



WHITEPAPER

SERVICE COMPASS

SUCCESSFULLY IMPLEMENTING AI

DIZ Digital Innovation Center GmbH (Publisher)

Partner:

EDIH AICS.

EUROPEAN DIGITAL INNOVATION HUB
Artificial Intelligence & CyberSecurity

KISS | AI IN TECHNICAL SERVICE

The ZIM innovation network KISS supports small and medium-sized enterprises (SMEs) in leveraging the potential of artificial intelligence (AI) in technical service in a targeted manner. The focus is on practical solutions that create real added value even with limited data and resources — from predictive maintenance and intelligent fault diagnostics to AR-based remote support. We bring together SMEs, research institutions, and technology partners to develop industry-specific AI services, train skilled professionals, and jointly overcome obstacles.

DIZ DIGITAL INNOVATION CENTER GMBH

The Digital Innovation Center supports organizations in navigating and implementing digital transformation. We connect stakeholders from business, academia, and politics and create a structured framework for developing forward-looking solutions. We identify relevant changes early on and bring together diverse expertise to create viable innovation projects. Our focus is on the consistent development of ideas through to implementation — with the goal of achieving sustainable and effective results.

EUROPEAN DIGITAL INNOVATION HUB APPLIED ARTIFICIAL INTELLIGENCE AND CYBERSECURITY (EDIH-AICS)

EDIH-AICS 2.0 is a European project designed to support SMEs, small mid-caps, and public institutions in the adoption and use of artificial intelligence. It offers a networked one-stop shop with services for trustworthy, secure, and sustainable AI technologies. The project (Grant Agreement No. 101256788) is funded by the European Commission's "Digital Europe" (DIGITAL) programme and co-financed by the Baden-Württemberg Ministry of Economic Affairs, Labor, and Tourism, and will run through January 2029. The project is carried out by a consortium of nine partners based in Karlsruhe.

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EXECUTIVE SUMMARY

IN A NUTSHELL

Technical service is undergoing a period of profound change. Rising customer expectations, increasing system complexity, and a persistent shortage of skilled workers are forcing service organizations — especially small and medium-sized enterprises (SMEs) — to fundamentally rethink their processes. Artificial intelligence (AI) is no longer a topic for the future, but a tool that can be used today and delivers measurable economic benefits.

Based on scientific findings and concrete real-world examples, this white paper highlights where and how AI creates added value in technical service — and how SMEs can approach implementation in a structured and realistic manner.

THE MOST IMPORTANT POINTS AT A GLANCE

A STRUCTURED APPROACH TO STARTING

Successful AI implementation is not achieved through large-scale transformation projects, but rather through a pragmatic, step-by-step approach: a concrete use case, piloting with measurable goals, a solid data foundation, and consistent change management. Experience from over 350 corporate projects conducted as part of the “Center for Industry-Related Services,” a project funded by the Baden-Württemberg Ministry of Economic Affairs, confirms that an application-oriented approach is the key to success.

PRACTICAL EXPERIENCE PROVES THE BENEFITS

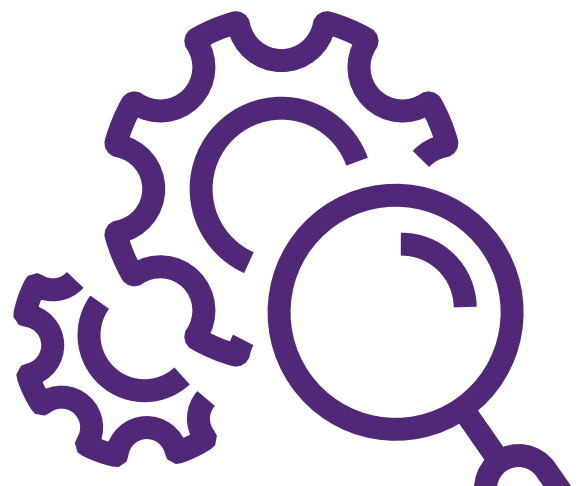
Four real-world examples from different service domains demonstrate exactly how AI is already making an impact today: an AI service agent (Transaction-Network) reduced case intake processing time by up to 40%. A conversational assistant (University of Kassel) significantly speeds up the onboarding of new service employees. An AI ticket system (esw Group / inovex) transforms practical knowledge from 18,000 historical cases into a structured knowledge base. AI- and VR-supported commissioning planning (INDIGRATE) makes critical field assignments predictable and scalable.

HIGH PRESSURE FOR CHANGE IN THE MARKET

Customer demand for digital contact channels, faster response times, and personalized service is growing steadily. At the same time, the shortage of skilled workers is exacerbating the situation: according to Bitkom (2023), there were most recently 149,000 unfilled IT positions — and the trend is upward. Companies that fail to take countermeasures here will lose their competitive edge.

AI AS A CATALYST IN TECHNICAL SERVICE

AI unlocks six key areas of potential benefit: increased efficiency through automated processes, faster error diagnosis through pattern recognition, sustainable knowledge management to preserve expertise, improved customer experience, resource efficiency, and predictive maintenance as a long-term value-creation strategy. According to McKinsey, AI-supported service approaches can reduce operating costs by up to 20–30%.



AI IN TECHNICAL SERVICE IS NOT AN END IN ITSELF – IT IS A STRATEGIC TOOL FOR SOLVING REAL-WORLD CHALLENGES. FOR SMALL AND MEDIUM-SIZED ENTERPRISES (SMES), THE FOLLOWING APPLIES: THOSE WHO START TODAY WITH THEIR FIRST CONCRETE USE CASE WILL GRADUALLY BUILD DIGITAL COMPETENCE AND SECURE THEIR COMPETITIVENESS IN THE LONG TERM.

CHALLENGES AND MARKET NEEDS

OF AI IN TECHNICAL SERVICE

THE SERVICE INDUSTRY IS UNDERGOING A PHASE OF RADICAL TRANSFORMATION. TECHNOLOGICAL ADVANCES, CHANGING CUSTOMER EXPECTATIONS, AND A NOTICEABLE SHORTAGE OF SKILLED WORKERS PRESENT SMALL AND MEDIUM-SIZED ENTERPRISES (SMES) WITH COMPLEX CHALLENGES, BUT AT THE SAME TIME OFFER EXEMPLARY OPPORTUNITIES FOR INNOVATION AND GROWTH.

