



INDUSTRY WHITE PAPER

SECURING THE FUTURE WORKFORCE OF THE METAL FINISHING INDUSTRY

Third Edition

Developed following constructive discussion and feedback from industry professionals.

Preserving Knowledge • Inspiring Talent • Building the Future

Prepared by

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Surface World Magazine

Manufacturers • Educators • Industry Stakeholders • Policymakers

MJB Industry Insights | Publication 001

First published: June 2026

Expanded Edition published: July 2026

Third Edition published: July 2026

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Suggested citation: Beard, C. and Beard, M. (2026) Securing the Future Workforce of the Metal Finishing Industry: Third Edition.

Independent Industry White Paper

This publication has been prepared independently by MJB Surface Advisors Ltd to encourage constructive discussion across manufacturing, education, professional institutions and government. It is intended to support collaboration, stimulate debate and contribute to the long-term sustainability of the UK metal finishing and surface engineering sector.

Foreword

Why We Wrote This Paper

Surface engineering has given us careers, friendships and opportunities for which we will always be grateful.

More importantly, it has introduced us to remarkable people who shared their knowledge, challenged our thinking and encouraged us to ask questions, keep learning and pass that knowledge on.

This paper has been written in that same spirit.

It is not intended to provide all the answers, nor to criticise the excellent work already being undertaken across our industry.

Instead, it is an invitation to continue an important conversation about the future of manufacturing, surface engineering and the people who will shape it.

We do not claim to have all the answers, but we firmly believe that asking the right questions is often the first step towards meaningful progress.

We hope that, whether you are a manufacturer, educator, policymaker, industry representative or student, this paper encourages discussion, collaboration and fresh thinking about the future of our industry.

Why MJB?

MJB Surface Advisors was founded on one simple belief: experience has its greatest value when it is shared.

We are grateful to the remarkable people who invested their time, knowledge and belief in us throughout our careers. Every service we provide is our way of passing that knowledge on and helping strengthen the future of our industry.

About This Publication

This independent white paper has been prepared to encourage discussion across manufacturing, surface engineering, education and government. The views and recommendations expressed are those of the authors and are intended to support constructive debate, collaboration and the continued development of the UK surface engineering industry.

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Executive Summary

The UK metal finishing and surface engineering sector faces a growing workforce challenge. An ageing workforce, increasing competition for skilled labour and limited awareness of the industry among young people threaten the long-term resilience of a sector that underpins many of the UK's advanced manufacturing capabilities.

This white paper explores the factors influencing recruitment and retention, drawing upon published research, industry experience and practical observations. It considers the role of employers, educators, professional institutions and government in developing a stronger and more sustainable talent pipeline.

The recommendations presented throughout this paper are intended to encourage collaboration rather than criticism. Many organisations are already making valuable contributions to addressing these challenges. This paper seeks to build upon those efforts by identifying practical opportunities that could further strengthen engagement, education and workforce development.

Since our first discussion paper, the response from across the industry has helped shape this work further. This edition looks more closely at how knowledge itself is developed, retained and passed on — because preserving expertise matters just as much as attracting new people into the sector. In Part Three, we set out the practical steps we believe could turn this discussion into action.

Ultimately, the future of the industry will depend not only on attracting new talent, but also on preserving and sharing the knowledge, experience and values that have shaped the profession for generations.

UNDERSTANDING THE CHALLENGE

Introduction

The UK metal finishing and surface engineering industry has long played a vital role in supporting advanced manufacturing across aerospace, automotive, defence, medical devices, energy and many other sectors. Despite its importance, the industry faces increasing challenges in attracting, developing and retaining the skilled people needed to support future growth.

This paper examines the factors contributing to those challenges and considers practical opportunities to strengthen the future workforce. Drawing on published research, industry insight and professional experience, it aims to encourage constructive discussion between manufacturers, educators, professional institutions and policymakers.

Before considering possible solutions, it is important to understand the current landscape, the pressures facing employers, and the reasons many young people remain unaware of the rewarding careers available in the sector.

Why This Matters: Manufacturing, Opportunity and Legacy

1.1 The Hidden Industry Behind Modern Manufacturing

Metal finishing and surface engineering are often described as hidden industries. Relatively few people outside manufacturing are familiar with processes such as electroplating, anodising, passivation, electroless nickel plating, chromium plating and specialist coatings, yet these technologies play a critical role in modern life.

Products and components used in aerospace, automotive, defence, medical technology, electronics and advanced manufacturing all rely upon specialist surface engineering processes to improve performance, durability, reliability and safety (Institute of Materials Finishing [IMF], 2025).

The Institute of Materials, Minerals and Mining (IOM3, 2025) identifies surface engineering as a discipline that improves component performance, enhances durability and contributes significantly to resource efficiency and sustainability. Without appropriate surface treatments, many modern engineering products would fail prematurely or be unable to meet customer, regulatory or safety requirements.

1.2 Supporting Strategic Industries

Sector	UK Economic Significance
Aerospace	Approximately £13 billion annual contribution to the UK economy, supporting hundreds of thousands of jobs. Customers include Airbus, Boeing, Rolls-Royce and Leonardo (ADS Group, 2025).
Automotive	Approximately £93 billion annual turnover and more than 800,000 jobs across manufacturing and supply chains (SMMT, 2025).
Defence	Hundreds of thousands of jobs supporting national security and advanced manufacturing capability (ADS Group, 2025).
Medical Technology	Specialist surface treatments supporting implants, surgical instruments and diagnostic equipment.
Electronics	Conductive coatings, connector plating and semiconductor processes fundamental to modern electronics.
Renewable Energy	Surface treatments supporting wind, solar, battery and hydrogen technologies as the UK transitions towards net zero.

The importance of metal finishing extends well beyond the sector itself. Surface engineering provides critical technologies that underpin many of the UK's highest-value manufacturing industries. Without these specialist

processes, the performance, durability and reliability expected by customers and regulators could not be consistently achieved.

1.3 Why Policymakers Should Care

Engineering and advanced manufacturing play a central role in the UK's economy, supporting millions of jobs, driving innovation and contributing significantly to national productivity. EngineeringUK (2025) estimates that engineering and technology occupations account for approximately 6.4 million jobs across the UK economy.

Manufacturers continue to report persistent recruitment difficulties, rising skills shortages, and growing concerns about future workforce capacity (Make UK, 2025). For specialist sectors such as metal finishing and surface engineering, these pressures are particularly significant because the knowledge required is developed through years of practical experience and cannot be replaced quickly.

