VIEW POINT


# AI CHATBOTS IN STEEL MANUFACTURING: CHANNELING AI FOR OPERATIONAL EXCELLENCE

## Abstract

Steel manufacturers are increasingly trialing artificial intelligence (AI) transformation by adopting virtual assistants or AI chatbots. These bots can be deployed across various functions in the steel industry such as supply chain procurement, vendor payments, and customer and employee support. This paper discusses the various roles played by AI chatbots in steel manufacturing operations. It examines critical use cases and provides a future vision on how steel manufacturers can further leverage this cutting-edge technology for operational excellence.

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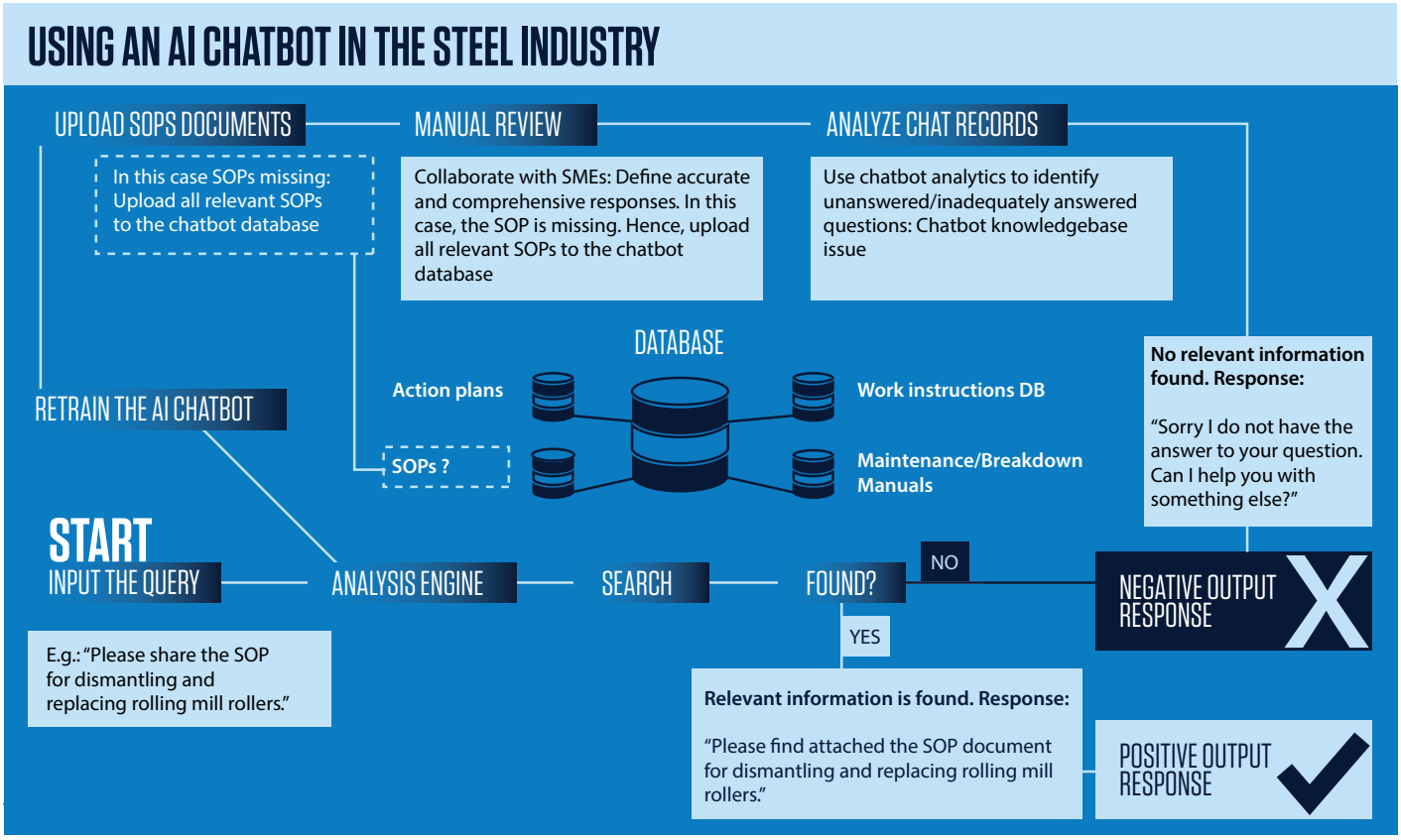
The steel industry plays a significant role in the development of a nation as well as the world at large. Steel is the foundation for several key industries such as oil and gas, automotive, building, and bridge construction, to name a few. The steel industry has its own unique challenges, many of which can be addressed by AI chatbots. Several major global steel producers have already identified key opportunity areas for AI chatbot implementation and are realizing significant gains. It is useful to understand the areas where AI chatbots can help traditional industries such as steel production transform their operations for greater value.

