



---

## The Critical Role of Talent in Bridging the Mainframe Skills Gap: Key Strategies for Modernization Success

**Srinivas Adilapuram**

Senior Application Developer, ADP Inc, USA

---

**Abstract:** Mainframe systems continue to be essential to operations across industries, but a skills gap is hindering their sustainability and modernization. As experienced professionals retire, organizations struggle to maintain and modernize legacy systems. This article explores strategies to address the skills gap, including training programs, educational collaborations, low-code platforms, and knowledge-sharing initiatives. By investing in these solutions, organizations can upskill existing staff, attract new talent, and simplify modernization processes. These strategies ensure that businesses remain adaptable and competitive in an increasingly technology-driven environment, supporting both legacy and modern systems effectively.

**Keywords:** Mainframe Skills Gap, Legacy Systems, Modernization Strategies, Training Programs, Low-Code Platforms, Knowledge Transfer

---

### 1. Introduction

Mainframe systems continue to underpin critical operations across industries, but a growing skills gap threatens their sustainability [1]. The aging workforce proficient in COBOL, JCL, and other mainframe technologies has left organizations grappling with a shortage of skilled personnel, resulting in project delays, increased operational costs, and stalled modernization efforts [2]. Compounding the issue is the challenge of integrating contemporary technologies into legacy systems, a process requiring specialized expertise that is becoming increasingly scarce [3]. This convergence of factors highlights the urgency of bridging the mainframe skills gap to ensure continued operational efficiency and innovation [4].

Research indicates that strategic investments in training programs, such as online courses, certifications, and workshops, can address the skills shortage by upskilling existing staff and attracting new talent [5]. Collaborative partnerships with educational institutions offer a sustainable solution by cultivating a talent pipeline equipped with the competencies needed for mainframe operations [6]. Furthermore, adopting low-code platforms has been shown to simplify modernization processes, making it easier for teams to enhance legacy systems with modern functionalities [7].

To build on these solutions, organizations are increasingly turning to mentorship programs that promote knowledge transfer, automation tools that streamline routine tasks, and cross-training initiatives to bridge gaps between modern and legacy systems [8][9]. Collectively, these strategies not only address immediate skill shortages but also lay the foundation for long-term success in mainframe modernization [10]. By embracing a holistic approach to skills development and technological integration, organizations can navigate the challenges of legacy systems and remain competitive in a rapidly evolving digital landscape.

### 2. Literature Review

The mainframe skills gap has emerged as a significant challenge for industries reliant on these systems, as the expertise required to maintain and modernize them diminishes with the retirement of experienced professionals



[1]. COBOL, JCL, and other mainframe technologies form the backbone of essential applications, yet their niche nature discourages younger professionals from entering the field, exacerbating skill shortages [2]. As organizations grapple with this reality, the cost implications extend beyond delayed projects to inefficiencies in resource allocation and the stalling of critical modernization initiatives [3].

The integration of modern technologies into legacy environments presents another layer of complexity, demanding nuanced knowledge of both traditional and contemporary systems. Research highlights that this dual expertise is increasingly rare, necessitating urgent intervention to avoid operational bottlenecks [4]. To mitigate these challenges, investment in structured training programs, including certifications and hands-on workshops, has proven effective in equipping both new and existing staff with the requisite skills [5].

Collaborations with educational institutions present another promising avenue. By aligning curricula with industry needs, these partnerships nurture a steady pipeline of talent well-versed in mainframe technologies [6]. Simultaneously, low-code platforms have gained traction as enablers of modernization, streamlining processes while minimizing the need for extensive coding expertise [7].

To ensure long-term success, organizations must foster environments conducive to knowledge sharing. Mentorship initiatives bridge generational divides, allowing seasoned professionals to transfer critical insights to newer teams [8]. Automation tools further alleviate workforce strain by reducing manual intervention, while cross-training programs promote versatility across modern and legacy systems [9]. Together, these strategies create a robust framework to address immediate skill shortages while ensuring adaptability in an evolving technological landscape [10].