The Department for Work and Pensions' Young People and Work review, chaired by Alan Milburn, highlights the importance of helping young people access meaningful employment while supporting long-term economic growth (DWP, 2026). Strengthening workforce pathways into manufacturing is therefore not simply an industry issue; it is a matter of national economic resilience.

Recognising metal finishing as a strategic manufacturing capability will help ensure that future policy, education and workforce initiatives reflect the sector's importance to UK supply chains and advanced manufacturing.

1.4 Preserving Knowledge Before It Is Lost

Perhaps the greatest challenge facing the sector is the gradual loss of knowledge as experienced professionals approach retirement. Across the industry, practical expertise in process control, quality, compliance, troubleshooting and operational leadership has often been developed over decades.

Without effective succession planning and structured knowledge transfer, valuable expertise risks being permanently lost. Preserving this knowledge is therefore not simply about documenting processes; it is about ensuring that experience continues to benefit future generations and strengthens the long-term sustainability of the industry.

CHAPTER 2

The National Workforce Challenge

2.1 Youth Employment and Economic Inactivity

One of the most significant workforce challenges currently facing the United Kingdom is the growing number of young people who are not in education, employment or training (NEET). According to the Office for National Statistics (ONS, 2026a), 957,000 young people aged 16–24 were classified as NEET during October to December 2025. The most recent figures increased this to 1,012,000 during January to March 2026 (ONS, 2026b).

The Department for Work and Pensions' Young People and Work review, chaired by Alan Milburn, identified limited awareness of career opportunities, reduced employer engagement and barriers to entering employment as significant contributors to youth economic inactivity (DWP, 2026). For manufacturing, these statistics represent not only a national challenge but also a significant opportunity to engage future talent.

2.2 Manufacturing Skills Shortages

Make UK (2025) reports approximately 55,000 long-term manufacturing vacancies, contributing to an estimated annual productivity loss of £6 billion. Skills England (2025) also identifies manufacturing as one of the sectors experiencing persistent skills-shortage vacancies.

For specialist industries such as metal finishing and surface engineering, the challenge is compounded by the highly technical nature of many roles and the years of practical experience required to develop competence.

2.3 Apprenticeships and Technical Education

The UK Government continues to identify apprenticeships and technical education as key mechanisms for addressing workforce shortages and supporting economic growth (DfE, 2025a). T Levels were introduced to strengthen technical education pathways and increase employer involvement in workforce development, while Skills England (2025) has emphasised the importance of stronger collaboration between employers and education providers.

Despite these developments, many employers continue to report difficulties engaging with education providers, and many young people have limited exposure to manufacturing careers. Apprenticeship starts within manufacturing have declined significantly in recent years (Make UK, 2025), creating a growing gap within the future talent pipeline.

2.4 Workforce Ageing and Knowledge Loss

Alongside recruitment challenges, many sectors are experiencing an ageing workforce. EngineeringUK (2025) highlights the importance of maintaining engineering capability while experienced workers approach retirement. For industries such as metal finishing and surface engineering, this challenge is particularly significant because many specialist skills are acquired through years of practical experience rather than formal education alone.

When experienced personnel leave the workforce, organisations risk losing valuable process knowledge, technical expertise, customer-specific understanding, problem-solving capability and operational judgement. Without structured succession planning and effective knowledge transfer, these losses may affect productivity, quality and long-term competitiveness.

The Metal Finishing Industry Challenge

3.1 What We Heard From Industry

While preparing this paper, we sat down with businesses across the United Kingdom and the United States — in aerospace, automotive, defence, manufacturing and specialist surface engineering supply chains, ranging from smaller operations employing around fifteen people to larger businesses employing more than one hundred and fifty. These conversations included:

- Anochrome Limited — aerospace and defence surface engineering
- Savekers Solutions — specialist surface treatment advisory
- Birmingham Plating — general engineering and decorative finishing
- Midland Chromium Plating — industrial chrome applications
- Armac Martin — luxury brass hardware and decorative finishing (Birmingham)
- Alliance Finishing and Manufacturing (USA) — precision finishing for aerospace
- Elite Metal Finishing (USA) — specialist coatings for defence supply chains

The organisations we spoke to differed considerably in size and market focus. What struck us was how consistently the same concerns came up, conversation after conversation.

3.2 Key Findings from Our Conversations

Finding	Risk Identified
Workforce Ageing	Critical loss of operational leadership within a 5–10 year window
Recruitment Deficits	A shrinking pool of experienced process control specialists in many regions
Limited Sector Awareness	Finishing careers remain almost entirely invisible to school leavers and career advisers
Public Misperception	Outdated stereotypes deter high-calibre STEM candidates
Concentration of Knowledge	Proprietary process techniques reside with single individuals approaching retirement
Latent Expert Supply	Valuable retired expertise remains unutilised and unrecorded
Employer Willingness	Strong appetite to contribute — a coordination mechanism is currently lacking

3.3 The Experience Gap

One theme came up in almost every conversation: the growing gap between experienced personnel and new entrants to the sector. Many of the businesses we spoke to still rely heavily on employees with decades of specialist knowledge — people carrying process control, problem-solving, quality management, customer knowledge and operational leadership in their heads. Many of those people are approaching retirement. As more than one employer put it to us, unlike some professions, these skills cannot simply be replaced by hiring; they are built over years of hands-on exposure to complex processes and real operational problems.

3.4 The Perception Challenge and Modern Reality

Employers repeatedly raised the gap between public perceptions of manufacturing and what we actually saw on their factory floors: highly regulated facilities supplying aerospace, defence, medical technology and automotive customers, with real investment in automation, quality systems, environmental controls and continuous improvement. Despite this, outdated stereotypes still shape how manufacturing careers are seen from the outside.

Modern metal finishing is a technology-intensive discipline. It encompasses electrochemistry, materials science, process control, environmental compliance, precision measurement and digital quality management. These are not the 'dirty factories' of public imagination; they are high-specification manufacturing environments supporting some of the world's most demanding industries.

Industry in Practice: Case Studies

Case Study 1: South West Metal Finishing (SWMF) — Apprenticeship as a Workforce Strategy

Location: Exeter, Devon (with sites in Chippenham and Yeovil)

Sector: Aerospace and high-technology surface engineering

Customers: Rolls-Royce, Airbus, Honeywell, Leonardo, Eaton Aerospace

South West Metal Finishing has developed one of the most active apprenticeship programmes in the UK surface engineering sector. Under the leadership of Managing Director Damon Gill, SWMF recruits multiple apprentices each year through a structured three-year programme combining hands-on practical training across all surface treatment disciplines with academic study in partnership with Exeter College.