## Role of Chatbots in the Steel Industry

There are several processes in the steel industry where AI chatbots can assist with the daily needs of different business functions and departments. Chatbots can act as an AI colleague that guides employees by answering questions, generating action plans, providing work instructions, and issuing checklists for executing critical tasks. They can also expedite multi-level approval processes, automatically generate alerts/notifications for timely action, and create business intelligence (BI) graphs for quick business insights and decision making.

Figure 1 depicts a typical process flow of how shop floor maintenance personnel can use an AI chatbot to get information on the standard operating procedure (SOP) used to install new rollers on a rolling mill. In a steel manufacturing plant, rollers are used to reduce the thickness of steel slabs or billets while increasing their length. This process, known as rolling, can be done at high temperatures (hot rolling) or at room temperature (cold rolling) to achieve the desired thickness and surface finish. Rollers help shape steel into various forms such as sheets, bars, and rods. The figure also shows some exceptional scenarios where, when relevant data is missing, users can take action to update the knowledge repository of the chatbot.




## Applications and Effectiveness of AI Chatbots in the Steel Industry

Many global steel producers have already embarked on AI transformation programs by implementing AI chatbots to assist with production processes. Here are some key examples of leading organizations that have adopted AI chatbots along with the benefits realized.

| Company | Chatbot application areas | Effectiveness |
|---|---|---|
| **Tata Steel**<br>A multi-national steel making company based in India | • Order tracking<br>• Production status updates<br>• Customer inquiries | • Reduced load on human agents<br>• Faster and more accurate responses, thereby improving customer satisfaction |
| **ArcelorMittal Steel**<br>A multi-national steel manufacturing corporation based in Luxembourg | • AI chatbot is named 'Steela'<br>• Used to review customer calls<br>• Also handles incident management such as password change requests by employees | • Reduced the dependency on human agents to handle routine IT requests from employees |
| **Jindal Steel and Power**<br>A steel company based in India | • AI chatbot is named JSPBOT<br>• Used for both internal and external communications<br>• Integrates with Google Chat<br>• Can query data from databases to generate reports for business decision making | • Faster retrieval of information (such as monthly sales reports) from internal databases<br>• Eliminates human effort spent collating data from multiple static Excel reports |
| **Nucor Corporation**<br>A US-based producer of steel and related products | • Used for incident management | • Reduced the risk of human error<br>• Enhanced clarity<br>• Improved operational safety |
| **Pohang Iron and Steel Company (POSCO)**<br>A global steel producer based in South Korea | • Automates communication between employees via email and chats<br>• Acts as a 'people search bot' by capturing all employee information from multiple work systems<br>• Allows users to directly call any employee within the organization without having to search through multiple applications | • Enables quicker access to the employee network by directly searching information that is visualized as an organogram |
| **Gerdau**<br>A leading global steel producer that is the largest manufacturer of long steel in the Americas | • AI chatbot is named Joao<br>• Provides information on product offerings like hot rolled bars, cut blanks, etc.<br>• Users can specify products and receive quotes from chatbot itself | • Reduces the dependency on human agents<br>• Lowers customer support cost |
| **JSW Steel**<br>A multi-national steel producer based in India | • Can identify production delays for customer orders and alert customers | • Promotes information transparency<br>• Proactive alerts allow customers to restructure their concurrent production activities |
| **Steel Authority of India Limited (SAIL)**<br>The largest government-owned steel producer in India | • AI chatbot is named SAIL Sarathi<br>• Accepts voice and text commands<br>• Automates customer support<br>• Assists with raising complaints, managing payments, booking after sales services, and finding dealer locations | • Reduces the dependency on human agents<br>• Enables faster and accurate responses<br>• Enhances customer satisfaction through timely acknowledgement of general queries |