By integrating education, innovation, and collaboration, organizations can effectively bridge the skills gap and sustain the relevance of mainframe systems in a dynamic digital ecosystem.

### **3. Problem: Challenges in Addressing the Mainframe Skills Gap**

The persistent skills gap in mainframe technologies poses significant challenges for organizations that depend on these systems to support critical operations. As experienced professionals retire and the complexity of maintaining legacy systems grows, organizations face increased operational inefficiencies, project delays, and rising costs. Furthermore, the integration of modern technologies into these systems requires a level of expertise that is becoming increasingly scarce.

We explore the key issues arising from the mainframe skills gap and their implications for sustainability, cost management, and technological innovation.

#### **Shortage of Skilled Professionals in Mainframe Technologies**

The shortage of professionals proficient in COBOL, JCL, and other mainframe technologies has become a critical concern for industries reliant on legacy systems. These technologies, although foundational, are often perceived as outdated, deterring younger generations of IT professionals from pursuing careers in this field. Organizations are left with a shrinking talent pool as experienced professionals retire, taking with them decades of institutional knowledge.

This talent vacuum affects the stability of operations, as even routine maintenance tasks require specialized knowledge that is no longer readily available. Additionally, the absence of skilled personnel increases the risk of downtime and system failures, as fewer employees can diagnose and resolve issues promptly.

This skills shortage not only jeopardizes the reliability of mission-critical systems but also hinders organizations' ability to innovate and adapt to changing business needs.



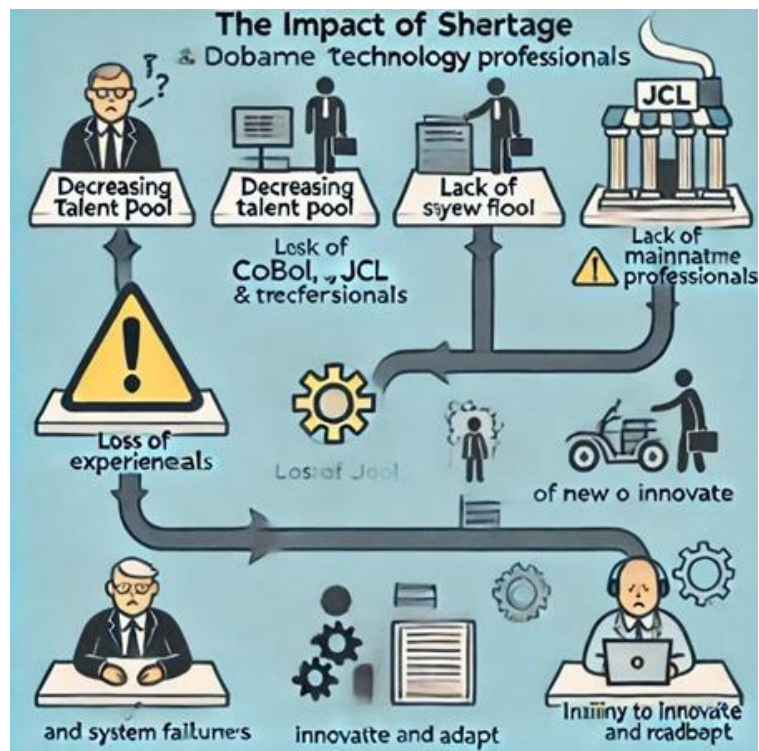


Figure 1: The impact of the shortage of COBOL, JCL, and mainframe technology professionals

### Rising Costs and Delays Due to Workforce Gaps

The lack of skilled personnel in mainframe technologies has direct financial implications for organizations. Recruitment efforts targeting niche talent often come at a premium, with companies offering higher salaries or incentives to attract experienced professionals. For many organizations, this leads to bloated budgets, particularly when hiring external consultants to fill immediate skill gaps.