Anyone who wants to succeed in technical service today must not only digitize their processes but also rethink them in a data-driven and customer-centric way. Artificial intelligence (AI) plays a key role in this: it is not just a tool but a catalyst that boosts efficiency, enables new levels of service quality, and helps companies differentiate themselves from the competition.

Customer expectations for technical service have fundamentally changed. A Deloitte study on customer service in Germany shows that the quality of customer service is becoming increasingly important to consumers when choosing a provider, and that customers switch providers more and more often when their expectations are not met.¹ Younger customers in particular increasingly expect digital contact options and faster response times.² Those who fail to keep pace here risk falling behind the competition. McKinsey shows that AI-supported service approaches can reduce operating costs by as much as 20 to 30 percent — provided the models are properly calibrated and the data is meaningfully integrated.³

Digitalization is the key driver of transformation for service organizations. Since service delivery remains highly labor-intensive, it offers enormous potential: it lays the foundation for the use of modern technologies and enables companies to make their processes more efficient and customer-focused.

1 <https://www.deloitte.com/de/de/services/consulting/research/studie-kundenservice-in-deutschland.html>

2 ebd.

3 <https://www.usu.com/de/blog/warum-ki-im-kundenservice-ohne-wissensmanagement-scheitert>

Without a solid digital foundation, AI cannot realize its full potential. According to McKinsey, 75 percent of the value generated by AI is concentrated in just four key areas: customer service, marketing and sales, software development, and research and development.⁴ According to the McKinsey Global Institute, by 2030, approximately 30 percent of current working hours could be automated through technology, including generative AI. In Germany, up to three million job changes are expected.⁵

Another key trend is the shift from being a pure product manufacturer to a provider of integrated solutions. The VDMA emphasizes that digitizing the service portfolio and introducing smart services are crucial steps for mechanical engineering companies to remain competitive in the age of Industry 4.0. In addition, remote services, digital twins, and data-driven after-sales offerings can generate additional revenue.⁶

Technological development is advancing at a rapid pace: today's modern machines and systems are highly networked, software-driven units. The VDMA study "Future Skills in Mechanical and Plant Engineering" shows that over 40 percent of companies rank Industry 4.0 service technicians among the three most important job profiles — and that around 80 percent of companies provide targeted continuing education for their skilled workers to ensure they have the necessary digital competencies.⁷ Without digital support, the diagnosis and maintenance of networked systems become increasingly

prone to errors. The Fraunhofer IAO, on behalf of the Baden-Württemberg Ministry of Economic Affairs, has developed practical recommendations on how AI applications can be specifically integrated into service processes⁸ — in particular through the automation of text processing, AI-supported assistance systems, and data-driven decision support.

The shortage of skilled workers is one of the most pressing challenges facing the service industry. According to the 2023 Bitkom study, there were most recently 149,000 unfilled IT positions in German companies — a record high, representing an increase of 12,000 positions compared to the previous year.⁹ At the same time, 79 percent of the companies surveyed expect the shortage of IT professionals to worsen in the future. This trend coincides with growing demand for services and presents companies with the question of how they can scale their service capacities. About half of the companies (48 percent) see AI as a way to counteract the shortage of skilled workers.¹⁰

This is exactly where the practical use cases in this white paper come into play. They illustrate how AI can be applied in technical service — from automated data analysis to intelligent assistance systems. The examples from partner companies demonstrate that AI is not just a theoretical concept, but is already delivering measurable results today.

4 <https://www.salesforce.com/de/blog/ki-in-der-industrie/>

5 <https://www.mckinsey.de/news/presse/2024-05-23-mgi-genai-future-of-work>

6 <https://www.vdma-academy.eu/tagung/vdma-tagung-digitalisierung-im-service/>

7 <https://www.industr.com/de/neue-kompetenzen-fuer-die-digitale-transformation-benoetigt-2651659>

8 <https://www.digital.iao.fraunhofer.de/de/publikationen/Potenziale-Generativer-KI-fuer-den-Mittelstand.html>

9 <https://www.bitkom.org/Presse/Presseinformation/Rekord-Fachkraeftemangel-Deutschland-IT-Jobs-unbesetzt>

10 <https://www.bitkom.org/Presse/Presseinformation/Deutschland-fehlen-IT-Fachkraefte>

THE POTENTIAL BENEFITS OF AI IN TECHNICAL SERVICE

TECHNICAL SUPPORT IS UNDER INCREASING PRESSURE. WHAT BENEFITS CAN AI OFFER IN THIS CONTEXT?

Technical service departments are under increasing pressure: growing plant complexity, a worsening shortage of skilled workers, and rising customer expectations call for more efficient solutions. Artificial intelligence (AI) offers a wide range of potential applications in this area – from the automation of routine operational tasks to predictive maintenance. The key areas of added value are presented in a structured manner below.

1 INCREASING EFFICIENCY IN SERVICE PROCESSES

AI-powered systems enable a significant increase in productivity in operational service operations. Automated classification and prioritization of service tickets accelerate processing and reduce error rates. At the same time, AI optimizes the scheduling of service technicians through intelligent route planning and resource allocation. The automatic documentation of service cases and the structured organization of knowledge significantly reduce manual routine tasks. .

Result

Time savings, higher first-call resolution rates, and measurable productivity gains in the service sector

Source

Fraunhofer IAO – The Potential of Generative AI for Small and Medium-Sized Enterprises: www.digital.iao.fraunhofer.de

2 FASTER ERROR DETECTION AND PROBLEM SOLVING

AI systems are capable of analyzing large volumes of service and sensor data in real time, identifying the causes of faults, and recognizing patterns that would be difficult for humans to detect. Based on this analysis, service technicians are provided with automated, context-specific solution recommendations. This reduces the mean time to repair (MTTR) and significantly increases the first-time fix rate.

Result

Service technicians receive context-specific support, and diagnostic times are significantly shortened.

