They can help navigate and streamline regulatory processes to make it easier for businesses to test and deploy RAS technologies. This might involve creating regulatory sandboxes or providing guidance on compliance.
- **Public awareness and engagement:** Raising awareness about the benefits of RAS and engaging with the community can help build public support and address any concerns about the impact of these technologies.

[24]Open Journal Systems
[25]Internationalization intensity of clusters and their impact on firm internationalization: the case of Poland
[26]How Robots Change the World - What automation really means for jobs, productivity and regions
[27]Economic impact of robotics and autonomous systems (RAS) across UK sectors

## BENEFITS OF A REGIONAL RAS CLUSTER IN ATTRACTING INVESTMENT AND FOSTERING INNOVATION

Creating a regional RAS cluster in the West Midlands could have substantial benefits in attracting investment and fostering innovation. Clusters are proven to enhance regional competitiveness by creating a favourable business ecosystem that attracts investments and encourages startups and established firms to scale their operations.[28] Clusters have been shown internationally to facilitate stronger ties between industry, academia, and research centres, which is essential for sustained innovation and technological progress.[29]

By fostering an innovation-driven ecosystem, the cluster can create synergies that accelerate the commercialisation of new technologies and solutions in robotics and automation. Studies indicate that such clusters not only draw financial investments but also enhance regional capabilities by developing a skilled workforce and encouraging continuous learning and knowledge-sharing within the community.[30]

Establishing an RAS Cluster in the West Midlands presents an opportunity to boost regional innovation, enhance technological integration, and create a cohesive community that drives economic growth. By coordinating efforts between suppliers, integrators, and users, and strengthening ties between academia, industry, and research centres, clustering can become a force in advancing the region in its next steps in robotics and automation.

## BENEFITS OF A REGIONAL RAS CLUSTER IN ATTRACTING INVESTMENT AND FOSTERING INNOVATION

The existing research on RAS understanding, particularly in the context of their adoption in regional areas like the West Midlands, is far from complete. One of the more notable gaps lies in the integration of robotics with local industries, as most studies primarily focus on broader industrial or global perspectives without addressing the specific challenges faced by regional clusters.[31] There is a lack of comprehensive frameworks that consider the unique economic and infrastructural conditions of the West Midlands, which can significantly influence the successful implementation of multi-modal robotic systems.

Another gap is the industry's limited understanding of the socio-economic barriers that hinder RAS adoption. While technical challenges have been extensively discussed, socio-cultural factors and their impact on technology adoption remain underexplored.[32] This gap suggests a need for research that goes beyond technical solutions and includes a deeper analysis of human factors, such as workforce skills, resistance to change, and management support in technology adoption.

[28] The Impact of Clusters on Regional Competitiveness
[29] SSA eLibrary: EVALUATION OF THE IMPACT OF CLUSTER STRUCTURES ON THE ECONOMY OF THE REGION
[30] Emerging robotic regions in the United States: insights for regional economic evolution: Regional Studies: Vol 52 , No 6 - Get Access
[31] Adaptive robotic manufacturing using higher order knowledge systems - ScienceDirect
[32] Robotics and automated systems in construction: Understanding industry-specific challenges for adoption - ScienceDirect

## LEADERSHIP AND MANAGEMENT IN UK MANUFACTURING

Make UK's report into leadership and management[33] found that in manufacturing, effective leadership is about more than just setting goals – it's about creating a united approach to achieving them. It requires a clear vision, ensuring that the entire workforce is invested in both the journey and the outcome.

The research showed that six in ten manufacturers said the right leaders are very important to adopting new technologies, and a further 80% said it cannot be achieved at all without the right leaders in place.

Other Make UK research highlighted the importance of good leadership in order to accelerate digital adoption. In fact, eight in ten manufacturers agreed with the statement, "Effective leaders are critical to adopting new technologies or green practices."

The disparity between academic research and industry application is a significant issue in the current landscape. There is often a delay or a mismatch between the innovations developed in academic settings and their practical application in industries, particularly in the construction and manufacturing sectors. Bridging this gap requires targeted research that aligns academic outputs with industry needs, focusing on scalable and cost-effective solutions.

## RECOMMENDATIONS FOR FUTURE RESEARCH

To address these gaps, future research should focus on several key areas to support strategic decision-making for RAS adoption in the West Midlands:

1. **Regional-specific research:** There is a need for local studies that focus specifically on the West Midlands' industrial and economic landscape. Understanding the local context will help in developing strategies that are more applicable and beneficial to the regional industries.[34]
2. **Socio-economic factors:** Research should prioritise investigating socio-economic barriers to RAS adoption, such as workforce development, training, and skill gaps. Understanding these factors will be instrumental in creating educational and training programmes that prepare the workforce for automation integration.
3. **Industry–academia collaboration:** There should be an increased focus on aligning academic research with industry needs to enhance technology transfer and commercial applications of robotics. Collaborative initiatives that include both academia and industry stakeholders will facilitate the seamless integration of innovative robotic solutions.[35]
4. **Integration of advanced technologies:** Future research should explore the integration of digital technologies, such as AI and machine learning, with RAS to develop more intelligent and autonomous systems that are adaptable to the evolving needs of West Midlands industries.

Addressing these research gaps will require a multifaceted approach that includes technical, socio-economic, and policy-oriented studies. Focusing on these areas will create the conditions suitable to establish a robust RAS cluster that drives innovation, economic growth, and regional competitiveness. This comprehensive approach will not only benefit the West Midlands but also serve as a model for other regions aiming to integrate robotics and automation into their industrial frameworks.

[33] Leadership and Management Skills | Make UK
[34] Mapping out research focus for robotics and automation research in construction-related studies: A bibliometric approach | Emerald Insight
[35] Impact of robotics on manufacturing: A longitudinal machine learning perspective - ScienceDirect

# Part II:
# SWOT Analysis on the West Midlands' Further Future Adoption of RAS Within the Local Production Ecosystem

## STRENGTHS

**Industrial and manufacturing heritage:** As one of the UK's most established manufacturing hubs, the West Midlands has a strong historic base in industries like automotive, aerospace, and heavy engineering, positioning it favourably compared to regions with a less dense concentration of manufacturing firms, critically with a diverse line-up of manufacturing sub-sectors. The varied and established nature of the sector within the area make it an ideal region for scaling RAS adoption, as cross-pollination and naturalised clustering effects are more likely than in other areas of the UK where there is a less dense spread of production industries.

**Strong research and educational ecosystem:** With well-known institutions like the University of Birmingham, Warwick Manufacturing Group, and the MTC, among others, the West Midlands has an edge over other regions in terms of advanced manufacturing research and skills development, not least in the number of institutions peripheral to advanced manufacturing. These institutions support innovation through applied RAS research/ implementation and talent development, contributing to the region's long-term sustainability in automation.

**Geographic and transport advantage:** With a central geographic location within the UK, the West Midlands offers strategic proximity to both northern and southern manufacturing hubs. This centrality facilitates efficient logistics and supply chain management, positioning the region as an ideal location for RAS development concentration on a national scale beyond just the potential local benefits of hosting an advanced RAS ecosystem.

**Supportive local government and initiatives:** The WMCA has demonstrated a commitment to driving digital transformation, industrial growth, and skills development, providing regional support that complements national efforts like Made Smarter. This local government engagement sets the West Midlands apart from other regions where regional support may be less focused on manufacturing and creating the ideal conditions for the next generation of productivity to flourish.

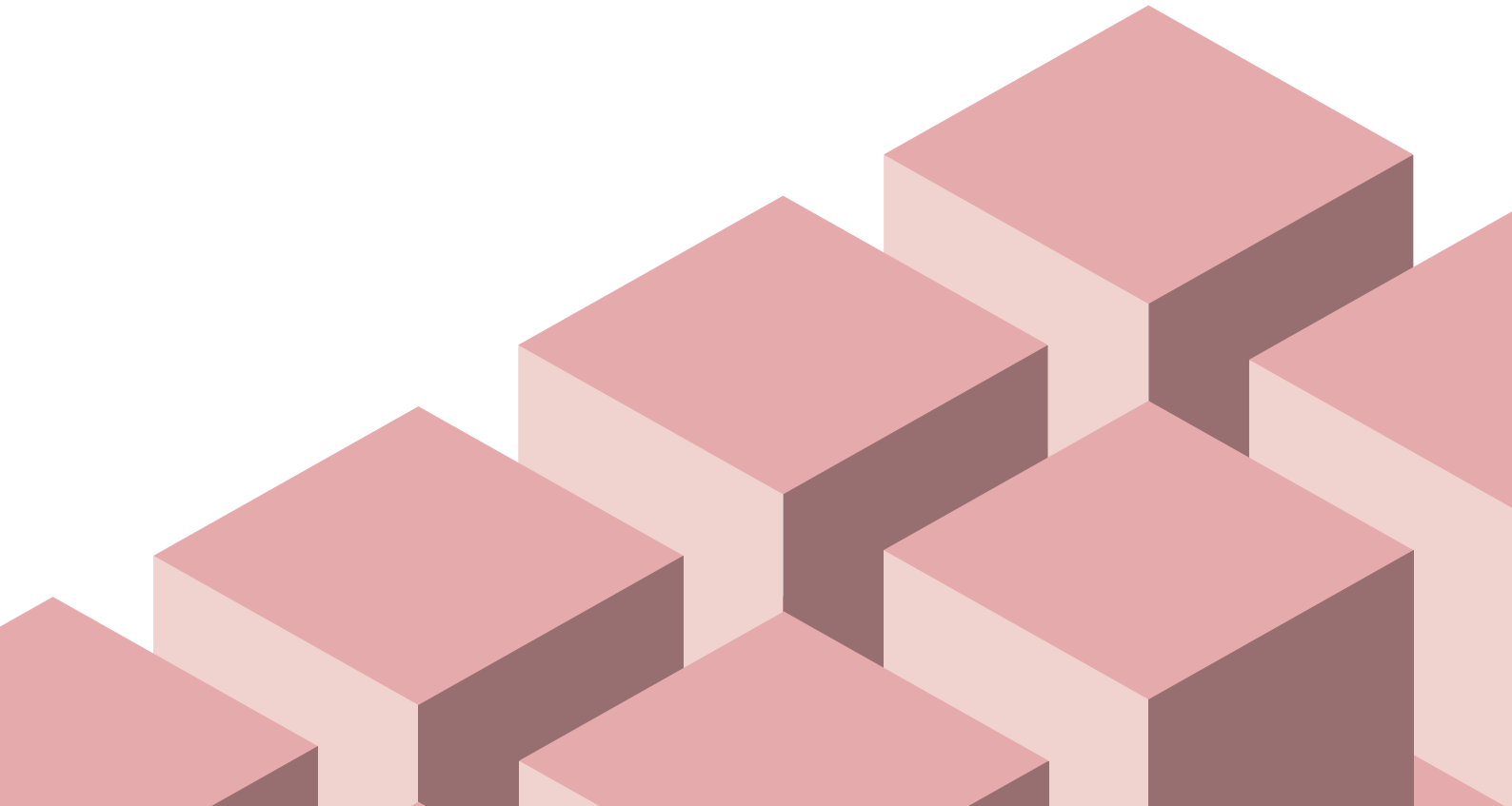
## WEAKNESSES

**Limited financial flexibility for SMEs:** As with other UK regions, SMEs in the West Midlands face significant cost barriers to RAS adoption. The high upfront capital investment required to implements RAS technology in a business can be especially prohibitive for smaller firms, as this study's fieldwork reveals, resulting in slower adoption rates. Relative to larger, more capitalised regions like the South East, where businesses may have greater access to capital and financial resources, potentially benefiting from the propensity for greater capital investment when proximal to the capital.

**Skills gap in automation specialisations:** While the West Midlands has a robust industrial workforce in relative terms, the region, like much of the UK, lacks sufficient automation-specific skills, such as robotics programming and systems integration. This shortage hinders businesses' ability to implement RAS effectively, leaving the West Midlands with a potential disadvantage compared to regions that are better positioned to fill these roles quickly.

**Risk of fragmented support resources:** Though the WMCA and institutions like the MTC provide valuable support, smaller companies in the region often face challenges in navigating the fragmented landscape of grants, training programmes, and R&D resources. This fragmentation can slow adoption relative to regions with more centralised support networks, established clusters, or tailored programmes for automation.

**Comparative investment aversion:** UK manufacturers, including those in the West Midlands, often adopt a short-term financial outlook. This cautious approach can be more pronounced in the region's SMEs, which, as the study's data shows, lack the confidence or risk tolerance for substantial RAS investments, especially when compared to larger, globally competitive regions. Despite the historic establishment of the sector within the region being highlighted as a benefit for other reasons, this same history and tradition can be highlighted as a weakness with regard to propensity to commit to "risky" capital investment relative to historic practices. Manufacturers in the region are more likely to fund capital investments through past profits, unlike international competitors, than to seek external finance, which places the region's sector at an available capital pool disadvantage if this tradition of rendering investment, particularly within SMEs, is maintained.



# OPPORTUNITIES

**Positioning as a national RAS hub:** With its nationally renowned manufacturing base and strong academic–industrial partnerships, the West Midlands is well positioned to become a national leader in RAS adoption. By developing dedicated robotics clusters and innovation hubs, the region can enhance its appeal as a go-to location for RAS technology nationally, offering a unique advantage over regions with less-established industrial bases and inferior geographic accessibility. The weaknesses identified in both the SWOT analysis and the fieldwork suggest that the region holds sufficient untapped potential in the growth of RAS adoption by production industries if the causes of adoption shortfalls were to be addressed.

**Leveraging national funding initiatives:** Expanding the access to Made Smarter funding in the West Midlands would support SMEs in financing RAS integration through increasing its scale. While the current £1.9m commitment that was launched in 2021 blazes the right path to see enhanced RAS adoption, programme capital commitments are insufficient to drive change at region-wide level. The region can also work with national government to develop tailored RAS incentive programmes, positioning itself competitively against regions like the North West which was an earlier recipient of automation-focused government backing.

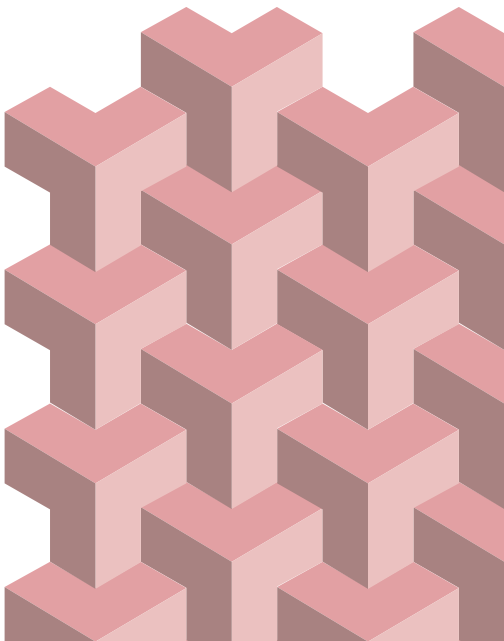
**Growing market demand for automation in key sectors:** The West Midlands' strength in automotive and aerospace manufacturing aligns with the growing global demand for automated solutions in these industries. As these sectors increasingly embrace RAS, the West Midlands can embrace these market conditions to attract further investment, from both domestic firms and international manufacturers seeking a UK-based RAS-friendly hub.

**Collaboration with regional RAS leaders:** Collaborating with RAS leaders in other UK regions, such as the North West and the South East, could foster national RAS standards, interoperability, and best practices. This would support a more unified UK-wide adoption of RAS and increase the region's appeal for businesses looking for cross-regional expertise in automation.

**Digital infrastructure:** The West Midlands is harnessing the power of 5G technology to transform public services, improve safety, and make daily life more efficient. Through a comprehensive 5G road sensor network, real-time traffic monitoring helps manage incidents, ease congestion, and guide better road design. This project has set new standards in data collection and traffic management. For drivers, real-time parking availability information reduces congestion and improves air quality, offering faster journeys and easier access to city centres.

In healthcare, the region introduced the UK's first ultrasound over 5G, enabling remote diagnostics and consultations, which enhances healthcare accessibility and delivery.

Looking ahead, WM5G is expanding 5G and fibre networks in collaboration with local authorities and mobile providers to secure strong regional coverage. Ongoing pilot projects continue to explore 5G's potential across various sectors, from transport to public services, underscoring the West Midlands' commitment to using technology to drive innovation, elevate public services, and enhance residents' quality of life.



## THREATS

**Competitive pressure from other UK regions:** Regions like the North West and South East, which also have strong manufacturing bases and RAS support initiatives, pose competitive threats to the West Midlands with regard to the establishment of national RAS excellence. Without continued and focused support, the West Midlands may appear comparatively less attractive, particularly for multinational firms and foreign investment which may consider alternative regions that offer similar resources or more concentrated government incentives.

