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Scaling Expert Knowledge with AI at CIMC

In manufacturing, expertise often resides not in systems, but in people's minds—embedded in experience, judgment, and informal processes that are difficult to transfer or scale. A subsidiary of CIMC used AI agents to interpret complex and unique engineering drawings that previously required manual interpretation by experienced team leaders. The result was that the processes that would have taken 18 dedicated team members more than two days could now be completed in less than one day, with an accuracy rate of 95%. This freed team leaders to get back to their real work—managing and producing on-site personnel.

Background

CIMC is a leading global manufacturer of transportation and logistics equipment, with over 300 member companies. As a diversified multinational industrial group, CIMC achieved revenue of RMB 177.664 billion in 2024, with a leading position in container manufacturing and excellence in road transport vehicles, airport ground service equipment, and integrated logistics solutions. This case study focuses on CIMC Tianda, a subsidiary of CIMC Group, which specializes in the design, engineering, and production of passenger boarding bridges (enclosed passages connecting airport terminals to aircraft). [CIMC Tianda has more than 50 member companies worldwide, employing about 5,000 people, and serving more than 130 countries across six continents; its boarding bridge products cover 89 countries and 419 airports worldwide.]

Business expansion has brought increasing complexity. The subsidiary handles over 10,000 new parts each year, each of which requires a precise manufacturing process roadmap before they go into production. With production volumes increasing, the process of translating engineering designs into production-ready instructions has become a bottleneck.

Core Challenge: From Design to Production Floor

The bottleneck is not just the volume of output, but the nature of the input data.

Every piece of work begins with an engineering drawing, a CAD file containing a bill of materials, dimensions, process features, and specifications—defining the product to be manufactured. Before this information reaches the production floor, it must be translated into a production path: which process steps to apply (milling, bending, drilling, rolling, welding,

assembly), which workstations to use, the budgeted work hours, and which production crews to deploy.

These drawings are understood by 18 experienced team leaders. They manually retrieve documents, interpret drawings, estimate process flows, calculate work hours, and dispatch routes. Each order typically takes more than two working days to process. However, their primary responsibility is not interpreting blueprints, but rather managing workers and overseeing production on the shop floor. Every hour spent interpreting blueprints means one less hour spent leading the team.

The Intervention: An AI Routing Agent

CIMC introduced an AI routing agent to handle the most time-consuming part of the process: transforming messy engineering inputs into executable manufacturing plans. In daily operations, the Bill of Materials (BOM) and CAD drawings are extracted from the Product Lifecycle Management (PLM) system, it identifies the manufacturing processes required for each workpiece (e.g., detecting features that require bending, milling, or drilling), generates a draft route including workstation assignments and labour-hour estimates, and sends instructions to the production team. Team leaders no longer have to complete all the work manually; instead, they enter a review and release mode: check the draft route, adjust it as needed, and then submit it to production.

A key function of this system is its ability to interpret the drawings that made manual routing so slow. Since the drawings were highly specialized, no single model could handle them. The team developed a layered approach: first, image processing was used to extract features; then, a visual reasoning model was used to interpret these features; and finally, a structured knowledge base was built, containing workstation rules, process definitions, and labour-time logic. They also used AI to speed up the knowledge construction itself, annotating and structuring the drawing data the system needed to learn from, rather than relying solely on manual intervention.

To ensure the reliability of the system, CIMC provided it with practical operational support: a well-maintained knowledge base that team leaders could update based on the evolution of the process; transparent progress tracking; the ability to manually correct any output; and a log of all changes, ensuring that the system could continuously improve over time.

Results and Consequences

Routing productivity has improved significantly. Labour costs associated with routing have been reduced by approximately 80%, the dedicated staffing footprint has decreased from 18

people to 2, cycle time has been shortened from over two days per batch to less than one day, accuracy has reached approximately 95%, and a practical review-and-correction mechanism for exceptions has been implemented.

Knowledge became transferable. Previously, routing processes relied on individual experience, making them difficult to transfer and scale. By integrating workstation instructions, process logic, and labour-time rules into a well-managed knowledge base, routing decisions can be replicated across teams, reducing dependence on any single person's expertise.

Workflows have been redesigned, not simply accelerated. Routing has evolved from a series of manual operations (downloading, interpreting, calculating, generating reports, and scheduling) to a standardized, end-to-end workflow. The work now begins with a system-generated draft, followed by clearly defined review and validation steps, thus reducing individual variability and making throughput more predictable.

Managers could manage again. The 18 team leaders were not eliminated; they were freed. Every hour saved on interpreting plans can be devoted to managing workers, quality control, and leading production on the floor.