Source

Fraunhofer IESE – Predictive Maintenance: www.iese.fraunhofer.de/blog/predictive-maintenance

3 KNOWLEDGE MANAGEMENT AND KNOW-HOW PRESERVATION

Demographic change poses a critical challenge, particularly for SMEs: as experienced employees retire, valuable tacit knowledge is lost. AI can systematically analyze service reports, technical documentation, and manuals, making the experiential knowledge of seasoned technicians digitally accessible. This enables structured support for diagnostics and decision-making – even for younger or less experienced service personnel.

Particular relevance

In light of the growing shortage of skilled workers, AI-powered knowledge management is becoming a strategic competitive advantage for service organizations.

Source

KIT – ServiceSecretary: www.zukunft-der-wertschoepfung.de | Springer: DOI 10.1007/978-3-662-71591-8_7

4 IMPROVED CUSTOMER EXPERIENCE

The use of AI can significantly reduce response times and align service processes more effectively with individual customer needs. Self-service portals and AI-powered chatbots enable customers to resolve simple inquiries on their own. Furthermore, AI opens up the possibility of personalizing services – for example, by analyzing usage patterns and proactively communicating about foreseeable maintenance needs.

Result

Higher customer satisfaction and stronger customer loyalty through faster, more precise, and more personalized service delivery.

5 SUSTAINABILITY AND RESOURCE EFFICIENCY

AI enables more resource-efficient service delivery: by planning service calls based on actual demand, unnecessary service visits are avoided, maintenance cycles are optimized, and energy use in systems is made more efficient. This creates both economic and environmental benefits and contributes to the achievement of sustainability goals.

Result

AI combines cost efficiency, customer satisfaction, and environmental responsibility in an integrated approach.

6 PREDICTIVE MAINTENANCE – FROM SHORT-TERM BENEFITS TO LONG-TERM COMPETITIVE ADVANTAGE

Predictive maintenance represents a paradigm shift in technical service: instead of interval-based maintenance – in which interventions are performed at fixed intervals regardless of the actual condition of the equipment – AI enables a condition-based and predictive maintenance strategy. Through the continuous analysis of operational data and sensor data, impending failures can be identified early on, and targeted maintenance measures can be initiated before damage occurs. This enables consistent risk management and the development of condition-based maintenance contracts.

Short-term benefits

Reduction in unplanned downtime, lower maintenance costs, and higher plant availability. According to a Siemens study (2024), the world's 500 largest companies lose an average of 11% of their annual revenue due to unplanned downtime.

Long-term benefits

The sustainable added value lies in the continuous improvement of data quality and data understanding. Through the iterative modeling of technical systems – similar to the CRISP-DM model (Cross Industry Standard Process for Data Mining) – a self-reinforcing learning process emerges: the more operational data is collected and analyzed, the more precise the predictive models become. This not only improves service quality but also fosters a deeper understanding of the system, which can be leveraged as a strategic asset for the company.

Source

Fraunhofer IIS – White Paper on Predictive Maintenance: www.eas.iis.fraunhofer.de | Oracle – AI in Predictive Maintenance: www.oracle.com/de/scm/ai-predictive-maintenance | CRISP-DM (DOI): 9783658291969

AI-BASED AUTOMATION IN INDUSTRIAL SERVICE

TRANSACTION-NETWORK GMBH & CO. KG

THE RESULTS SHOW
THAT THE AUTOMATED
PRE-QUALIFICATION OF
SERVICE CASES LEADS TO
SIGNIFICANT EFFICIENCY
GAINS IN THE SERVICE
PROCESS

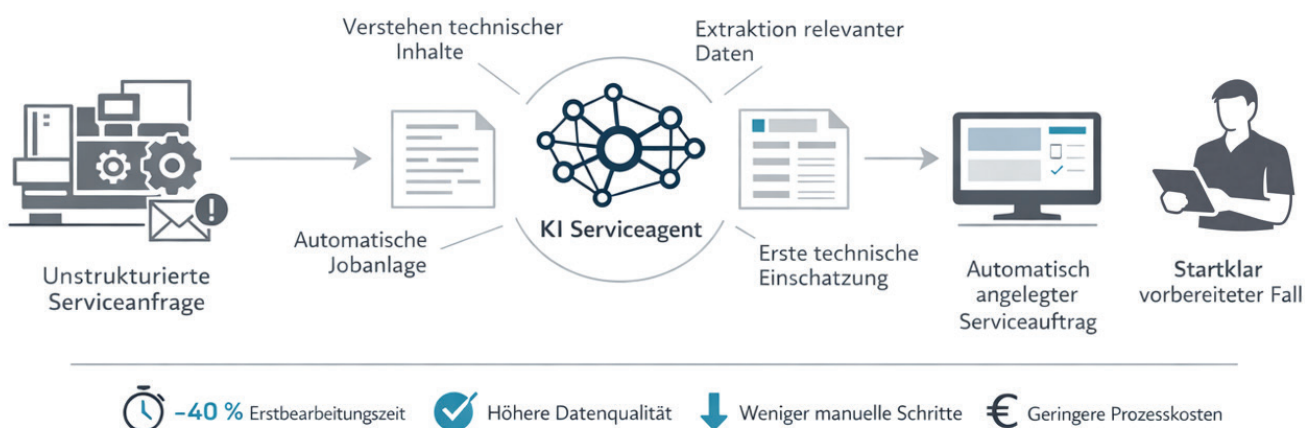
TRANSACTION-NETWORK TESTED THE USE OF AN AI-POWERED SERVICE AGENT TO AUTOMATE CASE ACQUISITION AND THE PLACEMENT OF SERVICE ORDERS IN INDUSTRIAL SERVICE, PARTICULARLY IN SPECIAL-PURPOSE MACHINE MANUFACTURING.

The project was based on the observation that, in many service organizations, a large portion of service processes begins with incoming emails, tickets, or digital trouble tickets. The information contained therein is often unstructured, sometimes incomplete, and must first be reviewed, interpreted, and manually entered into internal systems by employees. This step is time-consuming and ties up valuable service staff. At the same time, manual pre-qualification delays response times to technical issues reported by customers, especially when additional information must be researched or follow-up questions asked. For companies whose customers rely on rapid restoration of system availability, this represents a critical bottleneck in the service process.