| | | |
|---|---|---|
| **Novolipetsk Steel (NLMK)**<br><br>One of the largest steel companies in Russia | • Replies to queries received from suppliers about participation in procurement process<br>• Provides guidance on filling out forms, resolving technical details, or using vendor accounts<br>• Integrates with the ERP system<br>• Suppliers registered in the SAP supplier relationship management (SRM) procurement management system can also use the chatbot for payment status updates | • Improves supply chain functions, particularly around procurement and vendor payments<br>• Significant reduction in volume of payment queries |
| **Magnitogorsk Iron and Steel Works (MMK)**<br><br>An iron and steel company based in Russia | • Assists MMK Group personnel in identifying inefficiencies in the use of fuel and energy resources (leaks, discharges, water surfacing, the formation of ice on pipelines, etc.).<br>• Identified information can be submitted to MMK's center for energy-saving technologies via the chatbot | • Identified 146 cases of inefficient use of fuel and energy resources in 2023<br>• Generated annual savings of Russian Ruble (RUB) 1.1 million by eliminating these inefficiencies<br>• Led to the installation of a gas leakage prevention system<br>• Supports the vision of green energy and lower carbon footprint per ton of steel produced |

## Limitations of AI Chatbots

While chatbots have proven highly effective in reducing human effort, addressing routine queries, and automating repetitive tasks, this technology remains limited in dealing with specific challenges related to the steel industry. Figure 2 lists out these key challenges and limitations. These include:

**Ensuring data privacy** – Protecting sensitive customer details and proprietary data is critical when dealing with AI systems. However, establishing robust security measures and ensuring compliance to data protection regulations can be complex and costly.

**Limited contextual capabilities** – In their current maturity, chatbots are unable to always accurately read user emotions, which can result in unsatisfactory responses. Moreover, ambiguous queries from customers and employees may confuse the chatbots since they have limited contextual understanding.

**Low technical knowledge** – Chatbots may provide incorrect or incomplete responses to complex technical questions due to a lack of deep industry-specific knowledge. Further, they may be unable to accurately interpret technical terms used by employees and customers, due to insufficient training data on technical jargon.

**Integration with legacy systems** – Steel organizations have age-old legacy systems that pose looming challenges when integrating with AI chatbots.