Beyond recruitment costs, organizations face operational delays, as existing teams require extensive training to achieve the proficiency needed to maintain and modernize legacy systems. Training initiatives, while essential, demand time and resources that can disrupt workflows and slow the pace of ongoing projects. These delays have a cascading effect, often resulting in missed deadlines for modernization initiatives, competitive disadvantages, and strained budgets.

### Challenges in Integrating Modern Technologies

Modernizing legacy systems is a complex process that requires expertise in both traditional mainframe technologies and contemporary IT tools. However, the skills gap has made it increasingly difficult for organizations to execute these integrations effectively. For example, the deployment of cloud computing solutions, automation tools, or advanced analytics platforms often requires reengineering legacy code—a task that demands deep technical expertise.

Compatibility issues between legacy systems and modern technologies exacerbate the problem, creating bottlenecks in integration efforts. These challenges are further compounded by the need for organizations to ensure seamless data migration and interoperability, tasks that require not only technical skill but also meticulous planning and execution. Without experienced personnel, organizations risk errors that can lead to data loss, system instability, or costly project failures.

The skills gap also limits organizations' ability to innovate, as the effort required to maintain legacy systems diverts resources away from exploring and adopting new technologies. This reliance on outdated infrastructure diminishes their ability to compete in a rapidly evolving technological landscape, making it imperative to address the root causes of the skills shortage.





Figure 2: The key steps and challenges in modernizing legacy systems

#### 4. Solution: Bridging the Gap: Strategic Solutions for Mainframe Sustainability

Addressing the mainframe skills gap requires a proactive and multifaceted approach. Organizations must focus on developing talent pipelines, enhancing training opportunities, and leveraging innovative technologies to modernize their systems effectively. By investing in comprehensive solutions, businesses can not only mitigate the immediate challenges posed by the skills shortage but also secure long-term success in a rapidly evolving digital landscape.

We outline key strategies for bridging the gap and fostering resilience in mainframe operations.

##### Enhancing Workforce Competencies Through Training Programs

One of the most effective ways to address the mainframe skills gap is through targeted training initiatives. Offering online courses, certifications, and workshops tailored to mainframe technologies enables organizations to upskill existing employees while attracting new talent to the field.

These programs provide in-depth instruction on essential topics such as COBOL programming, JCL operations, and system debugging, ensuring that participants acquire both theoretical knowledge and practical expertise.

Additionally, hands-on workshops and simulated environments allow learners to engage with real-world scenarios, preparing them to tackle complex challenges with confidence. By promoting a culture of continuous learning, organizations can empower their workforce to adapt to changing technological demands and maintain operational excellence.





Figure 3: The process of how targeted training helps address the mainframe skills gap

### Building Talent Pipelines Through Educational Partnerships

Partnering with educational institutions is a long-term solution for addressing the skills gap. Collaborations with universities, technical colleges, and vocational schools help align curricula with industry needs, ensuring that graduates possess the competencies required for mainframe operations.

These partnerships may include the development of specialized programs, internships, and mentorship opportunities, all designed to equip students with the skills necessary to thrive in the field.

Such initiatives not only cultivate a steady pipeline of skilled professionals but also raise awareness about the value of mainframe technologies in modern business environments. By fostering relationships with academia, organizations can create a sustainable talent pool to meet future demands.

### Simplifying Modernization with Low-Code Platforms

Low-code platforms offer an innovative solution for overcoming the technical complexities associated with mainframe modernization. These platforms provide user-friendly interfaces and pre-built templates that allow developers to design and implement modern functionalities without extensive coding expertise. By reducing the reliance on niche skills, low-code platforms enable teams to enhance legacy systems more efficiently.

Furthermore, low-code solutions facilitate faster project delivery by automating repetitive tasks and streamlining integration processes.

They also promote collaboration between technical and non-technical stakeholders, ensuring that modernization efforts align with organizational goals. By adopting low-code platforms, businesses can accelerate their transformation journey while minimizing resource constraints.