Autonomously Analyzing Service Requests with the Service Agent

Against this backdrop, the project aimed to largely automate the first step in the service process: the acceptance and pre-qualification of service cases. The AI service agent developed for this purpose autonomously analyzes incoming service requests and converts them into structured service orders. This is based on a language model that interprets technical descriptions from emails, tickets, or trouble tickets.

Based on this, the system recognizes relevant content, identifies affected machines, and automatically assigns the request to the appropriate process. At the same time, key information is extracted from the unstructured text and transferred to the service management system in a structured format. This includes, for example, details on the machine number, the location of the equipment, possible error codes, the affected assembly, or the urgency of the report.



Key results: -40% initial processing time · higher data quality · fewer manual steps · lower process costs

In addition, the AI service agent uses an integrated knowledge model to generate an initial technical assessment of the reported problem. Based on the available information, it identifies possible causes and provides guidance on required replacement parts or appropriate standard procedures. For frequently occurring malfunctions, the agent can even prepare suitable standard procedures so that customer service representatives and service technicians can begin processing requests immediately without first having to conduct extensive research.

The technical implementation was based on an iteratively trained language model, whose performance was gradually improved until stable and reliable result quality was achieved. After the go-live, a continuous improvement process was also established, in which real service cases are used to further optimize the model and ensure the quality of the automated analysis in the long term. The system was initially introduced at a pilot subsidiary. The subsequent rollout is being implemented in stages, as additional adjustments are required for different countries and languages.

Reduced Working Hours While Simultaneously Improving Data Quality

The results show that the automated pre-qualification of service cases leads to significant efficiency gains in the service process. In particular, the initial processing steps between the receipt of a report and the actual technical analysis can be accelerated considerably. In practice, a reduction in processing time in the first process stage of up to forty percent was observed. At the same time, data quality improves, as relevant information is systematically extracted from the reports and transferred in a structured manner into the service processes. The error rate in data entry also decreases, as manual transcription errors are reduced. For the service teams, this means a noticeable reduction in workload, since less time needs to be spent on administrative tasks such as sorting requests, entering data, or following up on missing information. Instead, employees can focus more on actually solving technical problems.

For service technicians, this results in a much clearer starting point, as service cases are already structured and prepared with relevant background information. This reduces the need for follow-up

questions and additional coordination, allowing technicians to begin the actual work more quickly. At the organizational level, this leads to more stable service processes with fewer bottlenecks and an overall faster response time for customers. At the same time, the per-service-call costs decrease, as fewer manual process steps are required. Overall, the use of the AI service agent demonstrates that administrative and structuring tasks in the service process, in particular, have high potential for automation. By taking over these tasks, AI can help make service organizations more efficient, resilient, and, at the same time, more customer-focused.

ABOUT THE COMPANY

Transaction-Network is a technology company based in Gottmadingen that develops and operates a digital service platform for the mechanical engineering industry. The platform is designed for manufacturers, machine builders, service partners, and material suppliers, and aims to standardize and automate cross-organizational service processes. Its core functions include asset management, maintenance planning, downtime prevention, and AI-powered service assistance. The company is a member of the VDMA and the Industrial Digital Twin Association (IDTA)

REAL-TIME ASSISTANCE FOR SUPPORT STAFF

UNIVERSITY OF KASSEL

AI CAN BE USED NOT ONLY
TO AUTOMATE PROCESSES,
BUT ALSO TO EMPOWER
EMPLOYEES.

THE UNIVERSITY OF KASSEL IS TESTING THE TRAINING OF NEW EMPLOYEES IN ONGOING OPERATIONS USING AN AI-BASED ASSISTANCE SYSTEM TO DEVELOP THE EMPLOYEES' PROBLEM-SOLVING SKILLS MORE QUICKLY AND EFFICIENTLY.

Service organizations, particularly in technical customer service and IT support, are increasingly facing structural challenges. These include high turnover rates, rising demands on employees' problem-solving skills, and the growing complexity of incoming service requests. At the same time, new service staff are expected to be able to handle customer inquiries independently after only a short training period. In practice, however, it often takes several months for new employees to become fully productive in technical customer service. During this phase, new employees face a significant cognitive load. They must simultaneously analyze technical problems, research appropriate solutions, and maintain professional communication with customers. If a problem cannot be resolved imme-

diately during a customer conversation, this often leads to delays in the service process, escalation to more experienced colleagues, or an overall decline in service quality. Against this backdrop, targeted support for employees during their day-to-day work is becoming increasingly important.

Direct Support for New Employees in Handling Real Customer Inquiries

The approach presented here aims to support new employees in technical customer service through an AI-based conversational assistance system. The digital assistant is intended to be integrated into the work process as a supplementary tool and, in particular, to alleviate the workload during the early stages of employment. Unlike traditional training formats, which usually take place before employees actually begin working, this approach provides continuous support directly while handling real customer inquiries. The goal is to develop new employees' problem-solving skills more quickly, make the onboarding phase more efficient, and at the same time ensure a consistently high quality of service. The system is explicitly not designed to replace human expertise. Rather, the AI is intended to function as a supportive tool that provides relevant information, assists in the analysis of service cases, and suggests possible solutions.

The development of the assistance system is being carried out as part of a design-oriented research approach. First, a conceptual architectural model for an AI-powered conversational assistance agent was developed, which was subsequently prototyped. The agent is based on conversational AI and is designed to interact with employees while processing service requests. Through a dialogue-based interface, users can ask questions, retrieve information, or view rec-

ommendations for action. For example, the agent can assist in categorizing service requests, identify relevant knowledge sources, or provide suggestions for possible solutions. A key design aspect is tailoring the system specifically to the needs of less experienced employees. While experienced service staff often possess extensive tacit knowledge, new employees must first build this knowledge through their day-to-day work. The AI agent supports this learning process by providing context-specific information and making problem-solving strategies transparent

WHAT IS A LOW-FIDELITY PROTOTYPE?

A low-fidelity prototype (literally: low accuracy) is a simple, quick, and cost-effective model or sketch of a product. It is used for early idea generation, rapid testing, and risk minimization.