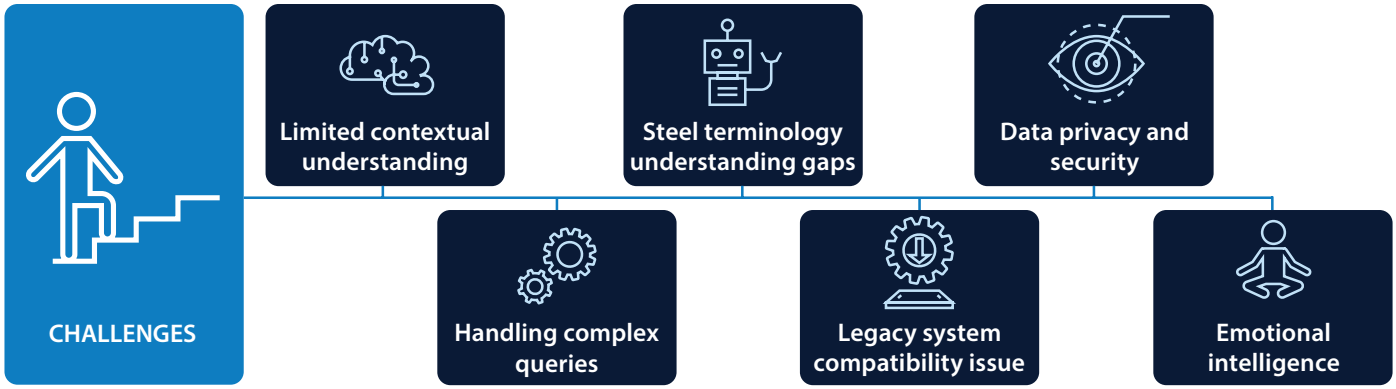



*Fig. 2: Limitations of AI chatbots in the steel industry*

## Advancing AI Chatbots: Two Use Cases

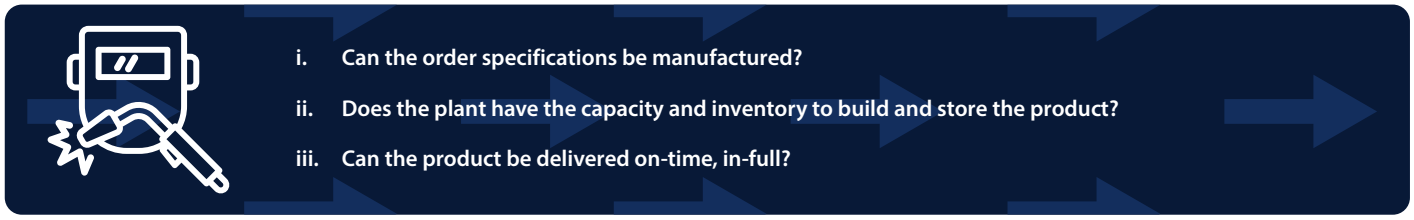
As the pace of advancements in artificial intelligence and machine learning (AI/ML) picks up, chatbots driven by generative AI (GenAI) capabilities are on the horizon. Such AI assistants will be instrumental in driving innovation within the steel industry. For instance, these are capable of creating new alloys with high strength and low weight based on different combinations of attributes (such as chemical constituents, mechanical properties, etc.) provided by a user. Before reaching GenAI maturity, however, there are other ways in which steel manufacturers can tap into the potential of AI chatbots. Here are two significant use cases for the application of chatbots in steel production.

## Use case #1: Transform sales, plant operations, and supply chain management

**Problem:** Managing unplanned or spot orders is an important job for steel manufacturers, one that directly impacts the Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA).

**Requirement:** Given that on-time, in-full (OTIF) requirements are met and that sufficient inventory is available, chatbots can help decide whether to proceed with spot orders or not. Once the salesperson approves and confirms the order, the chatbot should trigger workflows that build the production and logistics pathways, dispatch real-time alerts to stakeholders, and inform required teams of the scope of work in an agile manner.

**Solution:** Figure 3 depicts how this use case could work in a steel manufacturing plant. Sales personnel use the customer relationship management (CRM) system to capture customer requirements and share order details with the chatbot. The chatbot then interacts with back-end systems to assess feasibility of the order and calculate the cost of manufacturing, storage, and transportation. It does this by checking the following key parameters:




The above details are critical to ensure the most optimal manufacturing pathway. Once the information is captured, the chatbot also shares the projected revenue, profit, and margins with the sales personnel. Armed with this information, sales personnel can decide on the next course of action, i.e., to either decline or accept the customer order. If the order is accepted, the chatbot notifies the customer.

**Enhancements:** As AI advances, chatbots can be further enhanced with additional functionality. For instance, they can direct backend systems to group spot orders with similar specifications. This will help improve resource utilization or material yield and lower wastage or scrap rate. They can also request to block material for similar orders. When integrated with material requirement planning (MRP) systems, chatbots can analyze material consumption patterns and direct the system to raise purchase requisition and purchase orders to the concerned suppliers. This will help maintain optimal inventory levels of raw materials.