Apprentices undertake the IMF Technician Training course, with successful candidates achieving recognition as IMF Technical Members. In 2023, apprentice Mackenzie Hayes Tech IMF was awarded Best Student at Technician Level. The company also operates an annual Apprentice of the Year award and actively recruits at schools and colleges.

The company's stated vision — 'Leading the Way in Surface Engineering' — is reflected directly in its investment in future talent.

Sources: SWMF (2021–2023); ADS Group (2017)

Case Study 2: Armac Martin — Skills Passed Down Through Generations

Location: Birmingham, West Midlands (est. 1929)

Sector: Luxury brass hardware, decorative finishing and precision manufacturing

Customers: Leading interior designers, architects and luxury retailers worldwide

Armac Martin, based in Birmingham since 1929, produces luxury solid brass cabinet hardware with over 20 specialist decorative finishes. The company's reputation is built explicitly on 'skills passed down from generation to generation'. During National Apprenticeship Week 2024, Head of HR Lucy Anker discussed the company's active commitment to apprenticeships across all business divisions.

Armac Martin has also partnered with United in Design to support diversity and inclusion in manufacturing. The case illustrates how specialist decorative surface finishing — including nickel, chrome, brass and bespoke lacquered finishes — is a knowledge-intensive craft where investment in people is not optional; it is the business model.

Sources: Armac Martin (2024a); Armac Martin (2024b)

Case Study 3: Responsive Engineering — Surface Finisher Level 3 Apprenticeship

Location: North East England

Sector: Defence, energy and rail fabrication

Customers: Large complex fabrications across defence, energy and rail supply chains

Responsive Engineering actively recruits surface finisher apprentices at Level 3 through the national apprenticeship framework. The programme provides apprentices with the skills to lead and control manual and semi-automated surface finishing processes across a three-year structured training period.

The existence of a publicly advertised Level 3 Surface Finisher apprenticeship demonstrates that formal apprenticeship standards already exist within the sector — yet awareness of these pathways among schools, colleges and young people remains extremely limited. This represents a direct opportunity for the IMF, SEA and Surface World to amplify through wider promotion.

Source: GOV.UK (2024)

These case studies demonstrate that the solutions to the workforce challenge already exist in practice.

The challenge is scale, awareness and coordination. Where employers commit to apprenticeships, mentoring and community engagement, they attract, develop and retain talent. The sector must now ask: how do we make this standard practice across the industry rather than the exception?

PART TWO

UNDERSTANDING THE OPPORTUNITY

Introduction

The workforce challenge is significant, but it is not inevitable. Apprenticeships, mentoring, employer engagement, knowledge-transfer programmes and industry collaboration have all demonstrated positive outcomes. The challenge now is implementation at scale.

If workforce shortages continue to grow, businesses may face increasing difficulties meeting customer demand, maintaining service levels and supporting future growth. The result could be reduced domestic capability and increased dependence on overseas providers.

Across the industry, many experienced professionals possess decades of practical expertise. Without effective mechanisms for knowledge transfer, retirement represents not simply the loss of employees but the permanent loss of expertise.

The Cost of Doing Nothing

5.1 Introduction

The previous chapters set out the scale of the challenge. What is less often discussed is the cost of leaving it unaddressed. That cost, we believe, extends well beyond any single business — and is likely to be greater than the cost of taking action now (Make UK, 2025; EngineeringUK, 2025).

5.2 The Economic Cost of Skills Shortages

Chapter 2 set out the national picture: tens of thousands of long-term manufacturing vacancies, and billions in lost productivity each year. Within metal finishing specifically, the cost tends to show up close to home — in orders turned away, lead times that stretch out, and experienced staff stretched too thin because a vacancy has sat unfilled for months.

5.3 The Risk of Knowledge Loss

We have already touched on the knowledge risk facing the sector, and it is worth restating plainly here: when an experienced employee retires without a proper handover, the business does not just lose a person. It loses years of troubleshooting, customer knowledge and process judgement that took decades to build and cannot be re-hired at short notice (EngineeringUK, 2025; IOM3, 2025).

5.4 Supply Chain and Industrial Capability Risks

As Chapter 1 set out, aerospace, automotive, defence and other strategic sectors depend on surface engineering to meet the performance, durability and safety standards their customers and regulators require. A shrinking pool of skilled finishers does not just affect metal finishing businesses — it puts pressure on every supply chain that relies on them (IMF, 2025; IOM3, 2025).

5.5 The Cost to Future Talent

There is a human cost too. Chapter 2 noted that more than a million young people in the UK are currently not in education, employment or training (ONS, 2026a; ONS, 2026b). Every year that metal finishing remains invisible to careers advisers and school leavers is a year in which some of those young people never discover a trade that could have suited them well.

5.6 Competitiveness, Productivity and Growth

Government continues to prioritise advanced manufacturing, innovation and productivity (Skills England, 2025). Businesses that cannot recruit, develop and retain skilled people will find it harder to compete against international competitors drawing from much larger labour markets.

5.7 A Preventable Risk

The examples in Chapter 4 show that positive outcomes are achievable through apprenticeships, mentoring and education engagement. The issue is not a lack of solutions. The issue is scale, coordination and visibility.

5.8 Conclusion

So the cost of doing nothing is not just a recruitment problem. It is lost expertise, weakened supply chains, constrained productivity and missed opportunities for the next generation. Seen this way, workforce development is not a cost to be managed — it is an investment in the sector's future (Make UK, 2025; EngineeringUK, 2025).

The Awareness Gap

6.1 An Invisible Industry

Unlike professions such as teaching, nursing, law, finance or technology, metal finishing rarely receives significant visibility within mainstream careers guidance. Yet the industry supports products and technologies that most people encounter every day: aircraft, vehicles, medical devices, electronics and defence equipment. Surface engineering contributes to the performance, durability and reliability of countless products (IMF, 2025). Despite this importance, many young people complete their education without ever encountering the terms surface engineering, electroplating, anodising, specialist coatings or metal finishing.

6.2 The Careers Guidance Challenge

Career aspirations are often shaped by exposure. Research undertaken by EngineeringUK (2025) has repeatedly highlighted the importance of employer engagement and exposure to engineering careers in influencing future career choices. The Gatsby Benchmarks, widely recognised as a framework for effective careers guidance, emphasise the importance of meaningful encounters with employers and employees (The Gatsby Foundation, 2024). However, many metal finishing businesses have limited opportunities to engage directly with schools and colleges. Consequently, careers within the sector may receive little or no representation during key stages of career decision-making.