From a Low-Fidelity Prototype to a Versatile Generic Model

As part of the project, a low-fidelity prototype was first developed to demonstrate the system's basic functions. Based on this, an initial system architecture was derived that can serve as a generic model for developing similar assistance systems in various service organizations. The evaluation is being conducted in collaboration with industry partners from the service sector to examine the system's usability and practical value. The results to date show that AI-supported assistance systems hold significant potential for the further development of service organizations. Through direct support during real-world service interactions, new employees can become productive more quickly and solve complex problems more independently in problem-solving. This approach is particularly relevant given the rising demands on service quality and the growing challenges in recruiting and retaining qualified professionals. Furthermore, the use of conversational AI opens

up new possibilities for integrating learning and work in the service environment. Employees receive immediate support while handling real service cases and can simultaneously continue to develop their professional skills. At the same time, organizations benefit from more stable service processes, shorter processing times, and greater consistency

This use case illustrates that AI can be used not only to automate service processes but also as an intelligent assistance system to train and empower employees. For small and medium-sized enterprises in particular, this approach offers the opportunity to make better use of existing knowledge, train new employees more efficiently, and sustainably strengthen the performance of technical service.

THE PROJECT BEHIND THE USE CASE

This use case originates from the HISS (Hybrid Intelligence Service Support) project.

HISS was a research project funded by the Federal Ministry of Education and Research (BMBF) that ran from April 2020 to December 2023. The goal of the project was to develop an AI-based support system that combines human problem-solving skills with automated processes to make IT support processes more efficient and user-oriented. The consortium comprised nine partners from the fields of research, technology development, and industry, including the University of Kassel as the coordinator.

AI-BASED TICKET SYSTEM FOR TECHNICAL FAILURES

INOVEX GMBH X ESW GROUP

FAULT REPORTS ARE
SYSTEMATICALLY
STRUCTURED, ANALYZED,
AND FORWARDED TO
THE APPROPRIATE
RESPONSIBLE PARTY

WITH THE HELP OF AN AI-SUPPORT-
ED TICKET SYSTEM, THE ESW GROUP,
WITH THE HELP OF INOVEX, WAS
ABLE TO MAKE ITS MAINTENANCE
PROCESSES MORE EFFICIENT BY
TRANSFORMING IMPLICIT EXPERT
KNOWLEDGE INTO A STRUCTURED
KNOWLEDGE BASE.

With the help of an AI-supported ticket system, the esw Group, with the help of inovex, was able to make its maintenance processes more efficient by transforming implicit expert knowledge into a structured knowledge base.

The shortage of skilled workers is one of the key challenges facing many medium-sized industrial companies and has a particularly strong impact on areas such as maintenance and repair, where specific technical expertise is required. At the same time, many companies are facing the prospect of losing valuable experiential knowledge as long-serving employees retire. Against this backdrop, the esw Group – a specialist in high-quality metal and metal-plastic products for the automotive industry,

among others — is pursuing a consistent digitalization strategy to make its maintenance processes more efficient and to preserve existing knowledge for the long term. Together with the technology company inovex, an AI-powered solution was developed to systematically support the handling of technical malfunctions in production.

The application digitizes and structures the entire process of fault reporting and resolution. Incoming reports can be entered directly in natural language via an intuitive user interface. An integrated natural language processing model analyzes the description of the malfunction, identifies technical correlations, and cross-references the information with a comprehensive database of approximately 18,000

historical maintenance cases. Based on this, the system identifies similar past events, extracts relevant information from the report, and automatically classifies the malfunction. At the same time, it assigns the issue to the appropriate maintenance team — such as the electrical or mechanical team — thereby reducing misassignments. In addition, the system provides relevant repair reports, documented actions, and possible solutions from comparable cases. Service technicians thus begin their work with a solid foundation of information and can more quickly draw on proven solutions. In many cases, the system also generates specific recommendations for action or points to measures that have already been successfully implemented.

The screenshot displays the 'Problembeschreibung' (Problem Description) interface. At the top, there is a text input field labeled 'Beschreibung einfügen' (Enter description) with the text 'Öl absaugen' (Suck oil) entered. Below this, there is a toggle switch for 'Ähnliche Probleme' (Similar problems) which is turned on. To the right of the toggle is a checkbox labeled 'Nur für AP' (Only for AP) which is unchecked. Below these controls, there is a grid of six cards, each representing a similar problem. Each card contains the problem description, a blue button with a ticket ID, and a date.

Problem Description	Ticket ID	Date
öl absaugen	AP30702	22.03.2022
Kühlölbehälter Öl absaugen	AP30401	16.06.2018
Schrottband öl absaugen.	AP30704	16.10.2020
Kühlölbehälter Öl absaugen	AP30401	21.10.2020
Öl absaugen an den Förderbändern	AP32704	16.07.2021
Ölbehälter unter Sortierklappe Öl absaugen	AP30704	16.06.2018

Interface of the AI-Powered Ticket System

Vor dem produktiven Einsatz wurde die Anwendung in enger Zusammenarbeit mit Fachexpertinnen und Fachexperten aus der Instandhaltung getestet und iterativ weiterentwickelt. Die Ergebnisse der Evaluationsphase flossen direkt in die Optimierung der Modelle und der Benutzeroberfläche ein. Nach

erfolgreicher Validierung ersetzte die neue Lösung die zuvor genutzte Excel- und Makrolösung vollständig. Gleichzeitig wurde bei der Entwicklung darauf geachtet, dass die Plattform skalierbar bleibt und perspektivisch auch für weitere Anwendungsfälle im Unternehmen genutzt werden kann.

Benefits of the AI-Powered Ticketing System

The introduction of the AI-powered ticketing system leads to noticeable improvements in maintenance organizational processes. Thanks to the automated pre-structuring and classification of trouble tickets, maintenance orders can be created more quickly and with higher data quality. Relevant information is automatically populated, problem categories are suggested, and similar historical cases are displayed immediately. This significantly reduces the effort required for manual data entry, and processing can begin sooner with well-founded information. For machine operators, reporting malfunctions is simplified because fewer entries are required, and helpful suggestions for frequently occurring problems are provided at the same time. Service technicians benefit from having access to comparable repair cases and documented solutions right from the start of the process. Team leaders also benefit, as structured categories and filterable overviews

provide greater transparency into recurring malfunctions and their resolution.