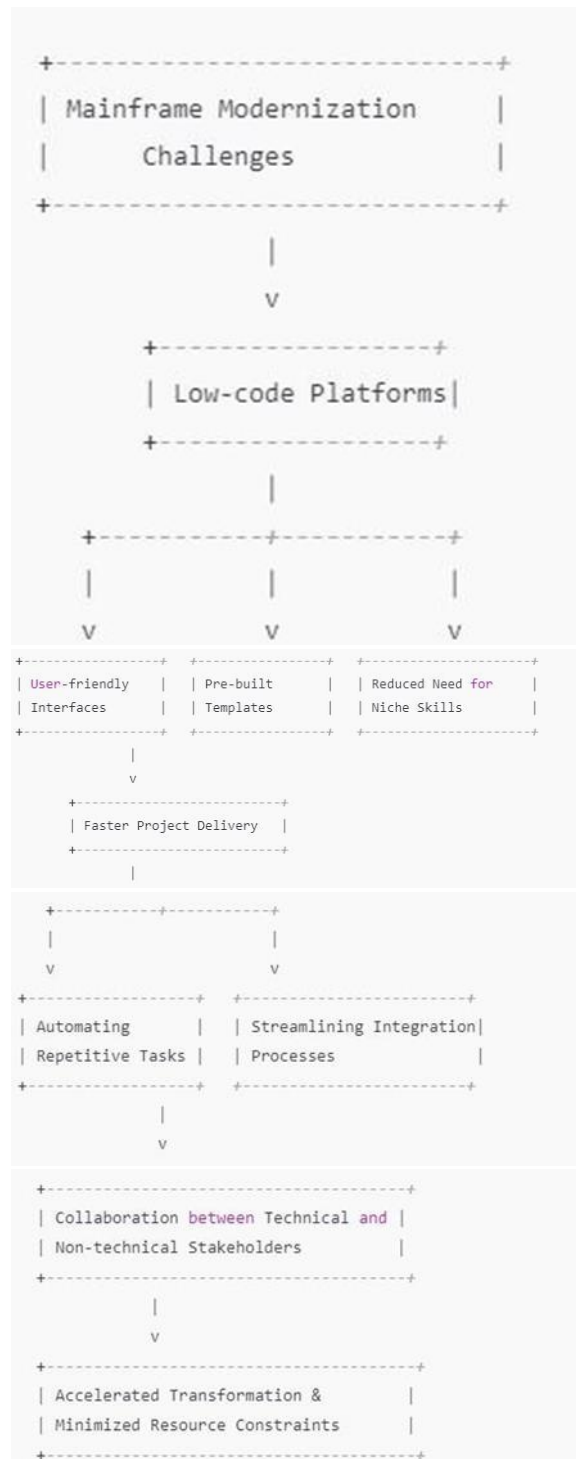


Figure 4: The key components of using low-code platforms in mainframe modernization

**Promoting Knowledge Transfer and Cross-Training**

To ensure the longevity of mainframe expertise, organizations must prioritize knowledge-sharing initiatives. Establishing mentorship programs allows experienced professionals to pass on critical insights to newer team members, bridging generational divides and preserving institutional knowledge. Cross-training efforts further enhance workforce versatility by equipping employees with skills applicable to both modern and legacy systems.

These strategies not only address immediate skills shortages but also foster a collaborative culture where employees are empowered to take on diverse challenges. By promoting an environment of mutual learning, organizations can strengthen their resilience and adaptability in the face of evolving technological landscapes.

## 5. Recommendations

To address the challenges associated with the mainframe skills gap and ensure successful modernization, organizations should focus on fostering knowledge-sharing and mentorship programs.

Experienced professionals can play a critical role in training junior team members through structured mentorship initiatives, while documenting best practices and creating accessible knowledge repositories can serve as valuable resources for ongoing development. These efforts help preserve institutional knowledge and promote continuous learning within teams.

Utilizing automation tools is another essential strategy. By automating repetitive and error-prone tasks, such as batch job scheduling, system monitoring, and report generation, organizations can minimize manual intervention and improve operational efficiency.