6.3 Learning from Other Sectors

Several industries have successfully improved awareness through coordinated engagement: STEM ambassador programmes across engineering; the Royal Navy and Armed Forces' schools engagement activities; the NHS healthcare careers campaign; and construction industry outreach through initiatives such as the Construction Industry Training Board (CITB). These demonstrate that awareness can be improved when industries actively engage with schools, colleges and communities. The metal finishing sector may benefit from adopting similar approaches at national scale.

6.4 Why Awareness Is a Foundational Issue

Awareness alone does not solve every workforce challenge. However, without awareness, many other solutions become significantly more difficult. Apprenticeships require applicants. Training programmes require participants. Employers require future talent. All of these depend upon visibility. If young people remain unaware of careers within metal finishing and surface engineering, the sector will continue to face difficulties attracting future generations regardless of the quality of the opportunities available.

6.5 Conclusion

The awareness gap is not simply a communications issue; it is a strategic workforce issue. Increasing visibility of careers within metal finishing and surface engineering will not, on its own, solve the sector's recruitment challenges. However, without improving awareness, attracting the next generation of technicians, engineers, scientists and leaders will remain increasingly difficult. The evidence reviewed throughout this paper suggests that stronger collaboration between industry, education and professional bodies represents the most sustainable route towards building a resilient future workforce.

Conclusions

7.1 Summary of Findings

This paper has examined the workforce challenges currently facing the UK metal finishing and surface engineering sector through industry engagement, published research and case study evidence. Although the challenges are significant, they are not unique to this sector, nor are they without practical solutions. Across industry there is clear evidence that organisations investing in people, apprenticeships, mentoring and knowledge transfer achieve positive outcomes. The challenge now is to apply these approaches more consistently across the sector.

7.2 Final Conclusions

The evidence presented throughout this paper indicates that the future success of the UK metal finishing and surface engineering sector will depend upon its ability to attract, develop and retain the next generation of skilled people. Whilst workforce shortages, demographic change and knowledge loss present significant risks, they also provide an opportunity for industry, education and professional bodies to work together towards a shared long-term solution.

The examples contained within this paper demonstrate that many organisations are already implementing successful approaches through apprenticeships, mentoring, employer engagement and workforce development. Rather than creating entirely new solutions, the sector now has an opportunity to scale existing good practice, strengthen collaboration and improve awareness of rewarding careers within metal finishing and surface engineering.

Looking Ahead

Building on this foundation, Part Three of this paper, Building the Future, translates the evidence into practical, actionable recommendations for industry, education providers, professional bodies and government. In the meantime, Chapter 8 looks in more depth at how knowledge itself is developed, retained and transferred within industrial environments — providing the foundation on which those recommendations are built.

Understanding Knowledge and Knowledge Transfer

8.1 What Is Knowledge?

Ask an experienced plater how they know a bath is ready, and you will often get a pause before the answer. They know — but putting it into words is harder than it sounds. That gap, between knowing something and being able to explain it, is really what this chapter is about. Before going further, it is worth being upfront: knowledge is one of the most widely used, yet least consistently defined, concepts in academic literature. Although the term is used frequently within philosophy, psychology, education, organisational learning and

knowledge management, there is no single universally accepted definition. Its meaning varies according to the discipline, context and purpose for which it is being considered (Zagzebski, 2017).

A commonly accepted dictionary definition describes knowledge as information, understanding or skill acquired through experience or education (Merriam-Webster, 2026). Similarly, the Oxford English Dictionary defines knowledge as facts, information and skills acquired through experience or education. Whilst these definitions provide a useful starting point, they do not fully explain how expertise develops within industrial environments or why individuals with access to similar information can demonstrate different levels of competence or confidence in practice.

That gap has a name in the academic world. Michael Polanyi (1966) described it well: people often know more than they are able to put into words. This is the difference between information that can be documented and the kind of knowledge that develops through experience, judgement and practice but is difficult to fully articulate. Information matters, but on its own it is not the whole picture — knowledge also involves understanding, interpretation, application and experience (Polanyi, 1966; Nonaka, 1991).

We have both seen this on the shop floor: two people trained on the same procedure, given the same information, ending up with noticeably different levels of confidence and competence. Our sense is that this happens because information only becomes knowledge once it is understood, interpreted and applied through an individual's own experience and judgement — a view supported by knowledge management research (Nonaka, 1991).

The variation in dictionary and academic definitions illustrates that knowledge is a complex and contextdependent concept. Rather than seeking a single universal definition, this paper adopts a definition appropriate to its purpose. For the purposes of this paper, which explores how expertise is developed, retained and transferred within the UK surface engineering sector, knowledge is considered not only in terms of what individuals know, but also how that knowledge is acquired, developed, applied and shared throughout their careers.

Knowledge itself is also not a single, uniform thing. Researchers commonly distinguish between two broad forms: explicit knowledge and tacit knowledge (Polanyi, 1966; Nonaka and Takeuchi, 1995). Explicit knowledge is the kind you can write down — manuals, procedures, drawings, specifications, training materials. Tacit knowledge is the kind that lives in someone's hands and instincts: personal, built through experience, and often hard to put into words. Both matter in manufacturing. Explicit knowledge gives consistency and standardisation; tacit knowledge is usually what gets a job done well when the written procedure alone is not quite enough.

Understanding what knowledge is, however, represents only part of the challenge. Equally important is understanding how individuals acquire, develop and apply that knowledge throughout their careers. This requires consideration not only of knowledge itself, but also of the learning processes through which expertise develops.

The following section therefore explores how knowledge evolves from information into practical capability, and how learning contributes to the development of expertise within industrial environments.

8.2 Learning and the Development of Knowledge

Why do two people with access to similar information often develop very different levels of expertise?

This question lies at the heart of workforce development. If organisations hope to preserve knowledge, develop future talent and address growing skills shortages, understanding what knowledge is represents only part of the challenge. Equally important is understanding how knowledge develops throughout an individual's career.

Expertise rarely appears overnight. Rather, it develops progressively through learning, curiosity, observation, practical application, experience and reflection. Understanding this journey provides an important foundation for considering how expertise may later be shared, retained and transferred within industrial environments.

Learning

Learning is a continuous process rather than a single event. Throughout a career, individuals acquire knowledge through a combination of formal education, workplace training, observation, questioning, practical experience, feedback and interaction with others. Whilst these processes provide opportunities to learn, they do not necessarily produce the same outcomes for every individual.