Overall, the application helps support key, knowledge-intensive maintenance tasks. Fault reports are systematically structured, analyzed, and assigned to the appropriate personnel, while relevant experiential knowledge from past cases is made immediately available. As a result, tacit expert knowledge is gradually transformed into a structured knowledge base and made available to all employees over the long term. The solution demonstrates how AI can help make technical service processes more efficient, preserve existing knowledge, and simultaneously reduce the workload on employees.

ABOUT THE COMPANY

inovex is an IT services company headquartered in Karlsruhe that specializes in implementing digital transformation projects. Its range of services includes software development, data and AI, infrastructure, digital strategy consulting, and technology training. The company employs approximately 500 people at eight locations in Germany and one location in Switzerland.

AI-SUPPORTED COMMISSIONING AND CHANGE MANAGEMENT IN INDUSTRIAL SERVICES

INDIGRATE GMBH

SERVICE TECHNICIANS
ARRIVE ON-SITE TO FIND
EQUIPMENT THAT IS
PREPARED, VALIDATED,
AND ACCOMPANIED
BY CONTEXT-SPECIFIC
PROCESSES

WITH THE HELP OF ARTIFICIAL INTELLIGENCE AND VIRTUAL REALITY, THE COMMISSIONING OF COMPLEX INDUSTRIAL PLANTS CAN BE REENGINEERED BY TRANSFERRING RISK-PRONE ON-SITE PROCESSES TO A PRE-VALIDATED, DIGITAL PLANNING PHASE.

In B2B industrial practice, the (secondary) commissioning of complex technical systems or machines at the customer's site poses a major challenge. From the manufacturer's perspective, value creation is largely complete and the product is ready for delivery. However, due to their complexity and degree of integration, these systems are not plug-and-play solutions but require specialized expertise for on-site commissioning.

From the customer's perspective, this is a particularly critical point, as a large portion of the investment has already been made without the actual use and expected added value being realized. Delays or errors often disrupt other, time-synchronized ramp-up processes.

The Use of AI and Virtual Reality Facilitates the Coordination Process

Among the greatest challenges are the wide variety of product variants and the associated differences in commissioning processes, the high qualification requirements for service technicians, and the technical and logistical dependence on service providers operating in parallel. Inadequate preparation often leads to delays and, as a result, to a delayed start of production or a delay in realizing the planned added value for the customer.

A key reason for this turbulence lies in the lack of coordination between development, planning, and service. Changes are not consistently incorporated into service processes, and existing process descriptions are often incomplete or out of date. As a result, errors often only become apparent on-site and can be mitigated only with great effort by drawing on the experiential knowledge of individual experts. Traditional planning methods reach their limits here, as they are too time-consuming and offer few opportunities for early, cross-trade validation.

The solution lies in consistently front-loading commissioning planning through the use of AI and virtual reality. The goal is to transform the complex (secondary) commissioning process from an unpredictable on-site event into a predictable and pre-validated process. Through the combination of AI-supported process generation and virtual validation, commissioning processes are created based on design data, bills of materials, and variant information. The system automatically generates and continuously updates process logic and existing service information. Changes from product and process engineering are directly incorporated into the process logic and are available for service planning without

any data discontinuities. A key component is the virtual representation of the commissioning scenario. Using VR technology, real-world operating conditions — including the customer's physical environment, interfaces with other systems, and specific work steps — are digitally validated. This allows processes to be simulated in advance, bottlenecks to be identified, and critical dependencies to be detected early on.

Service technicians and project participants experience the commissioning process in an immersive environment, practice procedures, and optimize them iteratively. This ensures that knowledge is not only documented but also operationalized and made available in a standardized format. This approach creates a seamless connection between development, planning, and service. Processes are no longer described statically, but are dynamic, up-to-date, and validated — long before actual deployment at the customer's site. By shifting commissioning planning to an AI-supported and virtually validated preparation phase, the way work is carried out along the entire value chain is fundamentally transformed.

Critical uncertainties are shifted from the customer's implementation phase to a controllable, digital planning environment. Commissioning loses its project-critical, exceptional nature and evolves into predictable, standardized processes. For the organization, this means a much closer integration of development, planning, and service. Changes are continuously and systematically integrated into service processes, silo mentality is reduced, and a consistent database creates transparency across all involved departments.

At the operational level, this results in a noticeable reduction in workload. Field service technicians encounter prepared, validated, and context-specific

workflows on-site, which significantly reduces the need for coordination, improvisation, and follow-up questions. At the same time, reliance on individual experiential knowledge decreases, as this knowledge is systematically recorded and made available. Planning efforts are also reduced, significantly accelerating order-to-cash processes on the manufacturer's side as well as time-to-market processes on the customer's side. Even for custom manufacturers, new opportunities arise, as collaboration with AI enables cost-effective and well-founded preliminary planning even in individual projects. This extends beyond commissioning, allowing various scenarios to be assessed and their impact on the service offering to be quickly evaluated. .

From a Risky On-Site Process to a Predictable Component of the Value Chain

The result is a more robust and scalable service and commissioning model that is less prone to disruptions and enables significantly greater planning and scheduling reliability — for both the manufacturer and the customer.

Through the targeted use of AI and VR, (secondary) commissioning is transformed from a high-risk on-site process into a pre-validated and predictable component of the value chain. Problems are identified and resolved early on, before they arise at the customer's site. The result is a faster, more stable, and significantly more cost-effective commissioning process.

ABOUT THE COMPANY

INDIGRATE is a German software company based in Munich that specializes in digital production planning for industrial manufacturing. The company's core product is the Virtual Process Planner (VPP), a digital tool that enables collaborative production planning without physical access to the production floor.