**Economic uncertainty and potential funding limitations:** Economic volatility and budget constraints within local and national government can impact available support for RAS adoption. Reduced funding for programmes like Made Smarter could slow the momentum for RAS uptake in the West Midlands, making it difficult to achieve a critical mass of capital backing that will inevitably be required for increased RAS prevalence. This uncertainty can shake the confidence of already under-investing production businesses in the region relative to their international peers.

**Technological obsolescence:** Rapid advancements in RAS mean that some systems can quickly become outdated, especially if businesses initially opt for lower-cost solutions that lack scalability. This risk is particularly relevant to SMEs in the region who may choose more affordable RAS options, only to face integration or replacement issues in the future. This challenge could deter smaller firms from RAS adoption altogether, through fear of the potential costs of upgrading. The bespoke nature of many RAS applications naturalises some of the risk into the technology itself, stimulating an environment of lenders apprehensive of providing as much support as they otherwise might if the residual value of investments was higher, or if the return on investment carried a higher guarantee.

**Workforce resistance and cultural barriers:** Despite the long-standing manufacturing culture of innovation in the West Midlands, workforce resistance to RAS adoption remains a potential threat. Concerns about job displacement, especially in the region's traditional industries, creates resistance to automation initiatives that requires addressing, as it impacts adoption rates relative to regions with a more flexible or technology-oriented workforce. The ageing workforce within the production sectors in the region compounds this challenge, as it does nationally: as the proportion of the workforce that approaches retirement age increases, the propensity for interest in developing new skills or retraining will likely fall.

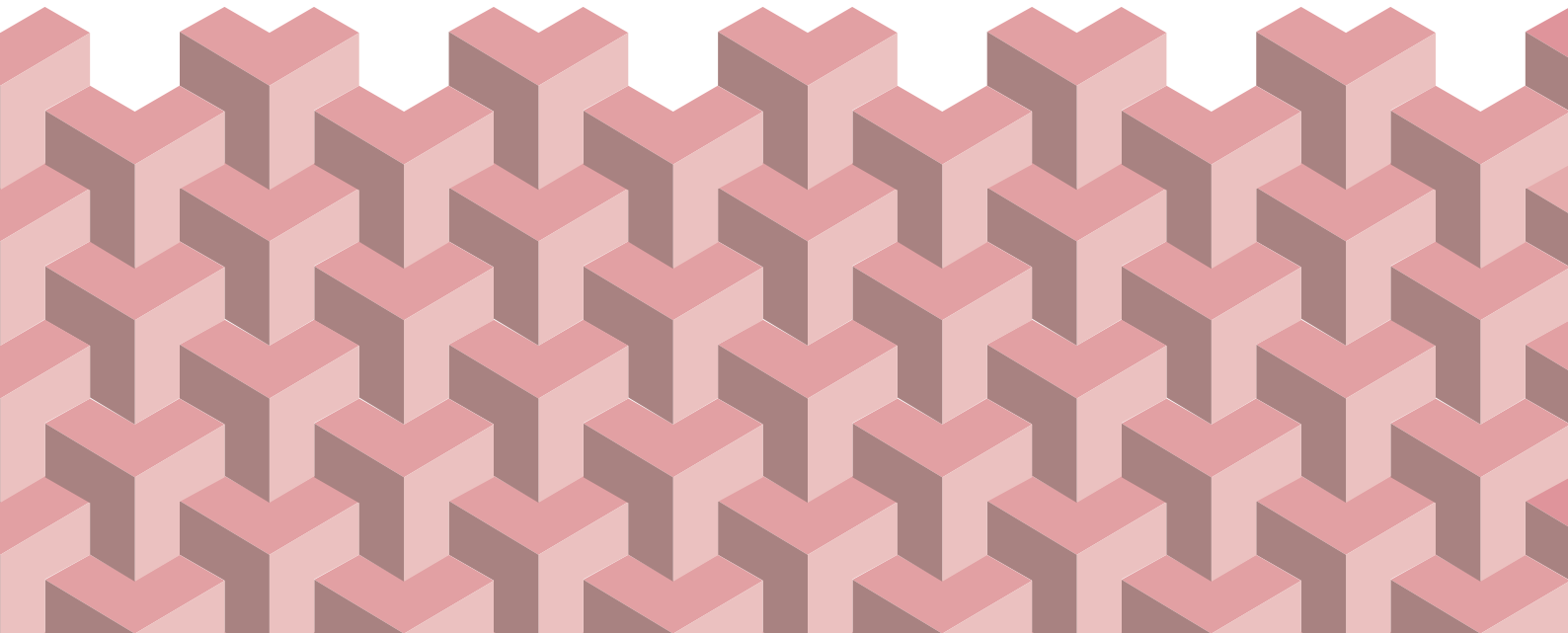
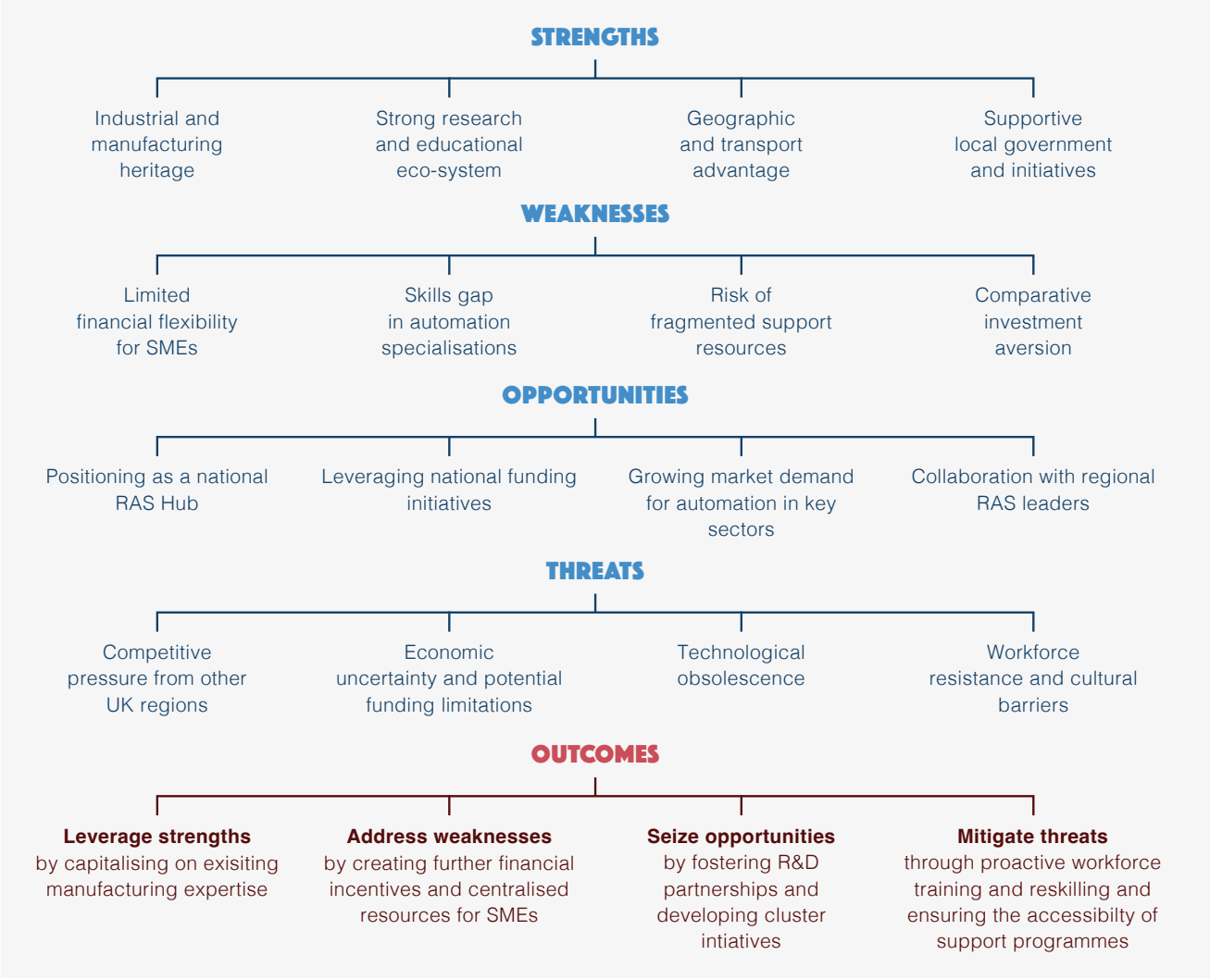


**Chart 4: Visual representation of the core themes emerging from a SWOT analysis on the suitability of the West Midlands for further RAS adoption**




## STRATEGIC RECOMMENDATIONS EMERGING FROM SWOT ANALYSIS

**1. Develop a centralised RAS support hub**
- Establish a dedicated robotics and automation cluster within the West Midlands to create a central hub for RAS expertise, training, and collaborative research, further distinguishing the region from other UK (and international) competitors.

**2. Expand financial support programmes**
- Advocate for additional regional funding and partnership with national initiatives to provide financial incentives and RAS-specific grants for SMEs, reducing the cost barrier to entry and fostering greater adoption rates across business sizes.

**3. Enhance training and upskilling programmes**
- Develop RAS-focused training curricula within local educational institutions and offer industry-recognised certifications. Strengthen partnerships with local universities to address the skills gap, helping the West Midlands workforce to be on par with or even to surpass other regions in RAS competencies.

**4. Foster national and international collaborations**
- Work with other UK regions that are strong in RAS to share insights and develop best practices, and explore international partnerships to position the West Midlands as a preferred destination for automation investment.

# Part III:
# Primary Research into the West Midlands RAS Landscape

As part of this report, primary research was undertaken through one-to-one engagement with West-Midlands-based businesses, focus groups, and a large piece of fieldwork. In total, 135 businesses in the region were involved in what was the largest study in RAS within the region by industry engagement.

This section of the report details those findings, identifying the progress to date, benefits, and challenges in RAS adoption seen by the production industries within the region, quantitatively identifying the best interventions to enhance the RAS adoption rate within the region.

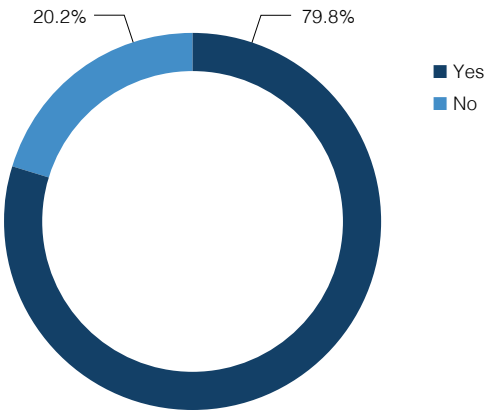
## RAS PREVALENCE IN THE WEST MIDLANDS MANUFACTURING ECOSYSTEM

Looking at overall reported adoption, RAS is prolific in West Midlands manufacturing businesses. Of course, the degree of advancement of these technologies within these businesses varies, but a large majority of eight in ten manufacturers in the region report having RAS incorporated into their operation in some form.

Despite this large proportion, the figure likely overrepresents the advancement of the deployment of RAS within the West Midlands' manufacturing ecosystem. Further expenditure data collected in this fieldwork reveals that the net levels of investment, particularly from SME businesses, which make up the majority of the region's manufacturing business population, signal entry levels of RAS adoption for most of these firms within the study.

An example of a simple use could be a basic robotic arm on an assembly line. This robotic arm might perform repetitive tasks such as picking up parts and placing them into a machine or packaging products. It operates

**Chart 5: Reported RAS adoption by manufacturers in the West Midlands is high**




Source: Make UK RAS Survey (September 2024)

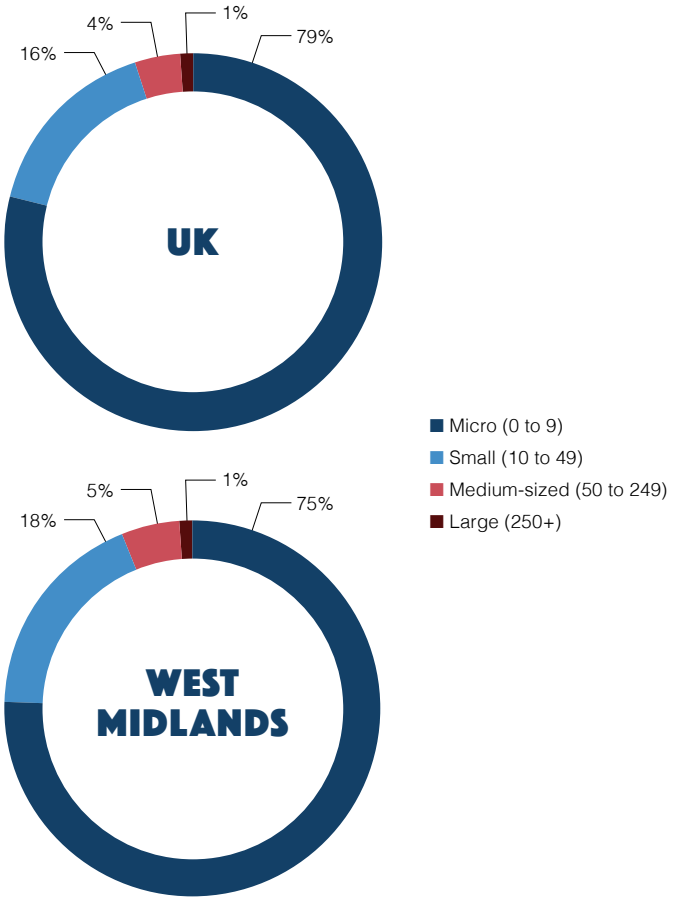
in a pre-programmed manner, following set instructions without any real-time decision-making.

As an example of advanced use, a manufacturing facility might employ a network of AI-powered robots integrated with the Internet of Things (IoT). These robots not only perform complex tasks but also communicate with each other and other machines to optimise the production process in real time. For instance, autonomous mobile robots might transport materials throughout the facility while using machine learning algorithms to avoid obstacles and reroute themselves.

## DOES RAS ADOPTION IN THE REGION VARY BY COMPANY SIZE?

By manufacturing business population – in other words, the number of individual businesses and not the respective value generated – manufacturing in the UK is heavily SME dominated. Nationally, SME manufacturers account for 99% of the business population, according to the definition of companies with fewer than 250 employees.[36] The West Midlands manufacturing business size distribution is in keeping with the national average, albeit with a slightly greater lean towards small and medium businesses, as opposed to micro-enterprises.

**Chart 6: UK manufacturing business size distribution compared to the West Midlands**




Source: ONS (2023)

Given this, it's particularly important to consider RAS adoption levels in the region through the lens of enterprise size. There are a multitude of ways to proxy for enterprise size, such as headcount, turnover, or capital value; however, to maintain ease of comparison with other SME data sets, stratification by headcount is used in this analysis to define company size.

When we cut the fieldwork data by company size, we see the adoption rate for RAS drops to 55% relative to the overall sample that reported an adoption rate of 80%. Nevertheless, the slim majority of SME manufacturers in the region report to have RAS incorporated in their operations in some form.

**"RAS adoption by SME manufacturers in the West Midlands is just over 50%"**

[35]ONS UK business counts data 2023 – UK Business Counts – enterprises by industry and employment size band. Accessible at Nomis - Official Census and Labour Market Statistics (nomisweb.co.uk)

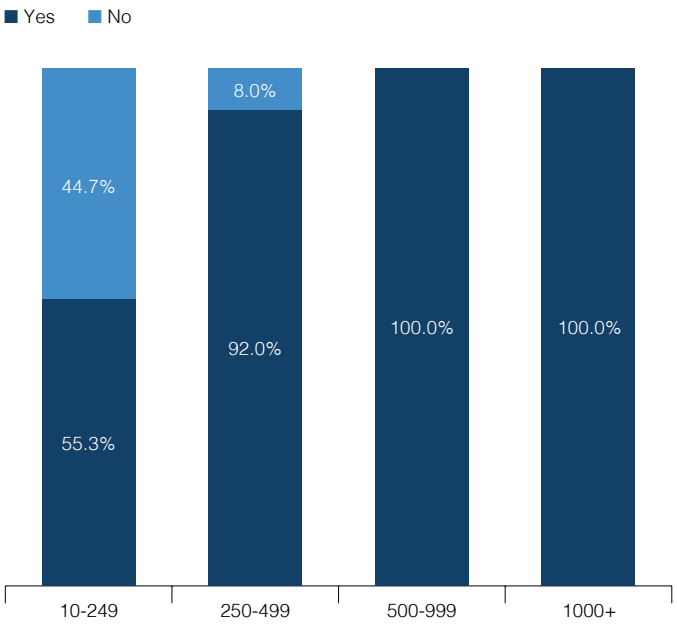
The full company size spectrum of adoption in the region shows that the propensity for RAS to be adopted increases with company size, where its adoption becomes universal in the data in companies with headcounts greater than 500. RAS adoption in the 250–499 headcount band of West Midlands manufacturers is reported to be at 92%.