This allows skilled professionals to focus on more strategic tasks, optimizing resource utilization and accelerating project timelines.

Providing cross-training opportunities is vital to equip teams with a versatile skill set that spans both legacy and modern technologies. Training programs should focus on enhancing employees' expertise in mainframe technologies like COBOL while also introducing them to modern frameworks, such as low-code platforms or contemporary scripting languages. Cross-functional skills not only foster adaptability but also ensure seamless collaboration in hybrid IT environments.

Establishing partnerships with academic institutions and training providers can help build a sustainable talent pipeline.

Collaborating on the development of specialized courses and certifications aligned with industry needs ensures a steady influx of skilled professionals. Internship programs and sponsorship initiatives further enhance this pipeline by attracting and nurturing emerging talent.

Lastly, integrating low-code platforms simplifies modernization efforts by reducing reliance on deep technical expertise. These platforms enable intuitive application development, cutting project timelines and facilitating the seamless integration of modern functionalities into legacy systems.

Combined with advanced resource monitoring tools, organizations can proactively identify bottlenecks, optimize system performance, and maintain a robust IT ecosystem. Implementing these recommendations will enable organizations to address skill shortages, enhance operational efficiency, and achieve long-term modernization success.

## 6. Conclusion

The mainframe skills gap poses a growing challenge to industries reliant on legacy systems, threatening operational efficiency and stalling modernization efforts. Bridging this gap requires a multi-pronged strategy, combining targeted training programs, educational partnerships, low-code platforms, and knowledge-sharing initiatives. By fostering a culture of continuous learning, promoting cross-training, and adopting modern tools, organizations can overcome skills shortages and accelerate mainframe modernization.

This proactive approach ensures long-term sustainability, enabling businesses to maintain system reliability, enhance innovation, and remain competitive in an evolving digital landscape.

## References

- [1]. R. Buyya, S. N. Srirama, G. Casale, R. Calheiros, Y. Simmhan, B. Varghese, et al., "A manifesto for future generation cloud computing: Research directions for the next decade," *ACM Computing Surveys (CSUR)*, vol. 51, no. 5, pp. 1-38, 2018.
- [2]. B. Victor, "Revisiting legacy systems and legacy modernization from the industrial perspective," M.S. thesis, Dept. Industrial Eng., [Institution], 2013.



- [3]. E. Quendler and M. Lamb, "Learning as a lifelong process-meeting the challenges of the changing employability landscape: competences, skills and knowledge for sustainable development," *Int. J. Continuing Eng. Educ. Life Long Learning*, vol. 26, no. 3, pp. 273-293, 2016.
- [4]. N. Forsgren, J. Humble, and G. Kim, *Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations*, IT Revolution, 2018.
- [5]. M. Kolding, M. Sundblad, J. Alexa, M. Stone, E. Aravopoulou, and G. Evans, "Information management—a skills gap?," *The Bottom Line*, vol. 31, no. 3/4, pp. 170-190, 2018.
- [6]. T. Abraham, C. Beath, C. Bullen, K. Gallagher, T. Goles, K. Kaiser, and J. Simon, "IT workforce trends: Implications for IS programs," *Commun. Assoc. Inf. Syst.*, vol. 17, no. 1, pp. 50, 2006.
- [7]. A. Gilchrist, *Digital Success: A Holistic Approach to Digital Transformation for Enterprises and Manufacturers*, Alasdair Gilchrist, 2018.
- [8]. A. Daghfous, O. Belkhodja, and L. C. Angell, "Understanding and managing knowledge loss," *J. Knowledge Management*, vol. 17, no. 5, pp. 639-660, 2013.
- [9]. S. C. Bell and M. A. Orzen, *Lean IT: Enabling and Sustaining Your Lean Transformation*, CRC Press, 2016.
- [10]. T. L. Ngo-Ye and J. Choi, "Teaching students mainframe skills for the niche market: An exploratory proposal," 2018.