HOW SMALL AND MEDIUM-SIZED ENTERPRISES CAN GET STARTED REALISTICALLY

IMPLEMENTING AI IN BUSINESS

DIE EINFÜHRUNG VON KÜNSTLICHER INTELLIGENZ (KI) UND AUTOMATISIERTEN PROZESSEN IM TECHNISCHEN SERVICE WIRD IN VIELEN UNTERNEHMEN NACH WIE VOR ALS KOMPLEXE UND RESSOURCENINTENSIVE HERAUSFORDERUNG WAHRGENOMMEN.

The implementation of artificial intelligence (AI) and automated processes in technical service is still perceived by many companies as a complex and resource-intensive challenge. Small and medium-sized enterprises (SMEs), in particular, often assume that, in addition to qualified specialists, extensive data sets and high computing capacities are necessary to successfully take the first steps. This perception often leads to reluctance when it comes to actual implementation. Practical experience shows that the successful implementation of AI is most likely to succeed when companies proceed in a structured and step-by-step manner. What is crucial is not rapid scaling, but a clear start with specific use cases that are implemented in a targeted manner and adapted as needed. The experiences from the “Center for Industry-Related Services” project, funded by the Baden-Württemberg Ministry of Economic Affairs, Labor, and Tourism, confirm this approach. Based on over 400 events and

350 corporate projects, it is clear that a pragmatic, application-oriented approach is the decisive factor for success.¹

Start with Clear Use Cases and Realistic Planning

A good starting point is to precisely define a specific use case. Companies should first identify a clearly defined challenge within their service that can be addressed by AI. In doing so, it is essential to define both the problem and the objective as specifically as possible and to formulate realistic expectations. Vaguely worded use cases often lead to unclear results and make it difficult to assess the benefits. At

the same time, it is advisable to establish measurable targets in the form of SMART goals: Specific, Measurable, Attractive/Achievable, Realistic, and Time-bound.² These create transparency and enable an objective assessment of the project's success. Key framework conditions must also be clarified as early as this phase. These include, in particular, requirements for data sources and target systems, such as integration into existing CRM or ticketing systems. Data protection issues and compliance with regulatory requirements – particularly the GDPR – should be taken into account early on to avoid having to make adjustments later. Realistic budget planning is essential and must include both initial develop-

¹ <https://industriennahe-dienstleistungen.de/>

² https://www.orghandbuch.de/Webs/OHB/DE/OrganisationshandbuchNEU/4_MethodenUndTechniken/Methoden_A_bis_Z/SMART_Regel_Methode/SMART_Regel_Methode_node.html

CHALLENGES IN IMPLEMENTING AI



Poor data quality or data silos



Uncertainty regarding data protection and regulatory requirements



Lack of AI expertise within organizations



Acceptance issues among employees



Projects remain in the pilot phase and do not scale

ment costs and ongoing operating costs, including expenses for infrastructure and personnel. Furthermore, investments in technology, data acquisition, quality assurance, as well as potential risks and scaling costs, should be systematically taken into account right from the start of the project.

Prototypes, Databases, and System Integration Determine the Practical Utility of AI

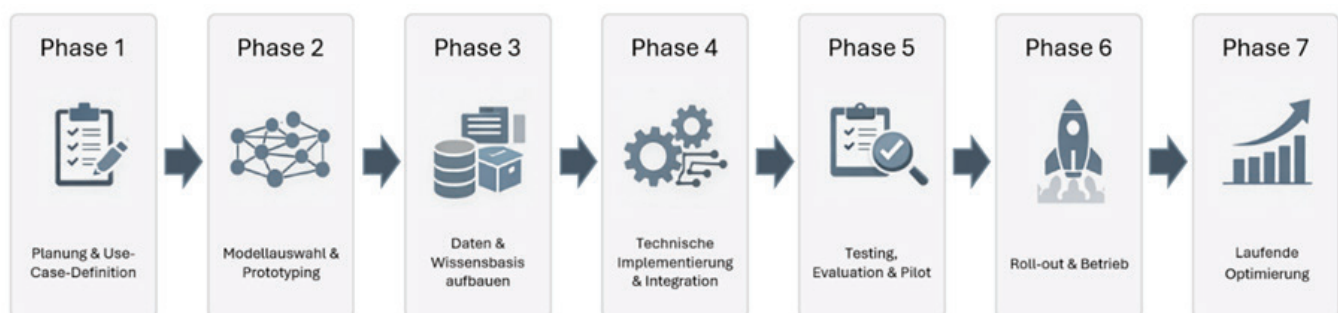
Building on this planning phase, the next steps involve selecting suitable technologies and developing an initial prototype. For SMEs, a pragmatic approach is advisable here: instead of working directly toward a final solution, a minimally viable prototype should first be developed that maps the defined use case in a simplified form. This often raises the question of which AI model to choose – for example, between proprietary and open-source solutions. Both approaches offer specific advantages and disadvantages in terms of cost, flexibility, and data protection. A structured comparison as well as initial tests with dummy data helps provide a realistic assessment of system performance

The results depend largely on data quality and data volume. Incomplete, inconsistent, or unstructured data, as well as a lack of context, can impair the

performance of AI applications. It is also important to verify whether models deliver reliable results in terms of content. This includes understanding technical terminology, interpreting context, and the risk of generating statements that are plausible but factually incorrect or unverifiable. At the same time, a realistic calculation of the usage costs per request is necessary to ensure the economic viability of the solution.

ABOUT DUMMY DATA

Dummy data is artificially generated, non-real data used in place of actual customer or company data. This helps prevent sensitive customer information from being leaked, trade secrets from being disclosed, or potential security vulnerabilities from being created.



The Seven Phases of AI Implementation in Operations

A key factor for the successful and sustainable use of AI in customer service is the development of an appropriate data and knowledge base. Many SMEs face the challenge that, while data is available, it is often unstructured, incomplete, or of inconsistent quality. It is therefore necessary to systematically develop a knowledge model that maps, for example, common service cases, standardized processes, and typical solutions. In addition, data pipelines should be established to consolidate relevant information from various sources — such as documentation, service reports, or historical tickets. Particular attention must be paid to data quality. Incomplete or erroneous data can significantly impair the performance of AI applications. Similarly, aspects such as multilingualism or the use of historical customer data in compliance with data protection regulations must be taken into account. It is precisely during this phase that it often becomes apparent that the quality of the results depends heavily on the underlying database. Topics such as technical terminology, contextual understanding, or so-called “hallucinations” of AI models must be critically evaluated.