RAS adoption (among other similar activities which require capital investment) is often greater in larger manufacturing companies than in SMEs due to systemic factors related to resources, economies of scale, and long-term strategic goals. Larger companies typically have more significant financial resources to invest in advanced RAS. Implementing RAS often requires considerable upfront capital for purchasing equipment, integrating the technology into existing workflows, and training employees. For large manufacturers, these costs can be absorbed more easily as part of long-term investments aimed at increasing productivity, reducing labour costs, and improving efficiency. SMEs, on the other hand, may struggle with these initial expenses, especially if their margins are thinner or they lack access to funding. As a result, smaller businesses are often slower to adopt new technologies that demand substantial financial outlay.

Large manufacturers could be expected to achieve greater economies of scale with RAS technologies. For high-volume production lines, automating processes through robotics allows large firms to maximise output while minimising per-unit costs, particularly in industries like automotive or heavy manufacturing. The larger the production scale, the more beneficial and cost-effective automation becomes, enabling these companies to recoup their investments faster, while making the internal business case for enhanced RAS adoption stronger. In contrast, SMEs, which often operate on smaller scales or produce specialised products on a bespoke contract-engineering basis, may not see the same return on investment from adopting RAS. In such instances, companies may prioritise flexibility and customisation over mass production, meaning the high degree of standardisation offered by RAS may not suit the business models as effectively.

The largest companies typically are afforded opportunities to focus on long-term strategic advantages, including supply chain optimisation and future-proofing their operations through digital transformation. As RAS technologies evolve, larger manufacturers are better placed to leverage data, predictive maintenance, and AI-driven systems to enhance efficiency. SMEs will likely be more focused on immediate operational needs and short-term results, which can delay their adoption and subsequent initial financial outlay for emerging technologies like RAS.

**Chart 7: Reported RAS adoption by manufacturers stratified by company size in the West Midlands**




Source: Make UK RAS Survey (September 2024)

This disparity in strategic focus means that larger firms will be early adopters of RAS, while SMEs follow once the technologies become more accessible and proven in the market.

International ownership and the differences in capital availability and corporate vision may also have an impact on RAS adoption. As part of the quantitative fieldwork, businesses were stratified by their ownership structure – critically, whether they are solely a UK entity or are foreign-owned.

- 82% of the fieldwork participants reported to be UK owned, with the remaining 18% reporting to be a foreign enterprise with a UK presence.
- Of the 82% that were UK companies, 56% reported to be solely UK based, with 26% saying they were UK based and complemented by international subsidiaries.

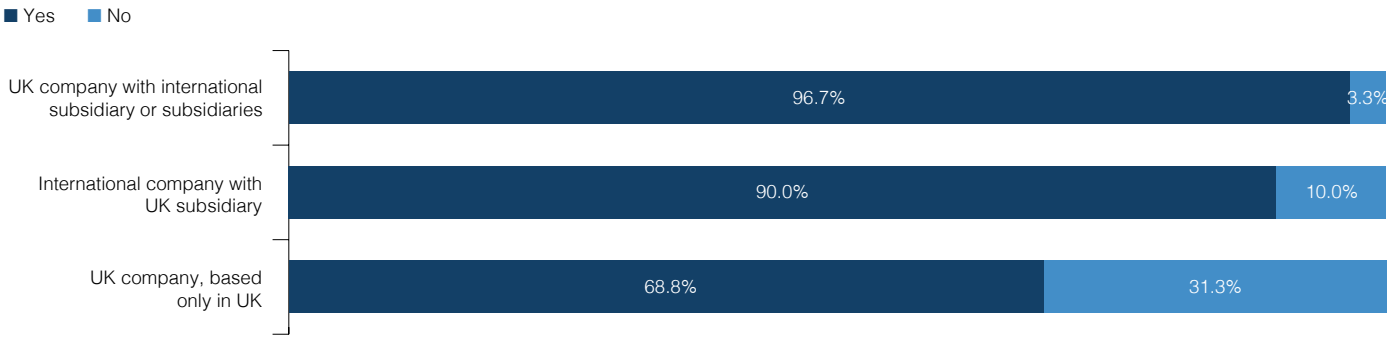
A significant disparity emerges in the rates of RAS adoption by manufacturers in the region who are solely UK based in comparison to those who either own foreign subsidiaries or are themselves a subsidiary of a foreign firm. There is of course an endogenous effect at play here also, as those companies who have international involvement are also likely to be larger companies. Nevertheless, this data may reveal a difference in the propensity for RAS adoption based on international variances of attitudes towards digitalisation in manufacturing.

In those West Midlands manufacturing firms with international involvement, both categories report RAS adoption of more than 90%. UK companies with an international presence report the highest rates of adoption, at 97%, whereas international companies with a UK presence report RAS adoption at 90%. The rates of RAS adoption drop drastically to 69% for companies that report to be solely UK owned and based.

What may be contributing to RAS adoption being lower among solely UK-based manufacturers compared to those with an international presence is a difference in investment patterns and a varying propensity to make innovative business investments. Companies with international involvement often have access to broader markets, larger customer bases, and higher revenues, which enable them to invest more heavily in advanced technologies like RAS. These firms typically face stiffer competition in global markets and must meet international standards of efficiency, productivity, and quality to stay competitive. Subsequently, international firms are more likely to invest in RAS to optimise their operations, reduce costs, and remain agile in the face of this global competition. The heightened requirement to maintain a competitive edge leads to a higher adoption rate of cutting-edge technologies compared to their solely UK-based counterparts.

UK-based manufacturers that do not operate internationally may be more conservative in their investment strategies. Without the pressure of competing in global markets, these firms are more likely to be prioritising cost containment and immediate returns over long-term investments in innovation. International firms often have greater access to finance, which allows them to commit more capital to RAS technologies. Solely UK-based firms will have more limited access to capital, making it harder for them to justify the significant upfront costs associated with RAS, as further data from this study reveals. International companies often benefit from exposure to regions with a stronger culture of technological innovation and may adopt best practices from more advanced manufacturing markets, whereas UK-based firms may not feel the same urgency to innovate at the same pace. This combination of limited capital and a more conservative investment approach could explain the lower RAS adoption rates among solely UK-owned manufacturers.

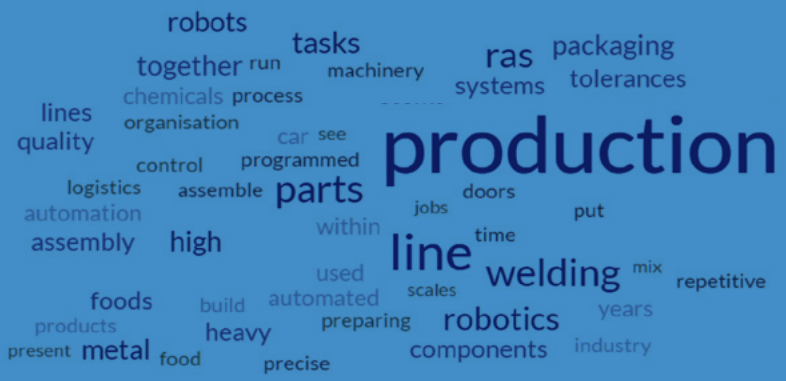
**Chart 8: West Midlands manufacturers who have international involvement have a higher propensity to have RAS in their operations**




Source: Make UK RAS Survey (September 2024)

## RATIONALE FOR RAS ADOPTION OR LACK THEREOF

To add qualitative insight to the fieldwork, two focus groups, five one-to-one interviews, and written responses were collected to support the survey data collected from West Midlands manufacturers. Short written responses were gathered from manufacturers to help reveal how, or why not, RAS had been adopted in their operations.




Source: Make UK RAS Fieldwork (September 2024)

The adoption of RAS is reportedly widespread in the region, but its application varies significantly depending on the complexity of the operations and the needs of the business. The responses show a spectrum of RAS use, ranging from basic automation to more advanced, fully integrated systems. The following sections give an overview of the written responses, placing them into three categories of complexity and highlighting common themes observed.

### Basic use of RAS

Many businesses have adopted RAS for repetitive, labour-intensive tasks that require precision but are too tedious or heavy for human workers, or in situations where the labour is better used for a more advanced task within the business. For instance, robots are used extensively in welding, with plenty of businesses mentioning that RAS handles all their welding operations, particularly for assembling heavy metal components with precise tolerances. This is highlighted in industries such as the automotive sector, where precise assembly is vital. Some manufacturers also use RAS for simpler tasks such as glueing components and packaging, showing that even basic applications are of value for their ability to streamline repetitive tasks and improve efficiency.

### Intermediate use of RAS

Some manufacturers are using more sophisticated systems that integrate automation with visual inspection and measurement systems. For example, some manufacturers mentioned using an automated visual inspection system, which, while not fully autonomous, is a step towards more advanced quality control processes. Other businesses are integrating cobots (collaborative robots), which work alongside humans in assembly tasks, especially for handling hot metal components or performing the assembly of intricate electronic parts. Cobots offer flexibility and efficiency, particularly for businesses that need adaptable automation solutions for variable tasks.

Cont.

### Advanced use of RAS

At the more advanced end, businesses are reporting using AI-driven systems for autonomous production machinery that can be pre-programmed to run independently, in order to optimise production cycles and reduce human intervention. In these instances, RAS systems can handle entire production lines, from material handling to quality control, ensuring high consistency and productivity. Data acquisition systems that monitor production line parameters in real time are also reported to be used, demonstrating a trend towards smart manufacturing, where data and automation combine to enhance decision-making and efficiency. Some businesses are even engaging in RAS R&D, aiming to innovate and expand their use of robotics for more complex and intelligent tasks in the future while bringing the innovation capacity in house.

### Common themes

Most manufacturers highlighted the role of RAS in increasing the quality of production by ensuring high precision, particularly in industries where high tolerances are required. The responses suggest that manufacturers are optimistic about the future of RAS and recognise the potential for new technologies to further improve safety, efficiency, and reliability in their operations.

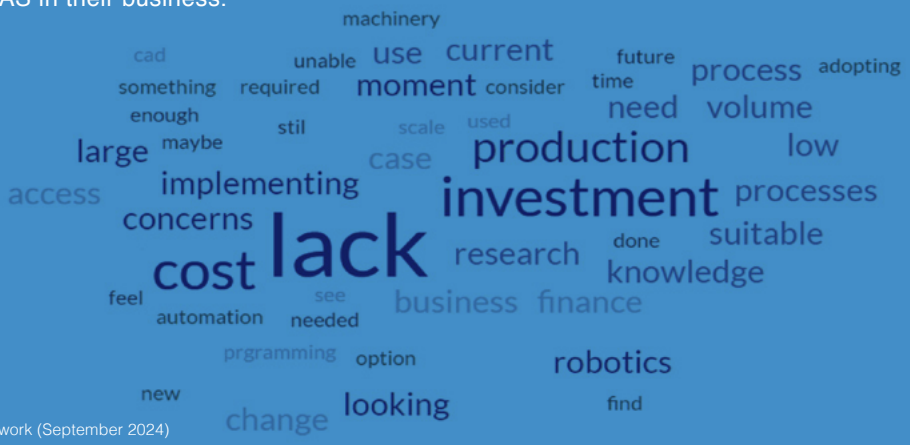
Companies are reporting employment of RAS at varying levels of sophistication, from basic automation of repetitive tasks to advanced, fully autonomous systems. The widespread use of RAS for tasks such as welding, assembly, packaging, and quality control indicates that these systems have been instrumental in enhancing both productivity and precision across subsectors. As new technologies emerge, many businesses suggest that they are keen to explore further advancements in the technology.

Contracts Engineering Ltd (CEL), one of South East England's largest steel and aluminium fabricators, demonstrates how culture change and digitalisation can transform a traditional SME. CEL fosters a strong, team-oriented, customer-focused culture, boasting low staff turnover rates of 5–10% per year, well below the UK manufacturing average of more than 25%. This supportive environment has enabled CEL to embrace new technologies like fibre optic lasers, CNC machines, and ERP software, alongside regular training.

Since BAMUK Group's acquisition in 2012, CEL's workforce has grown by more than 50%, with average pay rising more than 20%, including a bi-annual profit share. CEL's commitment to upskilling mitigates employee fears of job loss to automation. When CEL introduced its first robotic MIG welding plant in 2020 – more than twice as fast as manual welding – the team was reassured with extensive training. Welders learned to program the robot, while others advanced their skills in specialised techniques. Case studies from outside the West Midlands still hold relevance for the region, particularly when considering the impacts of RAS within the business walls and with regard to impact on the workforce.

## NON-USE OF RAS

Written responses by the participants of the study explaining why they are explicitly not using RAS in their operations were fewer in number than those statements that explained how it was being utilised, although proportionally consistent with the quantitative data from the survey revealing the proportion of the sector in the region that have RAS in their business.




Source: Make UK RAS Fieldwork (September 2024)

The written responses highlight several themes that explain why some manufacturers in the West Midlands have not yet adopted RAS in their operations. These reasons reflect a combination of financial, operational, and knowledge-based barriers, with cost concerns being the most frequently mentioned obstacle.

### Cost and investment constraints

One of the most cited reasons for non-adoption of RAS is the cost of investment. Many respondents cited the high upfront costs associated with implementing RAS as prohibitive, particularly in the business environment of the past few years. Statements such as “cost concerns” and “the cost of adopting new machinery isn’t something we can consider in current climate” point to financial limitations that make RAS seem inaccessible for smaller or resource-constrained businesses. Several companies noted a lack of internal financial resources or insufficient investment from ownership, which limits their ability to explore advanced automation technologies. The cost barrier is compounded by limited access to capital by some, making it difficult for those businesses to justify or finance the investment in digital transformation, despite recognising the potential long-term benefits.

### Perception of limited need

Another recurring theme is the perception that RAS is not necessary for the current scale or nature of some manufacturers’ operations. Several businesses mentioned that their processes are either low volume, high variety, or bespoke and technical, making automation seem unnecessary or unsuitable for their needs. Businesses with highly customised production processes often find that the set-up times and inflexibility of automated systems are not conducive to their operations. One respondent highlighted “low volume custom designs … our equipment is however full of robotics”, indicating that while they utilise robotics in specific areas, fully adopting RAS for all operations isn’t seen as practical. Some manufacturers simply feel that their processes are too simple or not complex enough to benefit from RAS adoption at this stage.

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### Knowledge and capability gaps

A lack of understanding and internal expertise is also a significant barrier to RAS adoption. Several responses pointed to limited knowledge about how RAS could be integrated into existing processes and whether it would provide tangible improvements in productivity or on-time-in-full performance. For example, some respondents noted a lack of suitable use cases, insufficient research, and concerns over the complexity of introducing new systems into their operations. Others mentioned limited internal resources with the capability to lead such a transition, highlighting that businesses may struggle to adopt RAS due to a skills gap or "vision gap" in robotics and automation within their workforce.

## THE BENEFITS AND CHALLENGES OF RAS ADOPTION IN WEST MIDLANDS MANUFACTURING

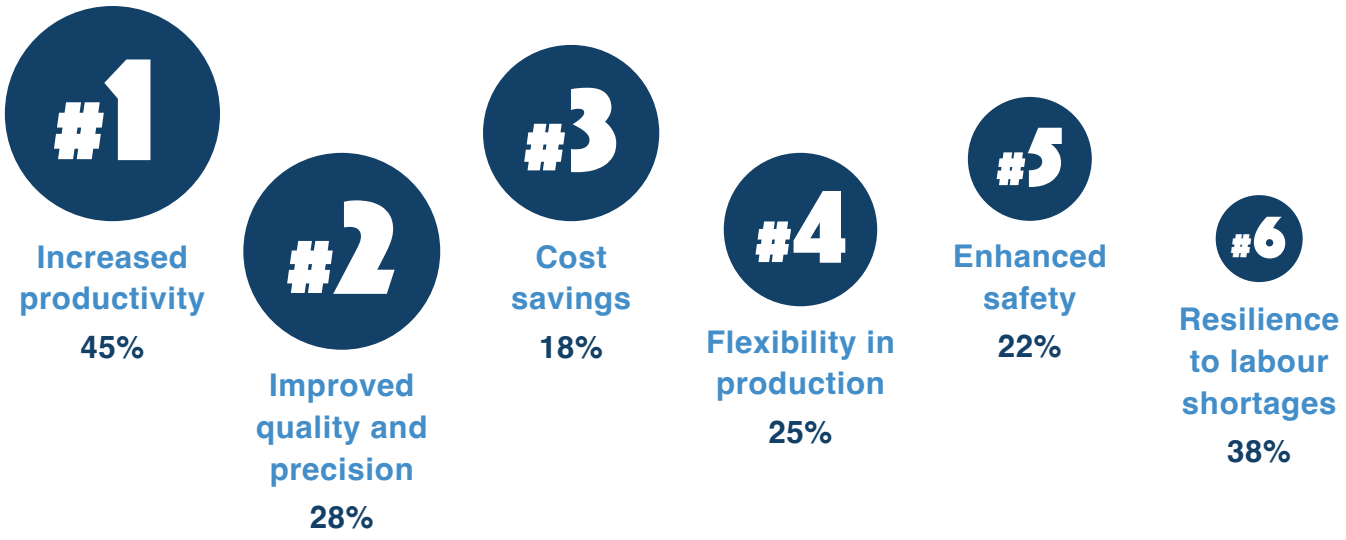
### Reported benefits

As part of the fieldwork, participants were invited to rank the benefits RAS has brought to their business, revealing the primary benefits that these manufacturers that have adopted RAS have realised in their operations.