Within industrial environments, it is common to find individuals who have completed similar training yet demonstrate different levels of confidence, capability and professional judgement. This suggests that learning involves considerably more than exposure to information alone. It requires individuals to engage with information, interpret its meaning and apply it within the context of real-world situations.

Recognising that individuals may engage with learning in different ways is therefore an important consideration when developing future workforce strategies. Whilst this paper does not seek to categorise learners, it does suggest that a more flexible approach to developing knowledge may warrant further consideration.

Curiosity

One factor that may influence the development of expertise is curiosity.

Curiosity encourages individuals to ask questions, challenge assumptions and seek understanding beyond the immediate task. Rather than simply accepting that a process works because 'it has always been done that way', curious individuals are more likely to explore why it works, what might influence it and how it could be improved. In doing so, curiosity transforms learning from the passive acceptance of information into the active pursuit of understanding.

IN PRACTICE

Throughout the development of this paper, discussions between the authors frequently began not with answers, but with questions: 'Why?', 'How do we know?', 'Can we prove it?'. These questions often challenged existing assumptions and prompted further investigation. Although simple, they demonstrate how curiosity encourages deeper understanding rather than passive acceptance of information.

QUESTION FOR CONSIDERATION

Could curiosity represent one of the most overlooked contributors to the development of expertise?

Experience and Reflection

Experience is widely recognised as an important contributor to expertise. However, experience alone does not necessarily result in greater understanding. Repeating the same task over many years may reinforce existing habits without improving judgement or decision-making.

Reflection provides the opportunity to transform experience into learning. By considering why outcomes occurred, questioning decisions and evaluating alternative approaches, individuals are able to refine their understanding and adapt future practice. In this sense, experience provides opportunity, whilst reflection provides learning.

IN PRACTICE

Early in a career, mistakes often feel like failures. Looking back, however, they frequently become some of the most valuable learning experiences. The difference is rarely the mistake itself, but the willingness to ask why it happened, understand what could have been done differently and apply those lessons in the future.

Pattern Recognition and Judgement

As knowledge develops, repeated exposure to similar situations enables individuals to recognise patterns that may not be immediately obvious to others. This pattern recognition contributes to professional judgement and forms an important aspect of tacit knowledge. Experienced practitioners may therefore identify subtle changes in a process long before they become apparent through documentation or measurement.

IN PRACTICE

An experienced plater once paused beside a process tank and quietly remarked, 'Something isn't right.'

When asked what was wrong, the response was simply, 'I can't explain it... it just doesn't look right.' Only later was a developing process issue identified. Whilst anecdotal, examples such as this help illustrate the challenge described by Polanyi (1966): experienced practitioners often possess knowledge that is highly valuable but difficult to articulate.

Bringing Learning and Knowledge Together

Expertise therefore, develops through considerably more than the acquisition of information. It emerges through continuous learning, curiosity, observation, practical application, experience and reflection. Together, these processes enable individuals not only to understand information, but also to interpret, adapt and apply it within changing industrial environments.

This naturally raises another important question: if expertise develops through these processes, what factors should organisations consider when seeking to develop and transfer expertise effectively to future generations?

The following section begins to explore these considerations by examining how knowledge may be transferred between individuals within industrial environments.

8.3 What Challenges Prevent Successful Knowledge Transfer?

The previous sections explored what knowledge is and how it develops. A natural question follows: if knowledge can be developed, why is it often so difficult to transfer successfully within organisations?

Knowledge transfer is rarely achieved through a single method. Documentation, observation, mentoring, coaching and practical experience each contribute differently depending on the nature of the knowledge being transferred and the needs of the learner.

Research distinguishes between explicit knowledge, which can often be documented, and tacit knowledge, which is frequently acquired through observation, practice and experience (Polanyi, 1966; Nonaka and Takeuchi, 1995). This distinction suggests that organisations may benefit from combining several approaches rather than relying on one method alone.

Documentation provides consistency, supports standardisation and allows individuals to revisit information. However, documentation alone may not always communicate the judgement, experience and practical understanding that develops over time.

Observation and mentoring enable learners to see how experienced practitioners apply knowledge in real situations, ask questions and receive feedback. These approaches may be particularly valuable where judgement and decision-making are important.

IN PRACTICE

Many organisations that operate structured continuous-improvement systems combine documented standards with on-the-job coaching and mentoring. This illustrates that documentation and practical learning are complementary rather than competing approaches.

QUESTION FOR CONSIDERATION

If your organisation lost its most experienced employee tomorrow, how much of their expertise would remain available to others?

What this tells us is that effective knowledge transfer is less about picking one method and sticking with it, and more about combining approaches to suit what is being taught, who is learning, and the environment they are working in.

8.4 What Influences the Willingness to Share Knowledge?

Introduction

The previous section explored the methods through which knowledge can be transferred. However, understanding how knowledge can be shared raises an equally important question: what influences an individual's willingness to share what they know?

The knowledge-sharing literature has consistently identified that willingness to share knowledge is influenced by a combination of individual, organisational and contextual factors rather than a single cause (Ipe, 2003; Cabrera and Cabrera, 2005; Lin, 2007). Trust, motivation, organisational support, opportunity and an individual's ability to communicate their expertise all appear to influence whether knowledge is effectively transferred between people.

Trust

Trust is widely recognised within the knowledge-sharing literature as one of the most important influences on whether individuals are willing to exchange knowledge (Mayer, Davis and Schoorman, 1995; Edmondson, 1999; Levin and Cross, 2004).

IN PRACTICE

Successful mentoring relationships are built upon trust as well as technical expertise.

QUESTION FOR CONSIDERATION

Would you openly admit that you did not understand something if you feared being judged for asking?

WORTH CONSIDERING

Could opportunities to develop trust begin before employment, through education, apprenticeships or earlier engagement with industry?

Motivation

Motivation has been identified as one of the principal influences affecting knowledge sharing (Ipe, 2003). Intrinsic motivations such as professional pride and helping others, together with extrinsic motivations such as recognition, career progression and organisational rewards, may all influence knowledge sharing (Lin, 2007). Knowledge-hiding research suggests that job insecurity, competition and perceived organisational injustice may also influence behaviour (Connelly et al., 2012).

Organisational Support

In our experience, culture and leadership shape this more than anything else — a view backed by research into organisational behaviour (Ipe, 2003; Cabrera and Cabrera, 2005; Schein, 2010). Recognition does not necessarily need to be financial.