Following the successful development of a prototype and the establishment of the database, the next steps are technical implementation and integration into existing systems. For SMEs, it is particularly important to ensure that the AI solution is integrated as seamlessly as possible into existing processes. Standalone solutions that are not connected to central systems often lead to data silos, inefficient workflows, and low user acceptance. Typical integration points include email systems, ticketing platforms, chat applications, and CRM systems.

Another important aspect is defining fallback mechanisms; at the same time, this helps build trust in the new technology. In addition to functional requirements, technical aspects such as security, scal-

ability, and cost control also play an important role. Mechanisms such as rate limiting or automatic cost caps help prevent uncontrolled spending. Likewise, measures to ensure data security — such as authentication and encryption — are essential.

DATA QUALITY STANDARDS

In the context of data quality, there are established DIN standards that prescribe a structured approach. These include, in particular, DIN EN ISO 9001:2015, which defines requirements for quality management systems, and DIN ISO 8000-64:2022, which describes approaches for assessing and improving data quality

Acceptance and Continuous Development Ensure Sustainable Use

A structured testing and pilot phase is recommended prior to a broad rollout. During this phase, the AI solution is tested under real-world conditions, ideally within a clearly defined area or a single department. The goal is to evaluate both system performance and user acceptance. In addition to automated tests, real-world use cases should be given special consideration in order to gain practical insights. A common mistake in this phase is relying exclusively on subjective impressions for evaluation. Instead, clearly defined, objective metrics should be used to measure the quality of the results. These include, for example, error rates, response accuracy, or time

savings. Equally important is the systematic incorporation of feedback from real-world use to enable continuous improvement. Employee acceptance is a critical success factor in this process. AI applications change existing work practices and can cause uncertainty or resistance. Therefore, accompanying change management is essential. Employees should be involved early on, trained, and made aware of the benefits of the technology. Only when users recognize the added value of the solution and have confidence in how it works can its full potential be realized.

After a successful pilot, the solution can be gradually expanded to other areas. Such an iterative rollout makes it possible to leverage lessons learned from the pilot phase and continuously optimize the solution. At the same time, monitoring and logging mechanisms should be implemented to monitor the application's performance and usage during live operation.

Even during routine operations, the continuous development of the AI solution remains a key component. Models must be updated regularly, knowledge bases expanded, and new use cases integrated. In doing so, it is important to keep an eye on technological developments without unnecessarily destabilizing existing systems. The goal is to achieve a long-term balance between innovation, stability, and cost-effectiveness.

CONCLUSION

AI IN TECHNICAL SERVICE — A PARADIGM SHIFT WITH CONCRETE BENEFITS

The insights and real-world examples presented in this white paper paint a clear picture: artificial intelligence is fundamentally transforming technical service — not as a distant future scenario, but as a technology that can be used today with measurable economic impact. Service organizations that consistently deploy AI benefit on multiple levels simultaneously: they become more efficient, more responsive, better equipped to retain knowledge despite personnel changes, and more attractive to their customers.

This shows that AI does not operate in isolation, but rather realizes its full potential only when combined with a robust digital infrastructure, high-quality data, and well-integrated employees. Digitalization remains the indispensable foundation — AI is its powerful catalyst.

A WIDE RANGE OF POTENTIAL BENEFITS — BOTH SHORT-TERM AND LONG-TERM

The spectrum of potential benefits ranges from immediate operational improvements to strategic

competitive advantages. In the short term, tangible efficiency gains can be achieved through automated ticket classification, intelligent resource planning, and AI-supported error diagnosis. Real-world examples demonstrate that reducing case intake processing time by up to 40 percent is not an exception, but an achievable goal.

In the long term, AI opens up strategic potential that goes beyond mere cost reduction: the iterative improvement of predictive models in line with the CRISP-DM approach leads to a continuously deeper understanding of the system and growing data literacy within the company. Predictive maintenance shifts the entire maintenance approach from reactive to proactive — with positive effects on equipment availability, maintenance costs, and customer satisfaction alike.

Particularly relevant for SMEs is the potential in the area of knowledge management: AI can systematically capture, structure, and make the implicit experiential knowledge of departing specialists permanently accessible. Given a shortage of skilled workers that is projected to worsen, this is not a “nice-to-have” but a strategic imperative.

PRACTICAL EXPERIENCE PROVES: AI WORKS – EVEN IN THE MIDDLE OF THE WORKPLACE

The four use cases presented here illustrate that successful AI implementations are not the exclusive domain of large corporations. Transaction-Network, esw Group, the University of Kassel, and INDIGRATE serve as examples of how different approaches – ranging from the automation of case intake to AI-supported assistance systems and virtual commissioning planning – are making a difference in practice.

What all these projects have in common is that they began with a clearly defined problem, a limited pilot scope, and measurable success criteria.

This insight is key: AI projects rarely fail because of the technology itself, but rather due to a lack of structure, unrealistic expectations, or insufficient employee involvement. Those who take these factors into account from the very beginning significantly increase their chances of success.

OUTLOOK

AI AS A COMPETITIVE FACTOR OF THE FUTURE

The service industry is only at the beginning of its AI-driven transformation. With the continued development of language models, multimodal systems, and autonomous agents, the possibilities will grow significantly in the coming years. Companies that take the plunge today will not only gain short-term efficiency advantages – they will also develop the digital expertise and the data foundation that will determine competitiveness tomorrow.

AI in technical service is not the exclusive domain of large corporations. It is an opportunity for anyone who is willing to take a structured approach, learn from experience, and grow step by step.

The examples in this white paper show that the first step is achievable – and it's worth it. .

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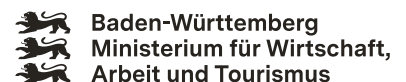
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FUNDED BY:



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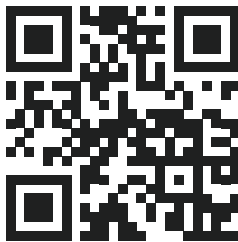
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