**Increased productivity** emerges as the most significant benefit, with 45% of respondents ranking it first. This finding aligns with the broader understanding of RAS's potential to streamline operations and automate repetitive tasks, allowing manufacturers to achieve higher output with fewer

**Chart 9: Increased productivity is most commonly cited as the highest-ranking reported benefit of adopting RAS by West Midlands manufacturers**

% respondents who placed each option in its respective ordinal position, ordered by the greatest proportion in each category




Source: Make UK RAS Fieldwork (September 2024)

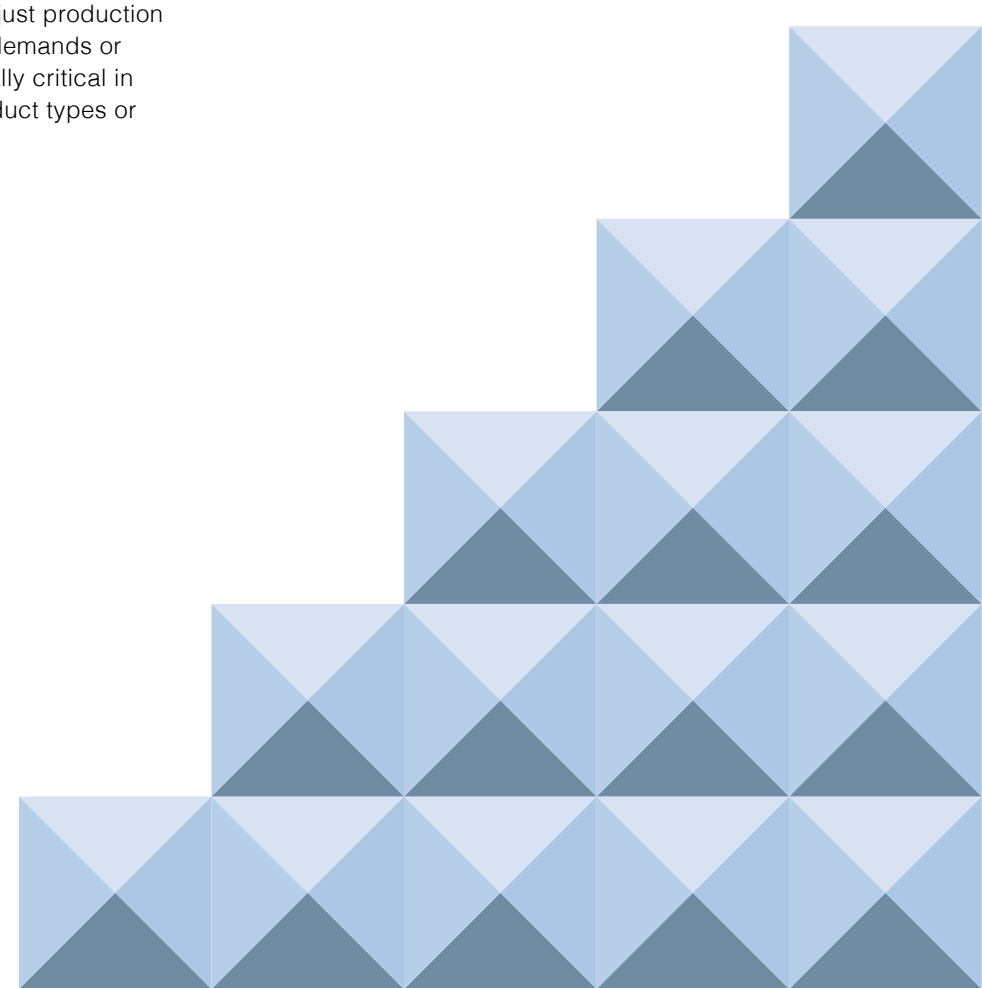
manual interventions. A further 24% ranked productivity as the second most important benefit, making it clear that, for the majority of businesses, enhancing productivity is a key driver for RAS adoption.

**Improved quality and precision** is ranked as the second most important benefit by 28% of respondents, emphasising the significance of RAS in enhancing production standards. Manufacturers see automation as a way to ensure consistent quality, particularly in precision-driven sectors such as automotive and electronics, where even minor deviations can have significant consequences.

**Cost savings,** although important, ranks lower in comparison, with only 16% of respondents identifying it as the top benefit. This indicates that while automation can reduce operational costs – through savings in labour, energy, and material wastage – it is not the primary motivator for many manufacturers. Interestingly, cost savings are ranked as a third or fourth priority for many, suggesting that companies may first focus on productivity gains and view cost reductions as a secondary advantage over time.

**Flexibility in production** also gains attention, particularly in mid-tier rankings. One-quarter of respondents placed flexibility as their fourth-highest benefit, highlighting the role of RAS in enabling manufacturers to adjust production lines more easily to meet changing market demands or customised orders. This flexibility is especially critical in industries that need to manage varying product types or batch sizes.

**Enhanced safety and resilience to labour shortages** appear lower on the hierarchy, but they are still recognised by a sizeable proportion of businesses. Enhanced safety is rated highly in mid-level ranks (21% and 22% in fourth and fifth place), which reflects the importance of RAS in reducing workplace hazards, especially in sectors involving heavy machinery or hazardous materials. Resilience to labour shortages is considered most important by fewer respondents (8% ranked it first), but it is seen as a key benefit in the longer term, with 38% ranking it sixth. The lower ranking of the resilience to labour shortages option is indicative that RAS adoption does not necessarily supplant the need for labour, but rather changes the nature and the skills of the labour required, as is highlighted in later data in this study.



## ANALYSIS OF WRITTEN RESPONSES TO THE BENEFITS OF RAS

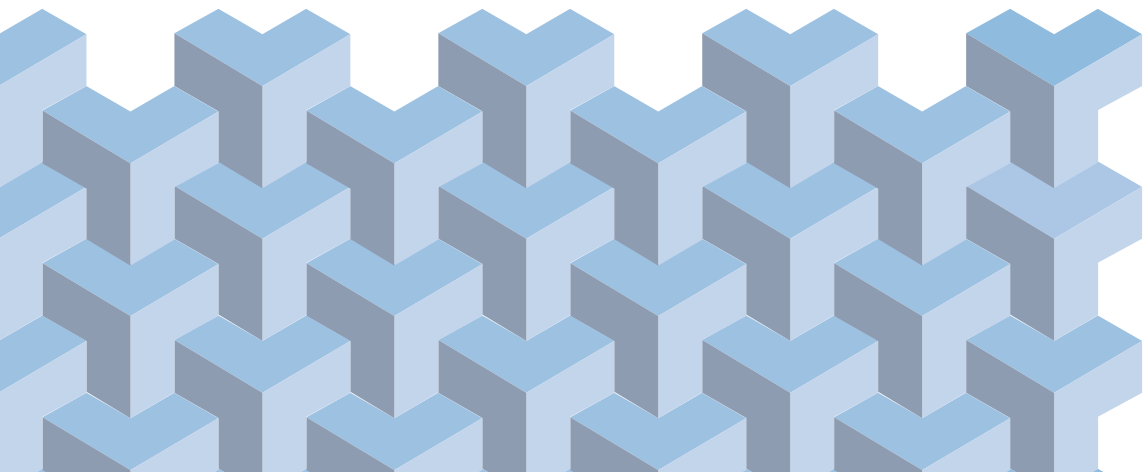
The additional written responses from participants provide a broader perspective on the benefits of adopting RAS beyond the core themes identified in the quantitative survey. A number of consistent trends emerge.

One prominent theme is increased productivity and higher production output, which echoes the earlier survey results but is elaborated upon with specific examples. Respondents frequently mentioned that RAS enables higher production rates, particularly in sectors like food manufacturing, where production rates are core to business success. The ability to operate RAS systems continuously, without breaks for holidays or fatigue, was cited as a major factor in boosting production capacity, enabling businesses to meet tighter deadlines and increase output. Several respondents pointed out that RAS allows for real-time monitoring and reliability in the production process, which enables smoother operations and allows manufacturers to track and optimise productivity.

Another key theme in the responses was the improvement in product quality. Manufacturers emphasised how RAS helps eliminate human error, ensuring greater consistency and precision in output. Responses like “cuts out variability” and “improves the quality of the final product” suggest that, for many, RAS not only increases production speed but also elevates the standards of the finished products, leading to fewer defects and higher customer satisfaction. For companies involved in high-volume production, this quality assurance can be particularly important in maintaining consistency as production ramps up.

A particularly interesting point raised by respondents was how RAS enables efficiency gains beyond the production line. Several manufacturers noted the efficiency of workload and supply chain improvements brought about by RAS, with one even highlighting environmental benefits. This suggests that the advantages of RAS are not confined to the immediate task of automating production but can have ripple effects across the entire business, from energy savings to more efficient use of space. Additionally, RAS reportedly helps with enhancing employee engagement by allowing staff to take on more varied and less repetitive roles, or to be redeployed to more strategic tasks, increasing job satisfaction and potentially upskilling employees.

Some respondents emphasised the cost-saving benefits of RAS, noting that the technology can lead to known and more predictable operational costs. This is particularly important in an environment where economic uncertainties may impact hiring decisions. One respondent made a key observation that RAS contributes to appealing to larger customers, as automation and efficiency improvements can make a company more competitive in attracting and retaining major clients by being able to offer confidence in their output capacity.



### Reported challenges

Through a similar methodology, participants were asked to rank their key challenges in the adoption of RAS.

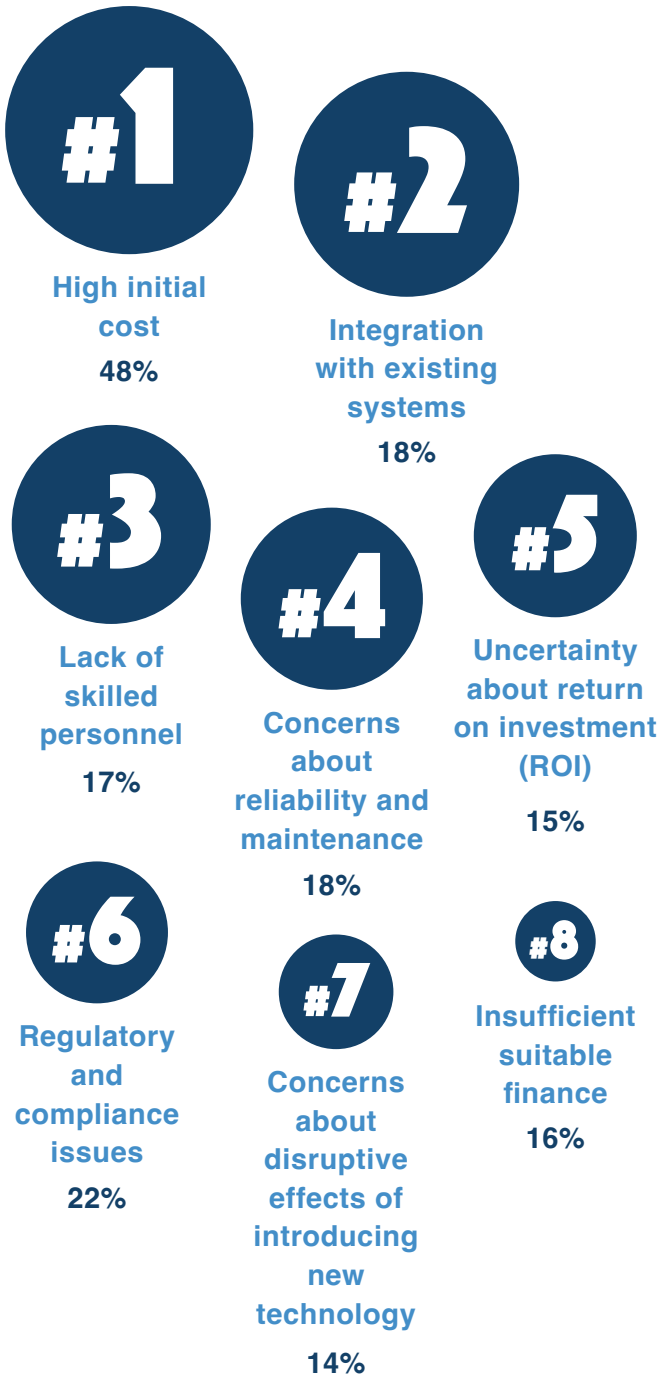
The **high initial cost** of implementing RAS technology emerges as the most substantial challenge, with nearly half (48%) of respondents ranking it as their top concern. This finding is consistent across the rankings, with "high initial cost" maintaining a presence among the top concerns for many respondents. Given the significant capital investment often required to introduce RAS, this finding follows intuition and reflects the financial burden manufacturers face when seeking to modernise their operations, especially for smaller businesses.

**Insufficient suitable finance** also ranks consistently as a key barrier, though to a lesser degree than initial cost. With 14% of respondents marking it as the second-largest concern and with similar percentages in lower rankings, it is clear that many firms struggle not only with the costs but also with securing the financial resources needed to support the transition. This suggests that while firms recognise the value of RAS, access to financing and credit facilities that can support long-term technology investments remains a critical challenge, particularly for SMEs.

Another notable issue is the **lack of skilled personnel** to operate or integrate these systems, which 16% and 17% of respondents ranked respectively as the second and third most significant challenges. This points to a skills gap in the workforce, where companies find it difficult to recruit or train employees with the expertise necessary to operate RAS technologies. This could explain why adoption has been slower in some firms, as effective implementation often requires not only financial investment but also upskilling or bringing in new talent.

**Chart 10: High initial cost is most commonly cited as the highest-ranking reported barrier to adopting RAS by West Midlands manufacturers**

% respondents who placed each option in its respective ordinal position, ordered by the greatest proportion in each category




Source: Make UK RAS Fieldwork (September 2024)

## DEVELOPING THE DIGITAL SKILLS NEEDED TO TRANSFORM MANUFACTURING

Across the sector, manufacturers increasingly require digital skills from their employees. With the advance of flexible working and the changing nature of the sector due to automation and AI, workers both in the office and on the factory floor must develop greater knowledge and confidence in using technology. For office workers, basic digital skills, such as an understanding of communications technology (like Microsoft Office or Zoom) and data management systems, will be necessary. However, for those working on and managing assembly lines, digital skills such as data analysis, programming, and troubleshooting will become increasingly important. With the adoption of technology and processes like digital twins (digital replicas of a machine or the entire factory, running in real time) and additive manufacturing becoming more popular, it will be critical for manufacturers to understand not only physical infrastructure, but also digital infrastructure like cloud computing and other software and data storage systems.

A recurring theme in the data is the challenge of **integration with existing systems**, with 15% of respondents ranking this as the primary concern and 25% placing it fourth in importance. Integrating new RAS technologies into already established manufacturing systems can be complex and risky, and firms may worry about disruptions to current operations. This concern could also be linked to worries about the **reliability and maintenance** of these systems, which ranked consistently across middle tiers, as businesses need assurance that once installed, these technologies will run smoothly without causing downtime or production delays.

Other concerns raised include **uncertainty about return on investment**, with 11% of respondents ranking this as their top challenge. Manufacturers are wary of the substantial investment required for RAS, particularly when there is uncertainty about whether the technology will deliver the expected cost savings or productivity improvements. Furthermore, **regulatory and compliance issues** and concerns about the **disruptive effects of new technology** are secondary but still important considerations for many firms, reflecting broader anxieties about the complexities of adopting cutting-edge technology in heavily regulated or highly technical sectors.

## ANALYSIS OF WRITTEN RESPONSES TO THE CHALLENGES AND BARRIERS OF IMPLEMENTING RAS

Similar to the written responses as to the benefits of RAS adoption, participants from the region were asked to concisely expand on the challenges they have faced in implementing RAS in their operations.