Practical Constraints

Not every barrier to knowledge sharing is behavioural. Organisational priorities, workload, available resources and operational pressures may influence opportunities for knowledge transfer. An absence of knowledge sharing does not necessarily indicate an absence of willingness; sometimes the opportunity simply does not exist.

QUESTION FOR CONSIDERATION

If your most experienced employee spends time mentoring a colleague today, is that a cost — or an investment in tomorrow's capability?

Ability to Transfer Knowledge

Possessing expertise does not automatically mean an individual can communicate that expertise effectively in every situation. The knowledge-sharing literature distinguishes between possessing knowledge and successfully transferring knowledge to others (Polanyi, 1966; Nonaka and Takeuchi, 1995). As organisations become increasingly diverse and inclusive, people may communicate and exchange knowledge in different ways. Language differences, communication preferences, neurodivergence, sensory impairments, accessibility requirements and other individual circumstances may influence how knowledge is most effectively shared.

Bringing the Evidence Together

Taken together, this tells us that willingness to share knowledge is shaped by several factors working together, rather than any single cause. Rather than concluding that knowledge sharing is simply too difficult, it may be more useful for organisations to ask a simpler question: what barriers exist here, in our own organisation, and how might we make sharing knowledge easier?

8.5 Creating an Environment That Supports Knowledge Transfer

Introduction

The previous sections have explored what knowledge is, how it develops, the different ways in which it can be transferred, and some of the factors that may influence successful knowledge sharing. The evidence discussed throughout this chapter has highlighted several recurring themes and, collectively, these raise an important question: if organisations wish to strengthen knowledge transfer, where should they begin?

The purpose of this section is not to introduce a single solution or recommend one approach over another. Instead, it brings together the evidence discussed throughout this chapter to consider the organisational characteristics that may help create environments in which knowledge transfer is more likely to occur.

Leadership

Throughout this chapter, trust, curiosity, motivation, and organisational culture have repeatedly emerged as important influences on knowledge sharing. Whilst these factors involve individuals, they are also shaped by the environments in which people work.

It is often suggested that there is a distinction between management and leadership. Management is commonly associated with organising work, allocating resources and achieving operational objectives, whereas leadership is often linked with influencing behaviours, developing people and creating environments in which others can succeed. Whether this distinction is universally accepted or not, it raises an interesting question: if organisations wish to encourage curiosity, trust and continuous learning, what role should leadership play in creating those conditions?

Leadership is therefore not solely the responsibility of senior managers. Experienced operators, supervisors, mentors and team leaders all influence how knowledge is shared through the behaviours they demonstrate every day.

Culture

The evidence discussed throughout this chapter suggests that knowledge sharing is influenced by more than procedures alone. Trust, psychological safety, recognition, motivation, and opportunities to learn all contribute towards an organisational culture that either encourages or unintentionally discourages the exchange of knowledge.

Culture develops through everyday behaviours, conversations and decisions. The behaviours that organisations recognise, encourage, and reward often become the behaviours that employees repeat.

Recognising Individual Differences

People do not all learn, develop expertise or communicate knowledge in the same way. Organisations may therefore benefit from considering whether knowledge transfer should also be sufficiently flexible to recognise these individual differences.

This naturally raises another question. If different combinations of knowledge-transfer methods may be appropriate in different situations, how might organisations determine which approaches are most suitable

for their own people, processes and objectives? Answering this question will require organisations to consider not only what knowledge needs to be transferred, but how their own people, processes and culture can best support that transfer.

Embedding Knowledge Transfer

Knowledge transfer should not be viewed as a separate organisational activity. Conversations between colleagues, problem-solving activities, shift handovers, project reviews, coaching discussions and practical demonstrations may all contribute towards organisational learning.

QUESTION FOR CONSIDERATION

If knowledge sharing already occurs every day, how can organisations become better at recognising and supporting it?

Continuous Improvement

Many organisations already apply the principles of continuous improvement to quality, safety, productivity and operational performance. The evidence discussed throughout this chapter suggests that knowledge transfer may also benefit from being viewed through a similar lens. Small improvements implemented consistently over time may collectively have a greater impact than isolated initiatives.

Bringing the Evidence Together

The evidence reviewed throughout this chapter has highlighted several recurring themes. Knowledge develops through experience, reflection, curiosity and application. It can be transferred through a variety of methods, each offering different strengths depending upon the knowledge, the learner and the organisational context. Successful knowledge sharing also appears to be influenced by trust, organisational culture, motivation, leadership and learning opportunities.

Collectively, these discussions suggest that effective knowledge transfer is unlikely to be achieved through a single procedure, training course or organisational policy. Instead, it appears to be influenced by the interaction between people, culture, leadership and the everyday environments in which learning takes place.

If people learn differently, if experienced practitioners share knowledge differently, and if organisations differ in size, culture, resources and priorities, can a single approach realistically support every organisation?

These questions form a natural starting point for organisations seeking to strengthen knowledge transfer within their own environments. Part Three of this paper, Building the Future, now turns to translate this evidence — together with the practical recommendations trailed in Chapter 7 — into a structured programme for action, developed by the authors in collaboration with the IMF, SEA and Surface World.

PART THREE

BUILDING THE FUTURE

The Industry Legacy Programme

9.1 Introduction

Throughout this paper we have argued that the industry's greatest asset is not equipment or floor space, but the knowledge carried by its people. The Industry Legacy Programme is our attempt to put that belief into practice: a simple way of preserving industry knowledge, supporting workforce development and connecting experienced professionals with the next generation, alongside the apprenticeship, education and training activity that already exists.

9.2 Programme Objectives

The Industry Legacy Programme is built around five core objectives:

- Objective 1 — Preserve Knowledge: Capture and transfer practical expertise before it is lost through retirement.
- Objective 2 — Inspire Future Talent: Increase awareness of careers and opportunities within metal finishing and surface engineering.
- Objective 3 — Support Workforce Development: Strengthen pathways into industry through mentoring, education and employer engagement.
- Objective 4 — Strengthen Industry Collaboration: Encourage cooperation between employers, professional institutions, educators and policymakers.
- Objective 5 — Build Long-Term Sustainability: Help ensure future generations possess the skills and knowledge required to support the industry.

9.3 The Retired Experts Register

A central component of the programme would be the creation of a Retired Experts Register: a voluntary network of retired and semi-retired industry professionals willing to contribute to workforce development activities. Participants might support mentoring, guest speaking, school engagement, college engagement, industry events, apprenticeship support, technical knowledge transfer and professional development activities. The register would not require full-time commitment — instead, it would provide a flexible mechanism through which expertise could be shared when opportunities arise.

Mentoring is widely recognised as an effective mechanism for supporting skills development, confidence and professional growth (CIPD, 2024). The programme would establish a structured mentoring network connecting experienced professionals with apprentices, new entrants and early-career employees. Such relationships can help accelerate learning whilst strengthening engagement and retention. Importantly, mentoring provides benefits for both participants: younger individuals gain access to knowledge and guidance, whilst experienced professionals gain the opportunity to continue contributing to the development of the industry.

9.4 A Different Way of Thinking About Retirement

Retirement is often viewed as the end of a professional career. However, it may also represent the beginning of a different form of contribution. Many retired and semi-retired professionals no longer wish to undertake full-time employment, but they may still wish to share knowledge, support future generations, remain connected to the industry, and contribute to workforce development. Rather than viewing retirement solely as the loss of expertise, the Industry Legacy Programme proposes viewing experienced professionals as an ongoing and active resource capable of supporting the sector's future.

The experience of yesterday can help build the workforce of tomorrow. Every career that ends is an opportunity to transfer knowledge, if the right structures are in place.

9.5 Potential Delivery Partners

The Industry Legacy Programme could potentially be supported through collaboration between the Institute of Materials Finishing (IMF), the Surface Engineering Association (SEA), the Surface Engineering Leadership Forum (SELF), Skills England, local authorities, colleges, universities, employers and industry sponsors. Such collaboration would help ensure that the programme operates as an industry-wide initiative rather than the responsibility of any single organisation.

The Metal Finishing Future Skills Initiative

10.1 Vision

The Metal Finishing Future Skills Initiative brings the ideas in this paper together into one coordinated effort — building a sustainable pipeline of future talent while preserving the expertise that has built the industry to date. It rests on a simple premise: this is not one organisation's job to solve alone. Success should be judged not by recruitment numbers alone, but by the long-term strength of the workforce behind them. **10.2 Six**

Priorities for Action

Pillar	Focus and Proposed Actions
1. Awareness and Engagement	Metal Finishing Careers Week; industry open days; school ambassador activities; social media campaigns; employer outreach
2. Education Partnerships	College Partnership Scheme; guest lectures; employer visits; curriculum support; industry placements; T Level engagement
3. Apprenticeships and Technical Skills	Increase apprenticeship participation; promote T Levels; share best practice; support employer navigation of the levy system
4. Knowledge Preservation	Industry Legacy Programme; Retired Experts Register; mentoring networks; knowledge-transfer workshops
5. Leadership Development	Future supervisor and manager pathways; management training; professional development; succession planning
6. Industry Collaboration	National Workforce Taskforce; shared resources; joint awareness campaigns; collaborative education initiatives

10.3 Metal Finishing Careers Week

One of the most practical immediate proposals is the creation of a dedicated Metal Finishing Careers Week. The purpose would be to showcase career opportunities, employers, apprenticeships, technical roles and industry success stories. Activities could include school visits, employer open days, social media campaigns, industry webinars and careers events. The initiative would provide a focal point for awareness activities whilst helping improve visibility of the sector nationally.

Surface World Magazine is uniquely placed to amplify this initiative through editorial coverage, digital platforms and industry networks. The IMF and SEA provide the institutional authority and membership reach to coordinate participation across hundreds of member organisations.

10.4 The National Workforce Taskforce

This paper proposes the establishment of a National Workforce Taskforce for Metal Finishing and Surface Engineering. The purpose of the taskforce would be to monitor workforce trends, share industry intelligence, coordinate initiatives, support education engagement, promote best practice and inform policymakers. Potential participants include the Institute of Materials Finishing (IMF), Surface Engineering Association (SEA), Surface Engineering Leadership Forum (SELF), Skills England, employers, colleges, universities and government representatives.

Recommendations

The evidence, observations and analysis presented throughout this paper suggest that the workforce challenges facing the metal finishing and surface engineering sector are both significant and increasingly urgent. The recommendations below are intended to provide practical and achievable actions that could contribute to securing the sector's future workforce. They should be viewed not as isolated initiatives but as components of a coordinated workforce strategy.

No.	Recommendation	Priority	Lead
1	Establish a National Workforce Taskforce for Metal Finishing and Surface Engineering	Immediate	IMF / SEA / SELF
2	Launch the Industry Legacy Programme	Immediate	IMF / Employers
3	Create a National Industry Ambassador Network	Short-term	IMF / SELF
4	Introduce an Annual Metal Finishing Careers Week	Short-term	IMF / Surface World
5	Establish a College Partnership Scheme	Short-term	Employers / Colleges
6	Increase Participation in Apprenticeships and T Levels	Ongoing	Employers / DfE
7	Develop a National Careers Resource Hub	Medium-term	IMF / SEA
8	Support Structured Knowledge Transfer Within Industry	Ongoing	Employers
9	Improve Industry Data and Workforce Intelligence	Medium-term	IMF / Skills England
10	Recognise Metal Finishing as a Strategic Manufacturing Capability	Ongoing	Industry Bodies / DWP

11.1 Implementation Timeline

Short-Term Actions (0–12 Months): Establish Workforce Taskforce; create Industry Ambassador Network; begin development of Careers Resource Hub; launch pilot education engagement activities.

Medium-Term Actions (1–3 Years): Launch Industry Legacy Programme; expand college partnerships; increase apprenticeship participation; introduce Metal Finishing Careers Week.

Long-Term Actions (3–5 Years): National rollout of workforce initiatives; expanded industry participation; improved workforce data collection; long-term evaluation and continuous improvement.

Call to Action

12.1 A Moment of Opportunity

Throughout this paper, one message has come through clearly, from the data and from the businesses we have spoken to. The metal finishing and surface engineering sector faces significant workforce challenges. Employers we met told us, again and again, of their concerns about workforce ageing, recruitment difficulties, succession planning and the future availability of skilled personnel. At the same time, many experienced professionals are approaching retirement, taking valuable knowledge and expertise with them unless something changes.

These challenges are real. However, this paper has also demonstrated that they are not insurmountable. The sector possesses committed employers, experienced professionals, respected institutions and strong educational partners. The challenge is not a lack of capability — it is a need for greater coordination, collaboration and visibility.

12.2 A Shared Responsibility

The future of the metal finishing and surface engineering sector cannot be secured by any single organisation acting alone. This paper therefore calls upon all stakeholders to play their part.