The additional comments from respondents regarding the challenges of adopting RAS reveal a range of recurring themes, from workforce-related concerns to the ongoing costs and complexities of maintaining new systems. Workforce-related issues are highlighted frequently, particularly regarding skills gaps, training needs, and resistance to change. Many respondents mentioned the need for employee skills enhancement and training for staff to operate the new machinery. Some businesses struggle to ensure they have the right personnel, as indicated by the need for "requesting more suitable staff", and face challenges in upskilling employees. Employee resistance to change is a recurring issue. Multiple respondents acknowledged that resistance is common when new technologies are introduced, but noted that this opposition tends to dissipate over time as employees become more familiar and comfortable with the systems.

### Spotlight on skills

Manufacturers are increasingly challenged by a skills gap that affects both digitalisation and efforts to reduce emissions. With around 61,000 job vacancies in the sector, labour shortages are pressing. While automation offers some relief, it also brings new skill demands, particularly for roles in maintaining, operating, and innovating with advanced technologies. Approximately 45% of manufacturers need engineers and technical experts, and 44% seek innovators who can leverage digital tools to tackle green challenges.

Despite these hurdles, many manufacturers are somewhat optimistic about securing the skills they need. According to Make UK and Sage's report *Unlocking the Skills Needed for a Digital and Green Future*,[37] most manufacturers believe their current workforce is equipped to operate sustainably. However, more than 60% are adapting workforce strategies to ensure ongoing skill development.

As technology advances, the skill demands shift. Key skills include IT, engineering, data analysis, innovation, and leadership. Technical skills are particularly crucial, with almost half of manufacturers identifying skills shortages as a barrier to digital and green investments, and 36% noting the challenge of retraining current employees.

With the sector's goal of achieving net zero and the acceleration of new digital technologies, upskilling both new and existing workers is critical, as many of today's employees will still be in the workforce for the next 15–20 years. While initiatives like the Apprenticeship Levy aim to support skills training, broader access to funded programmes and targeted support in digital and green skills would significantly boost manufacturers' confidence in meeting future demands.

The UK's manufacturing sector is grappling with an ageing workforce, presenting challenges in maintaining productivity and addressing skills shortages. Make UK highlights that approximately 10% of the manufacturing workforce is expected to retire within the next three years, exacerbating existing labour shortages.[38] This demographic shift is compounded by a high rate of staff turnover and an increase in long-term sickness absence, trends that have intensified since the COVID-19 pandemic. To counter these challenges, manufacturers are investing more in employee health and wellbeing, recognising that a healthy workforce is crucial for sustaining productivity and retaining talent.[39] Addressing the ageing workforce issue is vital for the manufacturing sector's future, necessitating strategic investments in health, wellbeing, and skills development to ensure continued growth and competitiveness.

Another frequently mentioned challenge relates to the costs of adoption and maintenance. The high initial outlay for RAS technology is seen as a key barrier, with concerns also extending to the ongoing costs associated with repairs and maintenance. Several manufacturers noted that repair costs can be high, and some worry about the downtime and production delays caused by breakdowns. These concerns reflect the need for both financial stability and robust maintenance strategies to ensure RAS systems are economically viable in the long term.

Technical complexity and compatibility emerged as another core theme. Some respondents highlighted technical issues such as compatibility with existing systems and the challenge of knowing "what to do when they break down". The pace of technological progression was also mentioned as a concern, with manufacturers needing to continuously update or upgrade systems to stay current. This can lead to challenges in maintaining the reliability of the technology and ensuring that it continues to meet production needs efficiently.

Some manufacturers raised concerns about the impact of RAS on employees beyond the initial resistance to change. There were mentions of fears related to job security, with some businesses worried that the implementation of RAS would lead to the potential loss of employees. A few responses noted concerns about employee morale when faced with the prospect of technological changes that could threaten their roles without upskilling. Balancing automation with human involvement, especially in businesses that rely on bespoke or human-centric tasks, is clearly a concern for several firms.

While the benefits of RAS are recognised, the barriers to adoption are multifaceted, spanning financial, technical, and human issues. Addressing these challenges will require investment not just in the technology itself but also in workforce development, system integration, and long-term maintenance strategies to encourage further successful adoption.

[37] 2030 Skills: Closing the Gap | Make UK
[38] Health, Wealth and Wellbeing for Manufacturers | Make UK
[39] Wellbeing and work in UK manufacturing report | Make UK

# INVESTMENT AND THE FUTURE OF RAS

The fieldwork on investment in RAS by West Midlands manufacturers over the past three years reveals a range of capital commitments. A significant portion of the respondents (40.4%) reported investing between £50,000 and £200,000 in RAS, indicating that a moderate level of investment is common among businesses in the region. This range may reflect firms that have moved beyond initial adoption but are not yet fully automating their operations, suggesting incremental investment as they gradually integrate RAS into their workflows.

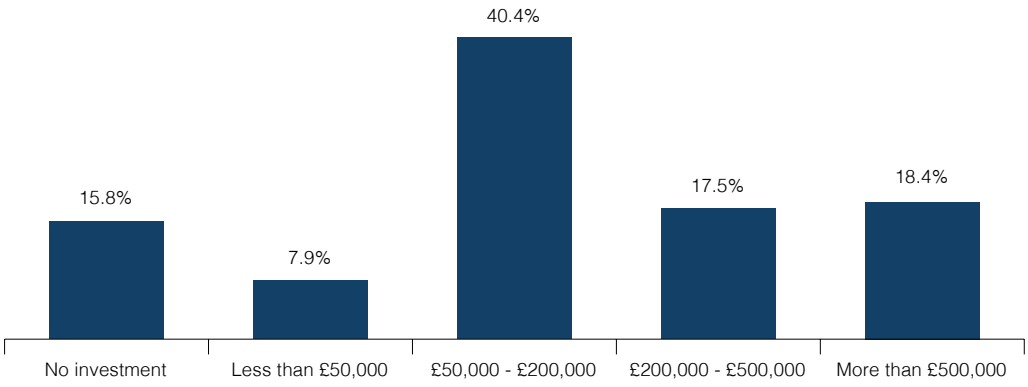
Approximately 18.4% of respondents stated that they had invested more than £500,000, while another 17.5% reported investments of between £200,000 and £500,000. These figures suggest that nearly one-third of the surveyed manufacturers (35.9%) are making substantial financial commitments to RAS, potentially reflecting larger firms or those in sectors where automation provides a significant competitive advantage, such as automotive or high-tech manufacturing. The willingness to invest at these levels indicates that these companies likely view RAS as a strategic priority to drive productivity, enhance precision, or stay ahead in the market.

In contrast, 16% of respondents indicated that they have made no investment in RAS over the past three years. This group may include smaller firms or those with less complex production processes that do not perceive RAS as an immediate need. Additionally, 8% reported investing less than £50,000, suggesting a cautious or exploratory approach to RAS adoption, perhaps focusing on small-scale trials or limited integration within specific areas of their business.

The findings illustrate that while a substantial number of manufacturers have committed significant resources to RAS, there remains a sizable segment of companies that have either not invested at all or have done so on a much smaller scale. This diversity in investment levels hints at differing levels of RAS adoption readiness across the sector, and is potentially influenced by factors such as company size and ownership structure. Subsequent analysis will explore how these investment patterns vary across these factors, providing a more nuanced understanding of what governs RAS adoption rates in the West Midlands.

**Chart 11: Two-fifths of West Midlands manufacturers have invested between £50,000 and £200,000 in RAS over the past three years**

% respondents reporting how much their company has invested in adopting RAS in the past three years



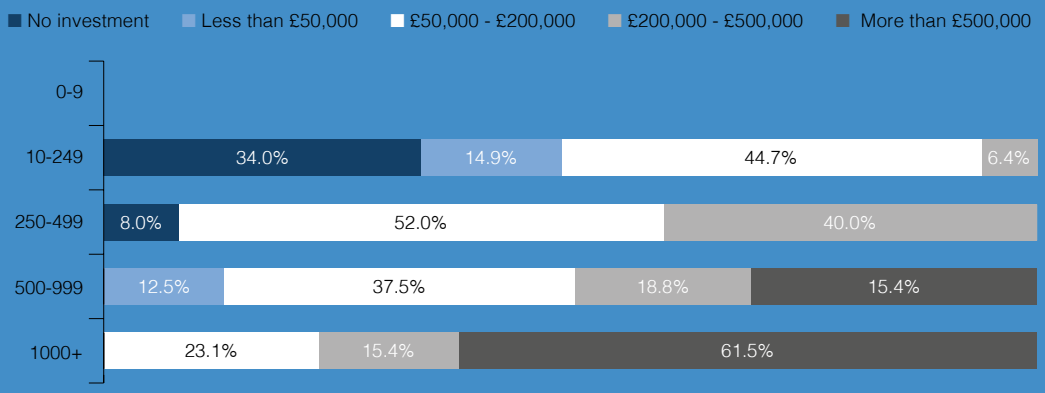

Source: Make UK RAS Fieldwork (September 2024)

# INVESTMENT LEVELS BY COMPANY SIZE AND OWNERSHIP STRUCTURE

The data on RAS investment levels broken down by company size (in terms of employee headcount) highlights a clear trend: larger companies have a greater propensity to make significant investments in RAS, while smaller firms are either investing cautiously or not at all. This pattern suggests that company size, and potentially access to financial and operational resources, plays a significant role in RAS adoption.

### Chart 12: A clear correlation emerges between company size and levels of historic RAS investment in the West Midlands

% respondents reporting how much their company has invested in adopting RAS in the past three years stratified by headcount banding




Source: Make UK RAS Fieldwork (September 2024)

Among small companies with 10–249 employees, 34% reported making no investment in RAS, and 14.9% invested less than £50,000. The most common investment range for these companies is £50,000 to £200,000, with 44.7% of respondents in this group. Very few small companies (6.4%) reported investing between £200,000 and £500,000, and none reported investing more than £500,000. This data indicates that smaller firms are either in the early stages of RAS adoption or face capital constraints that limit their ability to make larger investments.

In contrast, medium-sized companies with 250–499 employees display a more significant commitment to RAS technology. While 8% of these companies reported no investment, the slim majority (52%) invested in the £50,000 to £200,000 range, and a substantial 40% invested between £200,000 and £500,000. No companies in this category reported investments exceeding £500,000, suggesting that while medium-sized firms are more willing and able to invest in RAS, their financial capabilities or strategic priorities might still limit the extent of their investments.

The 500–999 employee group shows a diverse spread in investment levels, with 37.5% investing £50,000 to £200,000, 18.8% investing £200,000 to £500,000, and a notable 31.3% investing more than £500,000. No companies in this category reported no investment, which indicates that firms of this size are actively adopting RAS to enhance their operations. This group's willingness to invest in higher-cost RAS solutions suggests that as companies grow, they increasingly recognise the value of automation and have more resources available to implement these technologies.

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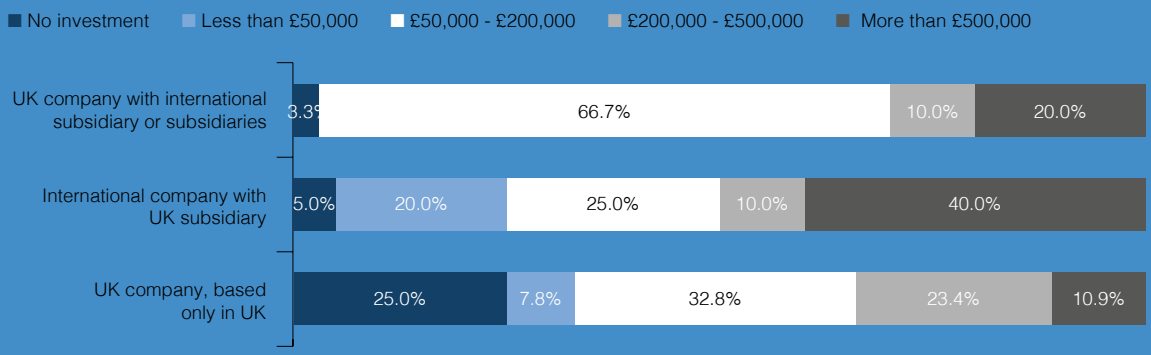
The most significant investments are seen in large companies with more than 1,000 employees, where 61.5% of respondents reported investing more than £500,000 in RAS technology. A smaller portion (23.1%) invested in the £50,000 to £200,000 range, while 15.4% reported investments between £200,000 and £500,000. Notably, no companies in this size category reported no investment or investment below £50,000, illustrating that large firms are both committed to and capable of investing heavily in advanced automation. The significant investment levels reflect these companies' needs for high productivity, quality control, and efficiency gains that RAS can provide at scale.

The data shows a direct correlation between company size and RAS investment, with larger companies more likely to commit substantial financial resources to automation. This trend is likely driven by larger firms' greater financial capacity, broader operational needs, and strategic focus on long-term efficiency and competitiveness. Smaller companies may adopt RAS more cautiously due to financial constraints and a potentially lower perceived need for extensive automation in their operations.

### Chart 13: Solely UK-based manufacturers have a lower propensity to invest in RAS than internationally involved manufacturers

% respondents reporting how much their company has invested in adopting RAS in the past three years stratified by ownership structure




Source: Make UK RAS Fieldwork (September 2024)

The data on RAS investment, broken down by ownership structure, reveals differences in investment patterns. UK companies based only in the UK show a more conservative approach to RAS investment compared to companies with international connections. A total of 25% of these solely UK-based companies reported making no investment in RAS over the past three years, and only 10.9% reported investing more than £500,000. The majority (32.8%) invested in the £50,000 to £200,000 range, indicating a cautious, incremental approach to automation. This pattern suggests that domestic-only firms may be more risk averse or face greater financial constraints when considering large-scale investments in RAS.

In contrast, international companies with a UK subsidiary exhibit a much higher commitment to RAS investment, with 40% of these firms investing more than £500,000. Only 5% reported no investment, highlighting a strong focus on automation from international owners. This investment pattern likely reflects the global competition that international firms are exposed to. With access to broader markets and potentially more substantial capital, these businesses are investing more heavily in RAS.

Cont.

UK companies with international subsidiaries fall somewhere between these two groups, but they still demonstrate greater commitments to investment compared to solely UK-based firms. Around 67% of these companies invested between £50,000 and £200,000, and 20% invested more than £500,000. This suggests that while these firms may not invest as aggressively as their foreign counterparts, their international exposure encourages them to adopt more advanced technologies to align with global industry standards.

The lower investment levels seen in solely UK-based companies can be attributed to several factors. One possible explanation is the differences in business and investment culture between the UK and other major manufacturing nations. In the UK, businesses – especially smaller, domestically focused ones – tend to adopt a more conservative approach to investment, prioritising short-term financial stability and cautious spending. This is observed in most fields of capital expenditure by UK manufacturers and is not just limited to investment in RAS.

## FUTURE INTENTIONS

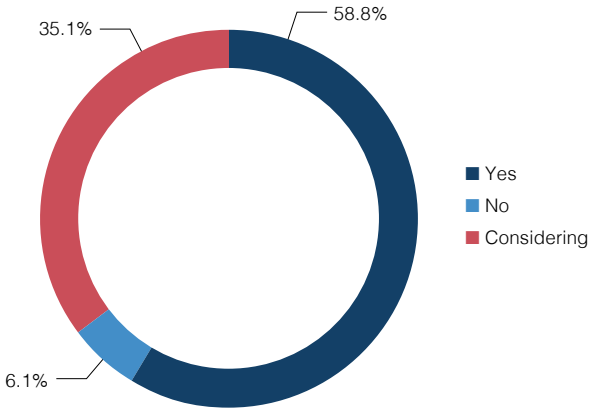
The fieldwork set out to understand how RAS adoption would proliferate in the region in the coming years. Participants were asked whether they are intending to invest further in, or expand their use of, RAS in their businesses. We also sought to uncover where that appetite lies: do those who have invested in RAS within the region previously have a greater intention to invest in the future?

The results indicate a strong inclination among West Midlands manufacturers to invest in or expand their use of RAS over the next three years. With 58.8% of respondents revealing their plans to proceed with RAS investment or expansion, or approximately every three out of five, there is clear momentum towards further automation across the region's manufacturing sector. This majority reflects the recognition among businesses of the significant productivity, quality, and efficiency benefits that respondents have highlighted.

However, a substantial proportion of companies (35.1%) remain in the "considering" category, indicating that while there is widespread interest in automation, many firms are still weighing the risks and rewards before committing. These businesses may be taking a cautious approach due to uncertainties around costs, return on investment, or the availability of skilled labour to manage the technology. This group represents a significant potential for growth in RAS adoption, provided that the right incentives, support, and information are available to help them overcome any apprehension.