A CALL TO ACTION

To Employers: Open your doors. Share your knowledge. Support future talent. Engage with schools and colleges.

To Professional Institutions (IMF, SEA): Champion workforce development, industry awareness and ambassador programmes.

To Education Providers: Strengthen links with employers. Showcase manufacturing careers. Embrace T Level placements.

To Policymakers: Recognise the strategic importance of the sector. Support collaborative workforce initiatives and Skills England's objectives.

To Industry Professionals — Past and Present: Your knowledge remains one of the industry's greatest assets. Help ensure it is passed to the next generation.

Together, we can preserve knowledge, inspire talent and build the future workforce of the metal finishing and surface engineering industry.

CLOSING REFLECTION

Why We Wrote This Paper

We set out to write something honest rather than something polished — a paper that reflects what business owners, technical specialists and platers have actually told us, rather than what might sound impressive on a shelf. If it has done that, and if it leaves you thinking differently about the people who will run our industry in ten years' time, then it has done its job.

We do not have all the answers. But we believe the questions in this paper are worth asking together — as employers, educators, institutions and policymakers — rather than apart. If any part of this has struck a chord, we would genuinely like to hear from you.

If this paper stimulates even one new conversation, one new collaboration or one young person to explore a career in surface engineering, then it will have achieved its purpose.

Mark Beard FIMF & Christina Beard BSc (Hons)

Co-Founders of MJB Surface Advisors

APPENDIX A **Key Industry Statistics**

National Workforce Statistics

Indicator	Data
NEET (Oct–Dec 2025)	957,000 young people aged 16–24 were NEET, representing 12.8% of that age group (ONS, 2026a).
NEET (Jan–Mar 2026)	1,012,000 NEET young people (13.5%), up 89,000 year on year (ONS, 2026b).
Manufacturing vacancies	Approximately 55,000 long-term vacancies in UK manufacturing, costing £6 billion annually (Make UK, 2025).
Skills shortage vacancies	42% of manufacturing vacancies classified as skills-shortage vacancies, up from 29% in 2017 (Skills England, 2025).
Apprenticeship starts	Manufacturing apprenticeship starts have fallen 42% since the Apprenticeship Levy was introduced in 2017 (Make UK, 2025).
Engineering workforce	Approximately 6.4 million engineering and technology jobs across the UK economy (EngineeringUK, 2025).
Aerospace sector	£13 billion annual contribution to the UK economy; hundreds of thousands of jobs supported (ADS Group, 2025).
Automotive sector	£93 billion annual turnover; more than 800,000 jobs (SMMT, 2025).

APPENDIX B

Glossary of Metal Finishing and Surface Engineering Terms

Term	Definition
Anodising	An electrochemical process used to increase corrosion resistance and improve the surface properties of metals, most commonly aluminium, by creating a controlled oxide layer.
Electroplating	The process of applying a metallic coating to a component using electrical current. Common applications include nickel, chrome, zinc, copper, gold and silver plating.
Electroless Nickel	A chemical deposition process producing uniform nickel coatings without electrical current. Widely used in aerospace and engineering due to consistency and corrosion resistance.
Surface Engineering	The modification of a material's surface to improve performance, durability, functionality or appearance. Encompasses a wide range of treatments, coatings and processes.
Passivation	A chemical treatment process used to improve corrosion resistance, particularly on stainless steel, by removing free iron and surface contaminants.
NADCAP	National Aerospace and Defense Contractors Accreditation Program. Globally recognised accreditation for special processes used within aerospace and defence supply chains.
AS9100	International quality management system standard for aviation, space and defence industries, based on ISO 9001 with additional aerospace-specific requirements.
T Level	Technical qualifications introduced in England combining classroom learning with substantial industry placements (minimum 315 hours). Designed as a high-quality alternative to A Levels for students aged 16–19.
Apprenticeship Levy	UK Government scheme requiring employers with a pay bill over £3 million to contribute 0.5% to a training fund. Credited with rising skills quality but also linked to a 42% decline in starts since 2017.
FIMF	Fellow of the Institute of Materials Finishing. The highest grade of professional membership within the IMF, recognising sustained contribution and expertise.

APPENDIX C

Proposed Workforce Development Initiatives — Summary

Industry Legacy Programme

Connects experienced and retired professionals with apprentices and future industry leaders through mentoring, ambassador activities and education engagement. See Chapter 9.

Retired Experts Register

A voluntary, flexible-commitment register of retired and semi-retired professionals willing to mentor, speak at events or support schools and colleges. See Chapter 9.

Industry Ambassador Network

Current and former professionals promoting careers within the sector through school visits, careers fairs and employer presentations.

Metal Finishing Careers Week

An annual national awareness week showcasing career opportunities, coordinated by IMF and SEA and amplified by Surface World Magazine. See Chapter 10.

College Partnership Scheme

Connects employers and colleges through placements, apprenticeships, guest lectures and careers guidance. Every participating employer is encouraged to build at least one active college relationship.

National Workforce Taskforce

Brings together industry, education and government to coordinate workforce development, monitor trends and inform policy. Proposed membership: IMF, SEA, SELF, Skills England, employers, colleges, universities and government. See Chapters 10–11.

National Careers Resource Hub

An online resource for students, parents, careers advisers and job seekers, covering career pathways, employer case studies and apprenticeship opportunities. See Recommendation 7.

APPENDIX D

About MJB Surface Advisors

MJB Surface Advisors is an advisory practice focused upon helping manufacturers bring clarity, confidence and credibility to demanding operational environments. The practice was established by Mark and Christina Beard following decades of combined experience within manufacturing, surface engineering and business development. The practice works with organisations operating across aerospace, automotive, defence, manufacturing and specialist surface engineering supply chains.

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Acknowledgements

The authors would like to thank the businesses, individuals and organisations who gave their time, insight and honesty during the preparation of this paper. Their willingness to speak openly about the challenges — and opportunities — facing the sector has shaped every part of this paper.

We would also like to thank the Institute of Materials Finishing and the Surface Engineering Association for their continued support of this work and their broader commitment to strengthening the future of our industry.

Finally, thank you to the wider community of manufacturers, educators and professionals who provided feedback on earlier editions of this paper and, in doing so, helped shape the discussion contained within this one.

Special and personal thanks go to Peter Merrington, John Oliver, Paul Fellows, Mark Goodban, and John Atherton. These people are just some of those who inspired us to make a difference in the industry, and without whom the industry and the things we now know would not be part of who we are.

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