**Chart 14: Two out of every three manufacturers in the region expect to expand their use of RAS in the next three years**

% respondents indicating whether they intend to invest further in, or expand their use of, RAS in their business in the next three years




Source: Make UK RAS Fieldwork (September 2024)

Interestingly, only 6.1% of respondents reported that they do not plan to invest in RAS over the next three years, suggesting that the overwhelming majority of manufacturers are either committed to or at least open to expanding their use of automation. This small minority may consist of companies operating in niche markets or using production processes where RAS integration is less feasible or necessary. Nonetheless, the low percentage of firms with no plans to adopt RAS reveals an encouraging outlook as to future attitudes towards RAS adoption in the region.

This ambitious indication of the future shows a strong trend towards further RAS adoption in the West Midlands, with most companies either already on board or considering the move. The significant portion in the "considering" category highlights the need for support, incentives and knowledge-sharing to aid these borderline businesses to embrace automation.

## DOES PREVIOUS RAS INVESTMENT INFLUENCE ANTICIPATED RATES OF FUTURE ADOPTION?

Intuition would suggest that those businesses who have already overcome the hurdle of starting to implement RAS technology in their business would have a greater propensity to adopt more automation in the future, particularly when we consider the previously detailed reported benefits of its adoption that study participants have highlighted. Nevertheless, it's plausible that some manufacturers in the region may, at some point, reach a critical mass of automation and it may be the group that is yet to automate at all that is most likely to invest in RAS in the next few years. Cross-analysis of the fieldwork data enables this study to answer this question, when we consider future anticipated adoption intentions stratified by whether RAS technology pre-exists in a participant's business.

Among companies that currently use RAS, 68% indicated plans to expand their use of RAS within the next three years. This suggests that businesses already familiar with RAS see the value in continuing to integrate and scale up their automation efforts, likely due to the benefits they have experienced. Only a small percentage (3%) of these companies reported having no plans for further RAS investment, indicating a strong overall commitment to automation among existing RAS users.

In contrast, among companies that do not currently use RAS, only 22% indicated that they plan to invest in or adopt RAS over the same period. The largest proportion of this group (61%) fall into the "considering" category. Their hesitation may be influenced by factors such as perceived high costs, lack of internal expertise, or uncertainty about the specific benefits that RAS could bring to their operations. Interestingly, 17% of companies without current RAS usage indicated that they have no plans to adopt it in the near future.

The results reveal a key trend: manufacturers already using RAS are more likely to pursue further investment, with almost seven in ten indicating expansion plans, while those without RAS show a significant degree of caution. The higher proportion of companies in the "considering" category among non-users reflects a potential growth area for RAS adoption, provided that these companies receive adequate support, information, and incentives to make the transition. The data suggests that familiarity with RAS correlates with a greater willingness to invest further, potentially due to increased confidence in automation's value and the ability to overcome initial challenges.

### Chart 15: Prior RAS adoption is a strong indicator for future adoption

% respondents indicating whether they intend to invest further in, or expand their use of, RAS in their business in the next three years, stratified by those companies who report to have RAS in their business already or not

| | | Do you plan to invest in or expand your use of RAS within the next three years? | | |
|---|---|---|---|---|
| | | Yes | No | Considering |
| Are you currently using Robotics and Autonomous Systems (RAS) in your manufacturing processes? | Yes | 68% | 3% | 29% |
| | No | 22% | 17% | 61% |

Source: Make UK RAS fieldwork (September 2024)

## HIGH PAST INVESTMENT CORRELATES WITH FUTURE EXPANSION PLANS

Among companies that have invested more than £500,000 in RAS over the past three years, a substantial 90% indicated plans to continue investing or expanding within the next three years. This high level of commitment suggests that firms with significant past investment have not only seen positive returns but are also confident in the ongoing value of automation. Only 10% of these companies are in the "considering" category, and none reported having no plans for future RAS expansion. This indicates that substantial investment correlates with a strong commitment to further automation.

For companies that invested between £50,000 and £200,000, 70% plan to invest further, while 28% are still considering expansion. This reflects a moderately high level of confidence, suggesting that firms in this investment range have likely realised some benefits from RAS and are inclined to pursue further adoption. The 2% of companies in this group reporting no plans for future investment may indicate cases where initial investments did not meet expectations or where automation is not perceived as a priority.

### Uncertainty among companies with little or no investment

In contrast, companies with no investment in RAS over the past three years show much greater uncertainty, with 50% in the "considering" category and only 28% indicating plans to adopt or expand RAS in the near future. The remaining 22% reported no plans for RAS investment, suggesting that without a prior financial commitment, these firms may be hesitant to enter the automation space. A similar trend is seen among companies that invested less than £50,000, where 78% are still considering RAS adoption and only 22% are committed to future investment. This indicates that small-scale investments have not been sufficient to build confidence in fully adopting or expanding RAS, possibly due to limited initial results, a cautious approach, or lack of suitable resources.

### Mid-level investment shows a balanced outlook

For companies that invested between £200,000 and £500,000, the data presents a more balanced outlook, with 45% planning to expand, 45% considering expansion, and 10% indicating no plans. This distribution suggests that while mid-level investments have provided some encouragement for further RAS adoption, these businesses may still face uncertainties or challenges that prevent a full commitment to future automation. The equal split between "yes" and "considering" responses indicates that some firms may need additional support or evidence of benefits before scaling up their RAS use.

The data demonstrates a clear relationship between past investment levels and future RAS expansion plans. Businesses with substantial past investments in RAS are the most likely to continue expanding their automation efforts, reflecting the confidence and positive outcomes associated with higher levels of commitment. In contrast, companies with little or no prior investment show greater hesitation, with a significant proportion still evaluating the feasibility of adopting RAS. This highlights the need for targeted engagement, especially for companies with lower levels of past investment, to help them overcome barriers and make informed decisions about expanding their use of automation.

### Chart 16: Previous investment in RAS signals future intent to invest further

% respondents indicating whether they intend to invest further in, or expand their use of, RAS in their business in the next three years, stratified by those reporting to have invested varying sterling values in RAS over the past three years

| | | How much has your company invested in RAS technology in the past three years? | | | | |
|---|---|---|---|---|---|---|
| | | No investment | Less than £50,000 | £50,000 - £200,000 | £200,000 - £500,000 | More than £500,000 |
| Do you plan to invest in or expand your use of RAS within the next three years? | Yes | 28% | 22% | 70% | 45% | 90% |
| | No | 22% | 0% | 2% | 10% | 0% |
| | Considering | 50% | 78% | 28% | 45% | 10% |

Source: Make UK RAS fieldwork (September 2024)

## DETAILED RESPONSES AS TO THE FUTURE OF RAS IN WEST MIDLANDS BUSINESSES

For each of the categories on future RAS adoption, "yes", "no", and "considering" participants were invited to provide short written explanations as to why (and how, in the case of "yes") their business was proceeding.

### "Yes" responses: Focus on production, quality control, and logistics

The common themes among businesses that plan to invest in or expand their use of RAS include a strong emphasis on production line automation, quality control, and logistics. Many companies cited plans to automate production processes to enhance efficiency and scale up manufacturing capacity. The responses suggest that companies see RAS as a tool for mass production, reducing manual repetitive tasks, and achieving higher output to meet demand.

Quality control is also a significant focus area for RAS expansion. Many respondents mentioned that they intend to adopt automated quality inspection systems, machine vision technology, and real-time monitoring to ensure consistent product quality. This emphasis on quality inspection shows that manufacturers are looking not only to increase output but also to maintain high standards and minimise defects, which are naturally prerequisites for high levels of customer satisfaction and regulatory compliance.

Another prominent theme is the use of RAS in logistics and material handling. Several responses highlighted plans to invest in warehouse robotics, logistics automation, and systems to improve material transport efficiency. This indicates that companies are looking to leverage automation to streamline their supply chain operations, reduce errors, and lower labour costs associated with logistics.

### "No" responses: Limited requirements and low-volume production

For businesses that do not plan to invest in RAS, the primary reason cited is the lack of need for automation. Responses point to low-volume, custom production processes where automation may not be economically viable due to the high costs associated with tooling and set-up for each unique job. In these cases, the flexibility and craftsmanship of human labour are preferred over automation, which is often optimised for high-volume, repetitive tasks.

Some respondents also mentioned that their businesses do not require scaling up or that their processes are relatively simple, making RAS adoption unnecessary. These companies may operate in sectors where manual processes are sufficient to meet customer demands and maintain profitability. The common thread among these responses is that the business case for RAS does not justify the investment, particularly in industries or production environments where volume and complexity are low.

### "Considering" responses: High initial costs and uncertainty about ROI

For companies that are still considering RAS investment, the dominant concern is the high initial cost of adopting automation technology. Many responses point to uncertainties surrounding the return on investment and whether the upfront expenses would deliver the desired financial benefits within a reasonable timeframe. This reflects a cautious approach, where businesses are weighing the risks and rewards of automation in the context of their budget constraints and financial capacity.

Other common uncertainties include whether RAS is suitable for specific processes, especially in high-variety, low-volume production settings where flexibility is needed. The challenge of finding automation solutions that can adapt to different products or production requirements is a factor that leaves businesses apprehensive. This indicates a need for flexible RAS solutions that can handle diverse tasks and rapid changeovers between different production runs.

A few respondents mentioned concerns about organisational resistance to change and about the economic climate, suggesting that cultural barriers and broader market conditions are also influencing decisions. Companies are cautious about making large investments when there is pushback from within the organisation, or when the economic outlook is uncertain. Additionally, access to finance was highlighted as a constraint, particularly for smaller firms that may not have the same level of capital available as larger corporates.

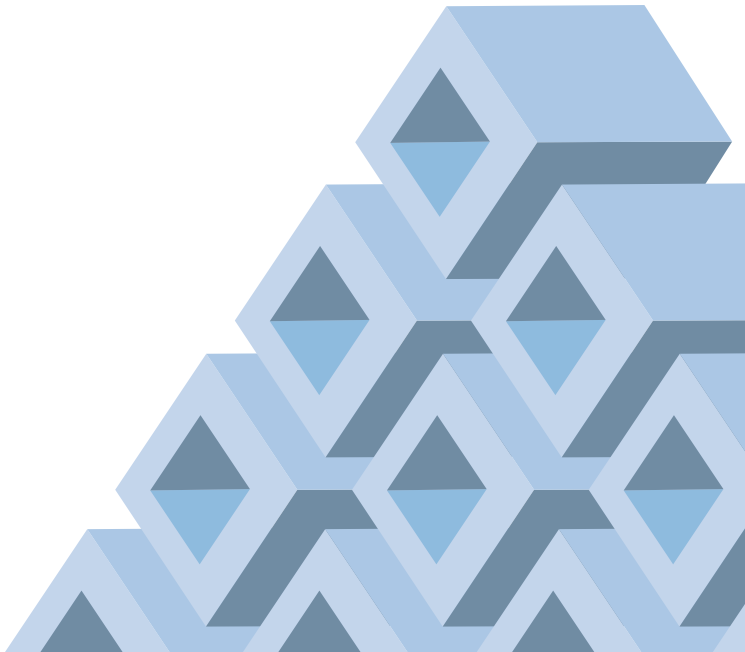
## SUMMARY OF QUALITATIVE RATIONALE FOR PLANS, OR LACK THEREOF, FOR FUTURE RAS ADOPTION

The written responses provide a nuanced view of the motivations, benefits, and barriers to RAS adoption among West Midlands manufacturers:

Companies that have committed to RAS see it as a way to increase production capacity, enhance quality control, and streamline logistics, with a strong focus on scalability and efficiency.

Those not planning to invest see no clear business case for automation, due to low production volumes, simple processes, or sectors where human labour is better suited to the tasks.

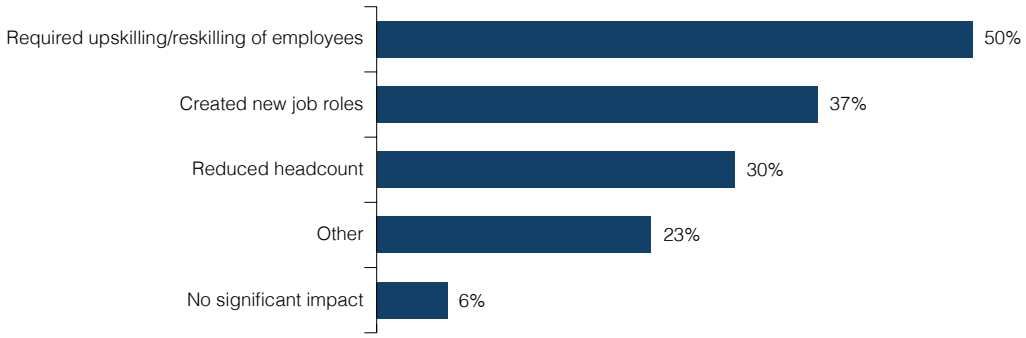
The main barriers for companies that are still considering RAS are high upfront costs, uncertainty about ROI, and concerns about finding suitable applications or flexible automation solutions.



# RAS AND THE WORKFORCE

### Chart 17: Upskilling is cited as the most prolific impact of RAS on the West Midlands manufacturing workforce

% respondents indicating how the adoption of RAS in their business has impacted their workforce




Source: Make UK RAS fieldwork (September 2024)

Concerns arise from stakeholders, businesses, and the workforce themselves as to the impact on labour through the adoption of RAS. The fieldwork set out to understand what businesses in the West Midlands have seen happen, or have required to happen, in this area as a result of RAS adoption.

The results dispel the common misconception that automation leads to widespread job losses. Instead, they suggest that while there are some shifts in workforce dynamics, RAS often fosters upskilling, reskilling, and even the creation of new roles, which can benefit both businesses and employees.

#### Upskilling and reskilling of employees

The most prominent impact, cited by 50% of respondents, is the upskilling and reskilling of employees. As companies adopt RAS, many found that existing staff need to be trained to operate, maintain, and manage these advanced systems. Rather than making workers obsolete, RAS often requires new skills that allow employees to transition into higher-value roles. This trend shows that automation doesn't replace workers but transforms their responsibilities. By investing in employee development, businesses not only help staff remain relevant in an increasingly automated environment, but companies also benefit from having a more skilled and adaptable workforce. This shift towards reskilling and upskilling is a laudable outcome of RAS adoption, enabling employees to take on more technical and supervisory roles, which can lead to increased job satisfaction and higher-paid roles.

#### Creation of new job roles

The survey also reveals that 37% of respondents reported the creation of new job roles as a result of RAS adoption. As businesses integrate automation into their processes, new positions often emerge, particularly in areas such as robot maintenance, programming, and system integration. These roles tend to require specialised knowledge and offer higher salaries, benefiting both workers and the geographic areas in which these businesses are located. The creation of new roles also challenges the myth that automation leads to job losses, demonstrating instead that RAS can create opportunities for workforce expansion and specialisation. By adopting RAS, businesses may also develop internal departments focused on innovation, data analysis, and digital transformation, further diversifying the types of jobs available within manufacturing. This creation of departments that exist to refine RAS implementation has also been referenced by some of the written responses.

#### Reduced headcount

While a smaller portion of companies (30%) indicated that RAS adoption has resulted in a reduced headcount, it is important to contextualise this finding. In many cases, RAS supplants manual, repetitive, and labour-intensive tasks that either are difficult to fill due to labour shortages or pose safety risks to employees. Automating these tasks can lead to cost savings and efficiency gains for businesses, but it does not necessarily equate to large-scale job losses. Instead, as referenced earlier, the employees whose roles are impacted by automation are often retrained for higher-value roles, leading to a more productive and

skilled workforce. Additionally, in sectors where there are skills shortages (such as welding or machine operation), automation helps companies meet production demand without the challenge of finding additional manual labour.

### No significant impact

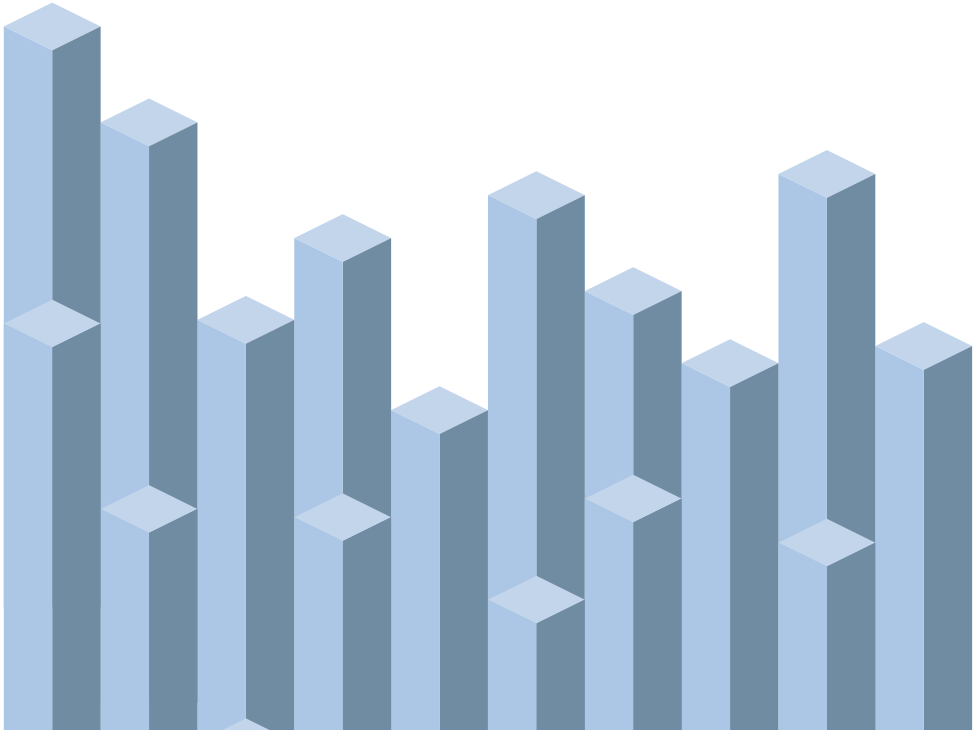
Only 6% of respondents reported no significant impact on their workforce due to RAS adoption, indicating that, for the vast majority of manufacturers, RAS does bring noticeable changes to their labour dynamics. This low figure further supports the idea that automation affects businesses in meaningful ways – whether through upskilling, job creation, or workforce restructuring. Businesses that report no significant impact may be in the early stages of RAS adoption or may be using automation in more isolated areas that do not yet impact their overall workforce structure in a meaningful way.

### Other

The 23% of respondents who selected “other” likely reflect a variety of more specific or complex impacts. For instance, RAS may have allowed some businesses to offer more flexible working conditions, or it may have changed the nature of certain jobs without completely eliminating roles. Additionally, some companies may have experienced a reallocation of tasks, where RAS takes over specific functions and employees shift to focus on the more strategic or creative aspects of their roles. This flexibility in response suggests that the impact of RAS on workforce dynamics can vary depending on the nature of the business, the extent of automation, and the strategies the given business is using to integrate RAS.

## RAS AS A DRIVER OF WORKFORCE EVOLUTION

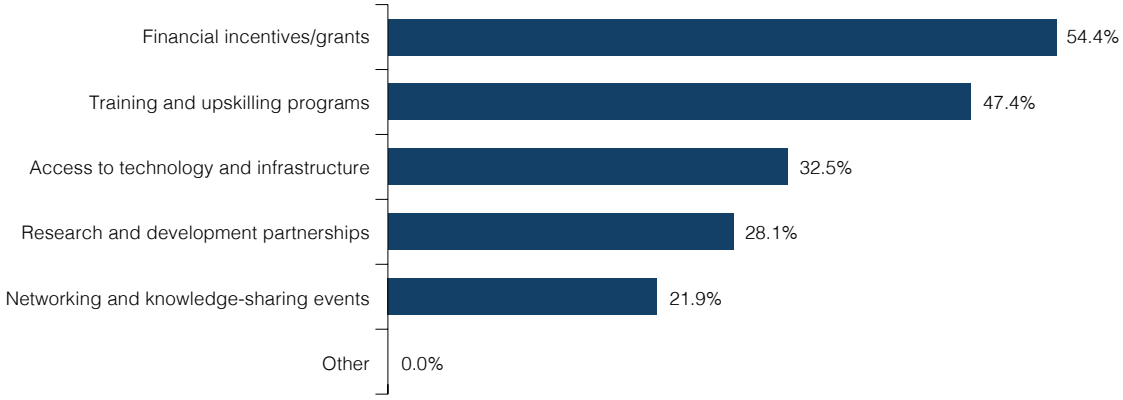
The data on workforce impacts supports the premise that RAS adoption does not “steal jobs” but instead reshapes the workforce in ways that benefit both employers and employees. While automation may reduce headcount in certain areas, it drives the creation of new roles and encourages the upskilling of existing employees. By leveraging automation, businesses can optimise operations while empowering their workforce with new, in-demand skills. These findings suggest that businesses should view RAS not as a threat to employment but as an opportunity to modernise their workforce and remain competitive in an increasingly automated environment.



# CREATING THE RIGHT REGIONAL BUSINESS ENVIRONMENT FOR INCREASED RAS ADOPTION IN THE WEST MIDLANDS

### Chart 18: Training programmes and financial incentives seen as the support with the highest potential to accelerate RAS adoption in the region

% respondents indicating what type of support or collaboration from national and local government and industry groups would most help their business in accelerating RAS adoption




Source: Make UK RAS fieldwork (September 2024)

This key part of the fieldwork highlights the critical areas where changes to the regional business environment can accelerate the region's automation efforts. The results indicate a clear preference for financial incentives, training and upskilling programmes, and access to technology and infrastructure, all of which reflect the barriers that manufacturers face in adopting new technologies. This section will discuss the key business environment factors presented to businesses in the region, exploring why they rank where they do among businesses' priorities and how these types of support could be implemented in the West Midlands context to foster greater RAS adoption.

### Financial incentives

Financial incentives and grants top the list of support needs, with more than half of respondents identifying this as the most critical factor. This embodies the high upfront costs of implementing RAS, which can be a significant barrier, particularly for SMEs. RAS technologies often require substantial capital investment in machinery, integration, and supporting systems, making it difficult for companies with limited capital resources to justify the expenditure in the short term, even if the long-term benefits are clear.

In the West Midlands context, financial support could take the form of regional grant programmes specifically aimed at RAS adoption, similar to the Made Smarter initiative, which has been part of the West Midlands support for SMEs to digitalise and improve productivity. Perhaps this might be a role that the WMCA and RAS cluster could follow up with the Made Smarter beneficiaries to continue on the digital roadmap with further investments in RAS. Expanding this type of support could provide targeted funding to help manufacturers offset the costs of automation, at least initially. Additionally, tax relief schemes, such as extending the super-deduction in a targeted, regional capacity for capital investment in automation equipment, could incentivise more businesses to adopt RAS. These measures would alleviate the financial pressure on manufacturers and encourage more firms to explore the benefits of automation.

### Training and upskilling programmes

Training and upskilling programmes ranks second in importance, with 47.4% of respondents identifying this as a core need. This reflects the skills gap that many manufacturers face when adopting RAS. While automation technologies can improve efficiency and productivity, they also require a workforce capable of operating and maintaining these systems. Many businesses may not

have the internal expertise needed to manage RAS, which can slow adoption or lead to underutilisation of the technology.

In the region, which has a strong manufacturing base but also faces challenges in workforce development, further training programmes specifically designed for RAS-related skills could prove beneficial. Partnerships between local government, industry, and educational institutions – such as apprenticeship programmes focused on automation, robotics, and digital technologies – could help bridge this skills gap.

The West Midlands is home to some of the largest apprenticeship training centres in the UK, such as MTC, Make UK Tech Hub, and Solihull Institute of Technology, relying primarily on government funding (the apprenticeship levy) and private sector sponsorships to operate.

The region's universities and technical colleges, including Aston University and University of Birmingham, could be key players in developing training modules that address the specific needs of manufacturers. Expanding existing programmes at centres like the MTC in Coventry, which already offers advanced training in digital manufacturing technologies, could support more companies in developing the skills needed for RAS integration. Likewise, the Solihull Institute of Technology is specifically equipped to deliver these skills. Importantly, what is needed is a full suite of training programmes from Level 3 up to Level 6, to allow for training at all levels.

### Access to technology and infrastructure

Access to technology and infrastructure ranks third, with 32.5% of respondents highlighting this as a key need. This likely reflects the technical complexity of RAS adoption, which requires not only the right equipment but also access to infrastructure that can support advanced manufacturing technologies, such as high-speed internet, data management systems, and robotics testing facilities.

Addressing this need could involve the development of shared technology hubs or robotics centres, where manufacturers can test RAS solutions in a controlled environment before committing to large-scale implementation. Such centres already exist in part, but expanding their capacity to include specific RAS-related infrastructure could make these resources more accessible to smaller businesses. Additionally, ensuring that manufacturers have access to fast, reliable networking and cloud-based digital infrastructure will be crucial for supporting the integration of RAS technologies that rely on real-time data processing and connectivity.

### Research and development partnerships

Research and development partnerships also feature prominently, with 28.1% of respondents seeing this as a crucial form of support. This reflects the need for ongoing innovation and collaboration in the development of RAS solutions that are tailored to the specific needs of manufacturers in the region. Many businesses may be interested in adopting RAS but lack the in-house R&D capabilities to develop bespoke automation systems or integrate cutting-edge technologies into their operations.

To address this, collaborative R&D projects between manufacturers, academic institutions, and research organisations could be expanded. The West Midlands is already home to several centres of excellence, such as the Warwick Manufacturing Group (WMG) and the MTC, which specialise in applied research for manufacturing. Expanding these partnerships to include more businesses, particularly SMEs, would accelerate the development of customised RAS solutions and ensure that new technologies are designed with practical manufacturing challenges in mind. Additionally, government-funded innovation grants could be targeted at projects that focus on developing RAS for specific industrial applications, helping to spur further innovation and adoption.

### Networking and knowledge-sharing events

Networking and knowledge-sharing events was identified by 21.9% of respondents as a helpful form of support. While this option ranks lower than others, it is still relevant, reflecting the importance of peer learning and industry collaboration in overcoming the challenges of RAS adoption. Many businesses, particularly SMEs, may be hesitant to invest in RAS because they are unfamiliar with the technology or are unsure how to implement it effectively. Networking events provide opportunities for manufacturers to learn from others who have already adopted RAS, to gain insights into best practices, and to build collaborative relationships that can facilitate the adoption process.

Expanding existing manufacturing networks to include more events focused on digital transformation and RAS may foster greater knowledge sharing. Regular forums, workshops, and case study presentations could help businesses understand the practical aspects of RAS adoption, including how to finance it, how to manage the transition, and how to upskill their workforce. Furthermore, these events could be linked with government or industry-led initiatives to provide more direct support and access to resources for companies interested in exploring RAS.

## DO THE BUSINESS ENVIRONMENT AND EXTERNAL SUPPORT NEEDS VARY BASED ON COMPANY SIZE?

The results, when broken down by company size, reveal some differences in the types of support that manufacturers in the West Midlands prioritise when considering RAS adoption. These differences reflect the varying capacities, challenges, and needs that SMEs and larger companies face in integrating automation into their operations.

### Financial incentives: A priority for smaller companies

One of the most striking differences is in the importance of financial incentives for smaller companies. Among businesses with 1–9 employees, 54.8% indicated that financial incentives or grants would be the most helpful form of support for RAS adoption. This is significantly higher than the response rate for larger companies, with only 14.5% of companies with 10–249 employees and 9.7% of those with 250+ employees selecting this option. This suggests that the smallest SMEs face greater financial constraints and view upfront costs as a major barrier to adopting automation technologies. For these smallest businesses, external funding could be critical to overcoming the financial hurdle of investing in RAS, which often requires significant capital investment.

This finding reinforces the notion that financial incentives, such as grants, tax credits, or low-interest loans, could be a particularly effective tool for encouraging RAS adoption among smaller companies in the West Midlands. If the financial burden for this class of business were to be reduced, they would be better positioned to invest in automation and realise its potential benefits.

### Training and upskilling: Important across all company sizes

Training and upskilling programmes are consistently seen as important across all company sizes, with around 33% of businesses in both the 1–9 and 10–249 employee bands selecting this as a priority. This reflects the skills gap that many companies face when adopting RAS, regardless of their size. While smaller businesses may struggle to finance external training, larger companies may face challenges in retraining their existing workforce to handle more advanced automation technologies.

For larger firms, internal training programmes or collaborations with educational institutions may help address this need, while smaller businesses would benefit from publicly funded training schemes or industry partnerships that offer affordable access to upskilling resources. The consistency in this response across different business sizes suggests that upskilling is a critical area where support is needed to ensure the workforce can effectively manage and operate RAS technologies.

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### Networking and knowledge-sharing: Mid-sized companies seek more collaboration

The fieldwork shows that networking and knowledge-sharing events are particularly valued by mid-sized companies. Among companies with 10–249 employees, 36% selected this as a helpful form of support, compared to 28% for the smallest companies and 12% for the largest companies. This suggests that mid-sized businesses may be at a stage where they are familiar with the potential of RAS but require further peer learning and industry insights to confidently proceed with adoption. For these companies, networking opportunities and knowledge exchange with other manufacturers who have successfully implemented RAS could provide actionable insights and best practices. Events and forums organised by local industry bodies or trade associations could help mid-sized businesses overcome uncertainties about implementation, cost management, and integration with existing systems.

### Research and development partnerships: A key priority for the smallest firms

The fieldwork indicates that research and development partnerships are of particular importance to smaller companies, with 46.9% of companies with 1–9 employees selecting this option. This is significantly higher than the level of interest from larger companies, which may have their own internal R&D departments or access to dedicated R&D resources. Smaller firms often lack these capabilities and would benefit from collaborative partnerships with universities, research institutions, and innovation hubs to help develop tailored RAS solutions. These partnerships could help smaller businesses access cutting-edge RAS technologies and co-develop solutions that fit their specific operational needs.

### Access to technology and infrastructure: Important for all, especially larger companies

Access to technology and infrastructure is another area where responses were relatively consistent across company sizes, with around 24–27% of businesses in all categories highlighting this as a need. For smaller companies, this may involve access to shared robotics facilities or technology hubs that allow for RAS testing without requiring large capital investments. Larger firms, on the other hand, may seek digital infrastructure, such as cloud-based systems, to support more advanced RAS technologies that rely on real-time data and connectivity.

### Company size and regional support in a nutshell

The results highlight that while financial incentives are particularly critical for smaller companies, training, upskilling, and access to R&D partnerships are important across the board. However, mid-sized companies may be more interested in networking and collaboration opportunities, while larger firms focus more on infrastructure access and advanced technological capabilities. Tailoring support to meet these specific needs could help encourage RAS adoption at all levels, ensuring that businesses of all sizes in the West Midlands can capitalise on the benefits of automation.

# DO WEST MIDLANDS BUSINESSES SEE THE REGION AS THE RIGHT PLACE TO RENDER FUTURE RAS INVESTMENT?

Businesses are unanimous in their view that the West Midlands is the right place for potential future RAS investment by their company. This is perhaps to be expected, given the region's reputation for being the manufacturing heartland of the UK. Participants were subsequently asked to justify their view, with the following common emerging themes.

### Manufacturing heritage and industrial strength

One of the most cited reasons for viewing the West Midlands as suitable for RAS investment is its rich history of manufacturing. Respondents consistently highlighted the region's long-standing tradition as a manufacturing powerhouse, with comments such as, "It is a major industrial hub with an abundance of traditional manufacturing companies." The region's established industrial base, particularly in sectors such as automotive and advanced manufacturing, is seen as a strong foundation for further automation. The presence of large industrial estates and a greater-than-average number of manufacturing businesses reinforces the idea that RAS investment would be both viable and beneficial in this environment.

This historic strength in manufacturing not only provides a pool of experienced labour but also ensures that businesses have a foundation of infrastructure and suppliers that can support RAS adoption. Many respondents mentioned the region's existing manufacturing capability, with some stating that RAS adoption would provide a natural progression to modernise the sector further.

### Geographic and transport advantages

The West Midlands' strategic location was another major theme among respondents. Several comments pointed to the region's central position within the UK. The region benefits from good transport links, including major motorways, rail networks, and proximity to key cities such as Birmingham, Coventry, and Wolverhampton. This geographic advantage makes it easier for businesses to distribute goods and services efficiently.

They also noted that the West Midlands' centrality makes it attractive for collaboration between businesses and R&D institutions across the country. Companies can draw on the expertise and support of nearby universities and research centres, which is an enabling factor for successful RAS implementation and innovation. The region's accessibility to global markets was also mentioned, with some businesses exporting significant portions of their products internationally, making RAS a tool for maintaining competitiveness.

### Skilled workforce and educational institutions

A recurring theme in the responses is the availability of a skilled workforce in the West Midlands. Comments such as, "The West Midlands has a pool of highly capable manufacturing talent," and, "There are many skilled technicians in the West Midlands area," reflect the region's strength in technical skills. This skilled workforce is seen as a critical asset for businesses adopting RAS, as automation technologies often require specialised knowledge and training to manage and operate effectively.

Respondents also highlighted the presence of world-class universities and technical training institutes in the region. Institutions like the University of Birmingham, Coventry University, and the University of Warwick provide valuable resources for RAS research, development, and workforce training. Several businesses mentioned their collaborations with universities to upskill employees and develop new technologies, which further support the region's ability to integrate RAS into its manufacturing ecosystem.

### Untapped potential and need for investment

While respondents were positive, on balance, about the West Midlands as a location for RAS investment, there was also recognition of the need for further investment in the region. Some comments pointed out that the West Midlands has experienced under-investment in recent years, particularly in modernising its manufacturing capabilities. Respondents noted that RAS could help reverse this trend. This theme of untapped potential was echoed in comments suggesting that many businesses in the region are ready to adopt RAS but may lack the financial resources or technological infrastructure to do so without external support. The responses reflect a sense of optimism about the region's ability to leverage RAS to boost productivity and competitiveness, but they also emphasise the importance of ensuring that investment continues to flow into the region to help realise this potential.

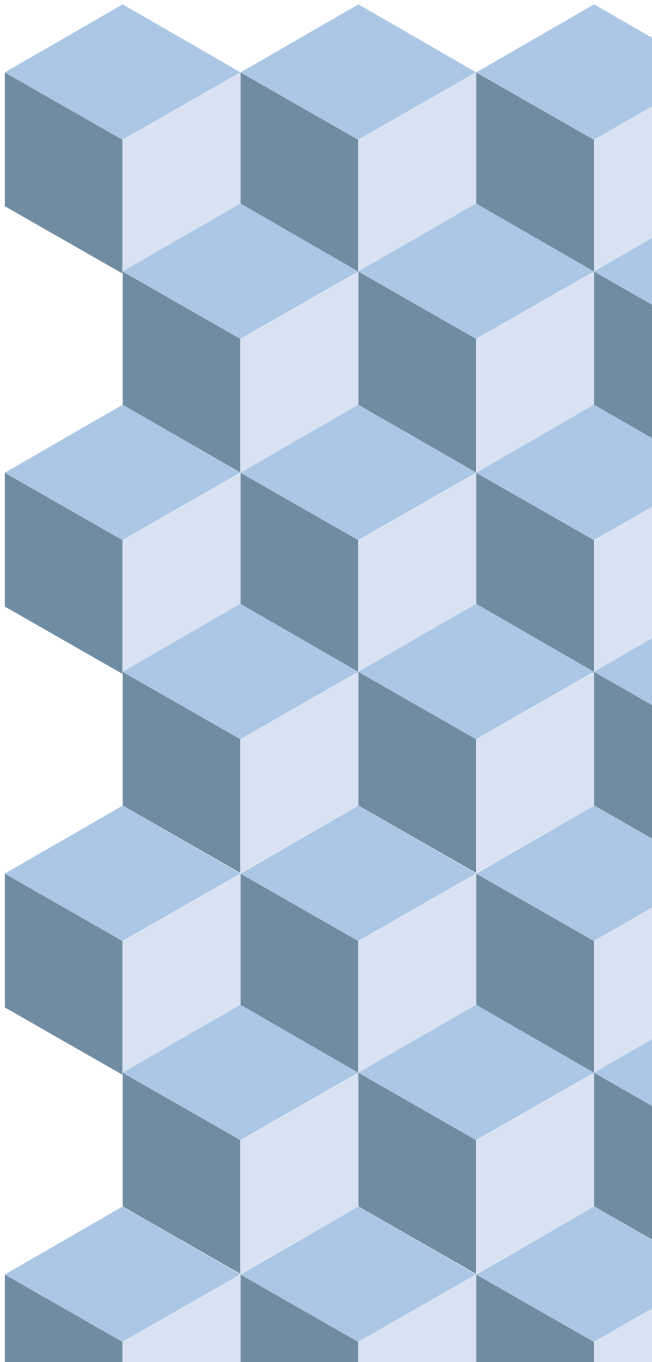
### Collaborative opportunities and industrial networks

The presence of industrial networks and collaborative opportunities in the West Midlands is seen as a major advantage for RAS investment. The region is home to many similar businesses and industrial sectors, which creates opportunities for shared learning and collaborative innovation. Several respondents mentioned the concentration of manufacturing companies in the area as a factor that would facilitate the adoption of RAS technologies, as businesses can share best practices and learn from each other's experiences. Respondents highlighted the importance of public–private partnerships and regional initiatives to drive forward the adoption of automation technologies, ensuring that the region remains a competitive hub for manufacturing in the UK.

With regard to government and policy support, strategic government initiatives like the Midlands Engine and the roll-out of the Made Smarter programme in the West Midlands provide additional impetus for the adoption of RAS technologies. These initiatives aim to drive productivity and innovation in the region's manufacturing sector by supporting businesses in their digital transformation journeys, offering incentives for technology adoption, and creating a favourable environment for RAS investments.

Make UK recommends that government incentives, such as tax benefits for training and automation, are instrumental in encouraging broader adoption. It suggests expanding initiatives like the Made Smarter programme to provide more support for digital adoption across the UK. There is also a call for better dissemination of information regarding the benefits of automation and clear guidance on how to implement these technologies effectively, particularly for SMEs.

This brief overview captures the insights from the report that highlight the transformative potential of automation in enhancing productivity and efficiency in manufacturing. The findings emphasise the need for supportive policies and targeted investments to overcome adoption barriers, maximising the benefits of RAS for industries in the West Midlands and beyond.



# Part IV:
# Summary of Recommendations for High-level Operating Model

The study finds that there is significant potential for a West Midlands dedicated RAS cluster to bring about increased RAS adoption – particularly in the SME space where uptake has been demonstrably slower. The combination of findings from the literature review, SWOT analysis, fieldwork, and direct engagement have been collated to inform a potential high-level operating model for such a cluster in the region.

## HIGH-LEVEL OPERATING MODEL FOR A WEST MIDLANDS RAS CLUSTER:

### 1. Vision

- To position the West Midlands as a leader in the UK for RAS innovation, adoption, and workforce development, creating a hub that integrates local industry, academia, and government to accelerate the adoption of RAS across multiple sectors.

### 2. Strategic objectives

- Drive RAS adoption within West Midlands manufacturing and industrial sectors to increase productivity and international competitiveness.
- Develop a skilled workforce that meets the demands of an automated and digital economy.
- Facilitate R&D partnerships among businesses, universities, and technology providers to foster innovation.
- Improve access to finance and technical resources for SMEs considering RAS adoption.

### 3. Core pillars and key activities

**Industry and academic collaboration**

- Collaborative R&D programmes
  - Establish partnerships with local universities like the University of Birmingham and Coventry University, encouraging joint research projects that focus on real-world applications and industry needs.
- Knowledge exchange hubs
  - Create physical and virtual spaces for knowledge sharing, demonstrations, and workshops to promote best practices in RAS implementation.
- Access to facilities and expertise
  - Allow SMEs to access advanced robotics labs and testing environments within regional research centres, reducing barriers to entry for RAS experimentation.

**Skills and workforce development**

- RAS upskilling programmes
  - Partner with educational institutions and private training providers to offer targeted RAS skills development, from shop floor level to advanced engineering management roles. Higher education institutions that offer undergraduate and graduate placements can help SMEs design and prototype new RAS applications.
- Apprenticeships and internships
  - Develop apprenticeship schemes focusing on automation and RAS maintenance, helping to build a pipeline of skilled workers for the region's future.
- Ongoing professional development
  - Provide industry professionals with continuous learning opportunities in new RAS advancements, assisting the local workforce in remaining competitive and adaptable.

**Financial and technical support**

- Grant and funding initiatives
  - Leverage local and national funding programmes like Made Smarter to offer grants and incentives specifically for RAS adoption, with a focus on supporting SMEs. Ensure the use of national schemes is maximised to demonstrate regional appetite for support in the future.
- Access to RAS technology and infrastructure
  - Establish a fund to support small businesses with the high initial costs of RAS technology, possibly through shared RAS infrastructure within the cluster.
- Technical advisory services
  - Offer consulting support for SMEs on selecting, implementing, and maintaining RAS systems, drawing on expertise from regional research centres and (potentially clustered) technology firms.

**Market development and networking**

- Sector-specific innovation programmes
  - Run tailored programmes that focus on RAS applications for identified advantage regional industries (e.g., automotive, aerospace, logistics) to ensure solutions meet the varied needs of these sectors.
- Regular industry events and networking
  - Organise conferences, trade fairs, and networking events in collaboration with industry bodies to foster partnerships and raise awareness of RAS benefits.
- Outreach and education
  - Host educational events for businesses considering RAS, showcasing case studies and success stories from similar businesses.

### 4. Governance and management

- Central governance body
  - Form a multi-stakeholder council with representatives from local government, industry associations, research institutions, and private RAS firms to provide strategic oversight and resource allocation.
- Cluster management team
  - Employ a dedicated team responsible for the day-to-day management of the cluster, ensuring that programmes are executed effectively and that SMEs receive the necessary support.

### 5. Funding strategy

- Public and private funding mix
  - Secure initial funding from public sources, such as the WMCA (either naturally or through bids to national initiatives, e.g., Innovate UK, Made Smarter), alongside private investment from regional manufacturers and technology firms.
- Membership and service fees
  - Generate additional revenue by charging membership fees to businesses using the cluster's resources, along with fees for specialised services like consulting or facility access.

### 6. Potential benefits for the West Midlands arising from successful RAS clustering

- Enhanced productivity and competitiveness: Accelerated RAS adoption will improve productivity within the West Midlands' core manufacturing sectors.
- Job creation and workforce resilience: The cluster will help upskill the workforce, creating new opportunities and addressing concerns around job displacement.
- Innovation hub reputation: Establishing the West Midlands as a national RAS innovation hub will attract talent and future investment to the region.
- Support for SMEs: Providing technical and financial support to SMEs will move to increase equitable access to RAS, fostering an inclusive and resilient regional economy.

# Conclusion

This study has taken a multifaceted approach in assessing the case for further RAS adoption by businesses in the West Midlands. It has combined both quantitative fieldwork and direct industry engagement in an effort to reveal why RAS adoption in the region is spread as it is, ultimately seeking to discover what benefits are brought to the region through its adoption and how to proliferate its further use.

From the quantitative fieldwork we saw that use of RAS across the sector, even if oftentimes in a simple form, is widespread, with an adoption rate of more than 80% in study participant firms, albeit dropping significantly when the lens is focused solely on SMEs. A core feature of the work was to understand the past and potential future workforce impacts of RAS adoption on employees in the sector, and what potential productivity-enhancing effects were reported. The data is clear: businesses in the region know that, for those that have adopted RAS, the benefits to productivity and product quality are commonplace.

With a typically tight labour market in the West Midlands' industry, particularly within the production industry, we see that on net the majority of firms will take staff on the RAS journey with them. Upskilling and reskilling emerge as the major labour actions businesses have taken in the region as a result of the adoption of RAS, but access to training provision and the lack of ready-to-hire RAS skills make appropriate staffing a challenge.

Above all, the building blocks the West Midlands has in the forms of its central geographic location, extensive research infrastructure, and mass of manufacturing businesses leaves the region ripe for a future ground for rapid expansion of RAS technology, given the proper encouragements, both financial and otherwise.

Even though there are barriers to overcome to achieve enhanced adoption, whether that be costs, skills, or the fragmented support infrastructure, mitigations are within reach to improve access to the technology. Addressing these barriers will require concerted efforts from both local government and industry stakeholders, as well as strategic partnerships to make RAS more accessible and achievable for businesses of all sizes.

The report identifies strategic actions to erode these barriers, from financial support programmes and training partnerships to dedicated RAS clustering and sector-specific initiatives. Beyond servicing the region's own interest, the report found that the region has the capability to lead nationally on the initiative, particularly given the geographic and infrastructure advantages it benefits from. Overall, this makes a compelling case for increasing the prevalence of RAS adoption by businesses in the West Midlands. By leveraging its unique strengths, addressing key barriers, and implementing targeted support strategies, the region can secure its role as a UK leader in RAS innovation. With commitment from local government, industry, and educational institutions, the West Midlands has the potential to build a future-proof manufacturing sector that not only drives productivity and economic growth but also supports workforce resilience and regional prosperity.

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Led by the Mayor of the West Midlands, the WMCA brings together 18 local councils to oversee the transfer of powers and funding from Whitehall to the West Midlands. The WMCA is putting these new powers from government back where they belong, in local hands, bringing the region together to build a healthier, happier, better connected and more prosperous West Midlands. Billions of pounds are being invested by the WMCA to improve the region's transport network, transform its derelict industrial land into new homes and workplaces, support existing businesses and help grow the innovative, green industries of the future. At the heart of this vision is a strong economy that is both green and inclusive, one that supports the region's ambition to be net zero carbon by 2041 and offers everyone the opportunity of a good quality, affordable home and the skills needed for a worthwhile job.

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Founded by the Manufacturing Technology Centre (MTC) and University of Birmingham the West Midlands RAS Cluster is a collaborative group comprising of industry, academic institutions, and local authorities. By promoting the power of robotics and autonomous systems, the cluster aims to drive growth, innovation, enhance productivity, and ensure the West Midlands region can continue leads on the global stage within this sector. With a mission to advance the development and exploitation of robotics and autonomous systems within the West Midlands the group works to facilitate innovation, partnerships and collaboration between industry, academia and Government across all engineering sectors and organisation sizes.

**www.westmidlandsrascluster.org**

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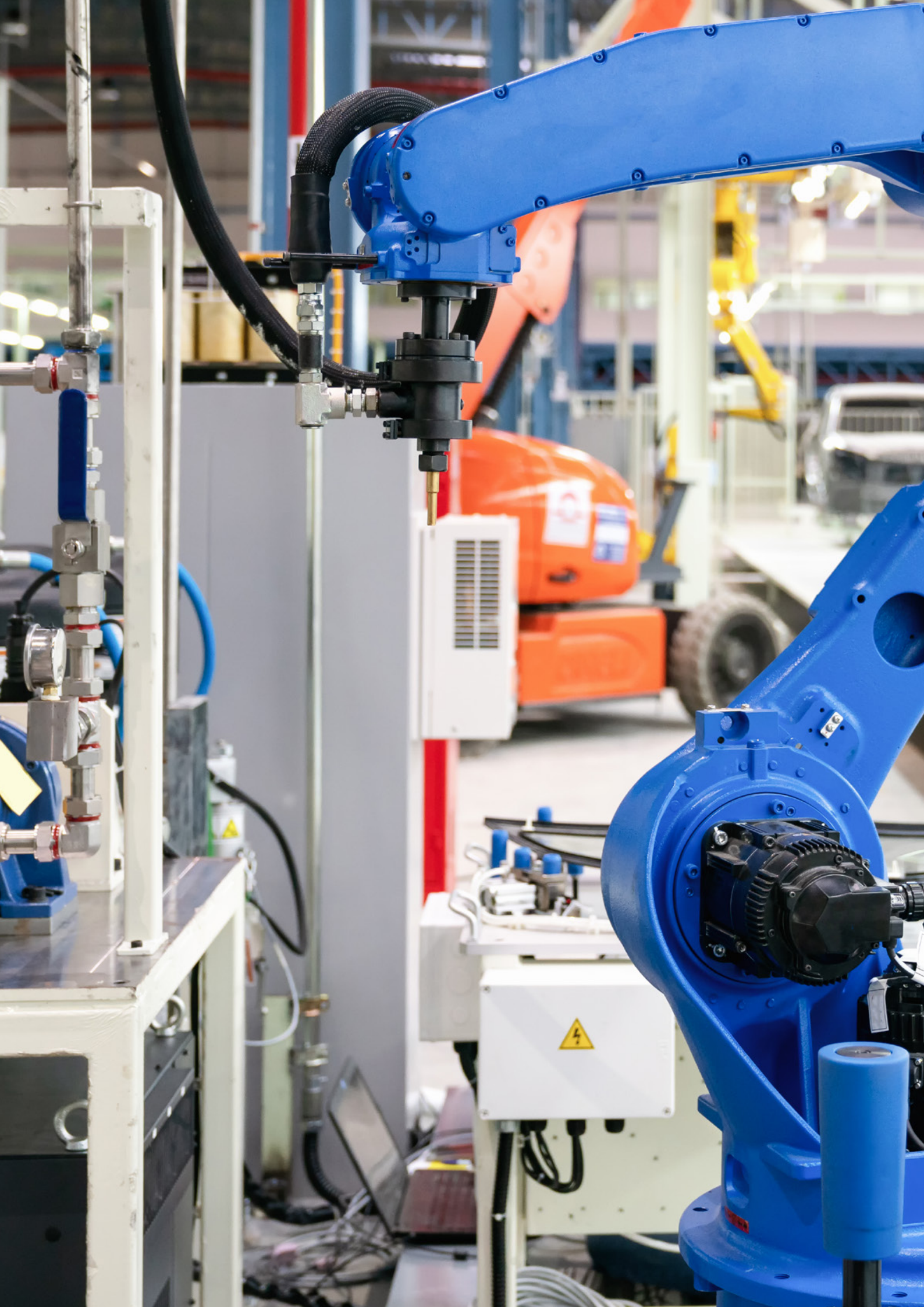



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