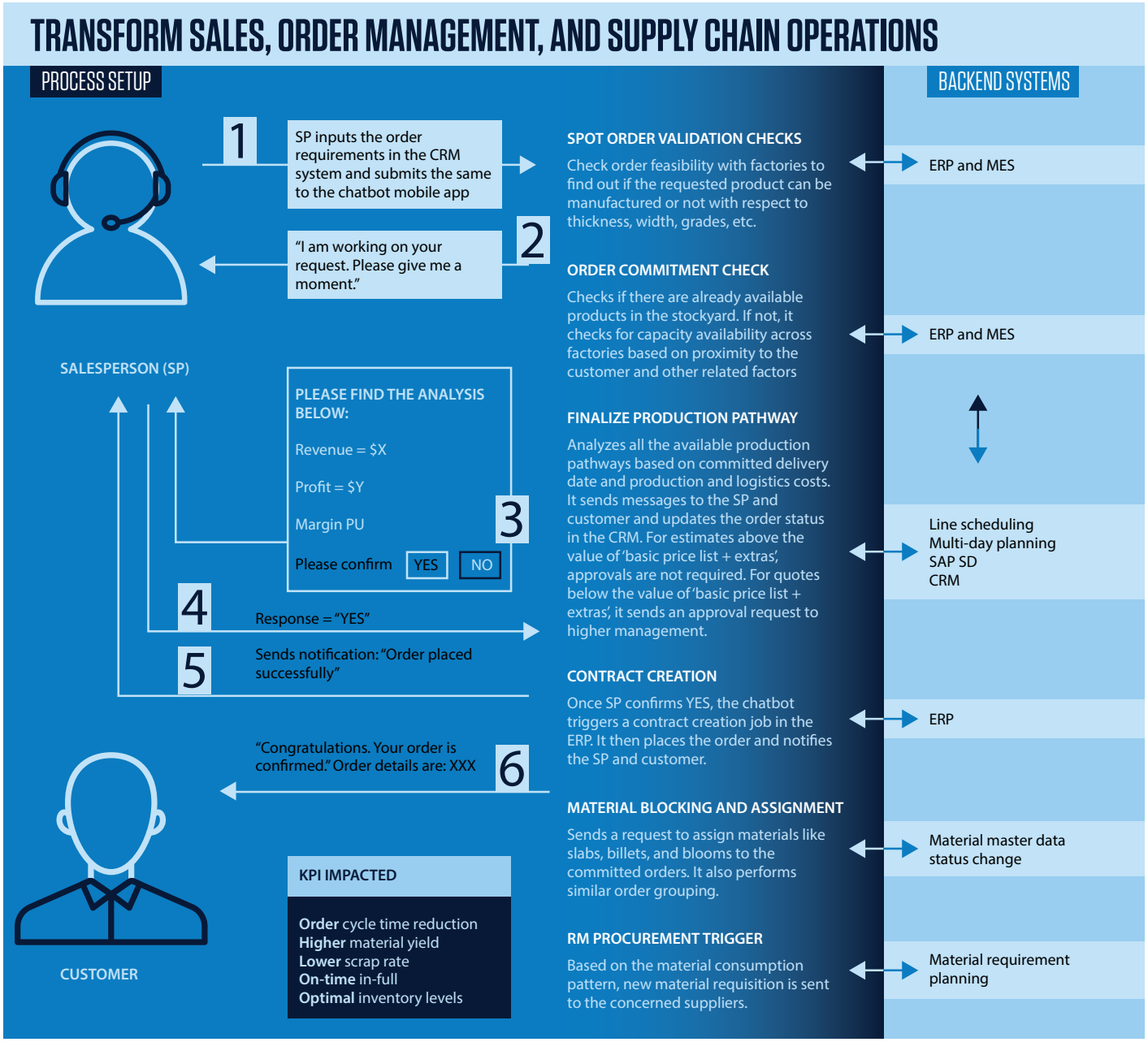



*Fig 3: Using AI chatbots to improve operational excellence, sales, and SCM*

## Use Case #2: Leverage chatbots for customer support in the downstream supply chain

**Problem:** Metal distributors often set up physical departments staffed with several customer service agents to handle numerous standard and complex customer queries. This results in high operating costs, long response times, and staffing challenges. The application of chatbots is often overlooked by most organizations in metal distribution.

**Requirement:** Customer queries – whether standard or complex – should be addressed quickly and effectively, within a few seconds. This can be done using a chatbot, supported by robotic process automation (RPA), that is embedded on the distributor's website and easily accessible by customers.

**Solution:** Metal distributors can integrate AI chatbots with their websites and leverage these to enhance customer satisfaction. Such chatbots can provide customers with instant and accurate updates on product availability, pricing, and order status, such as whether the order is validated, canceled, under preparation, dispatched, in transit, or delivered. This reduces the need for additional human agents to handle customer queries. Chatbots can also be trained to handle complex customer queries such as determining the availability of specific-sized steel sheets. In such cases, the chatbot triggers RPA to quickly scan inventory and check the availability of the required material. Figure 4 provides a visual representation of such customer interactions.

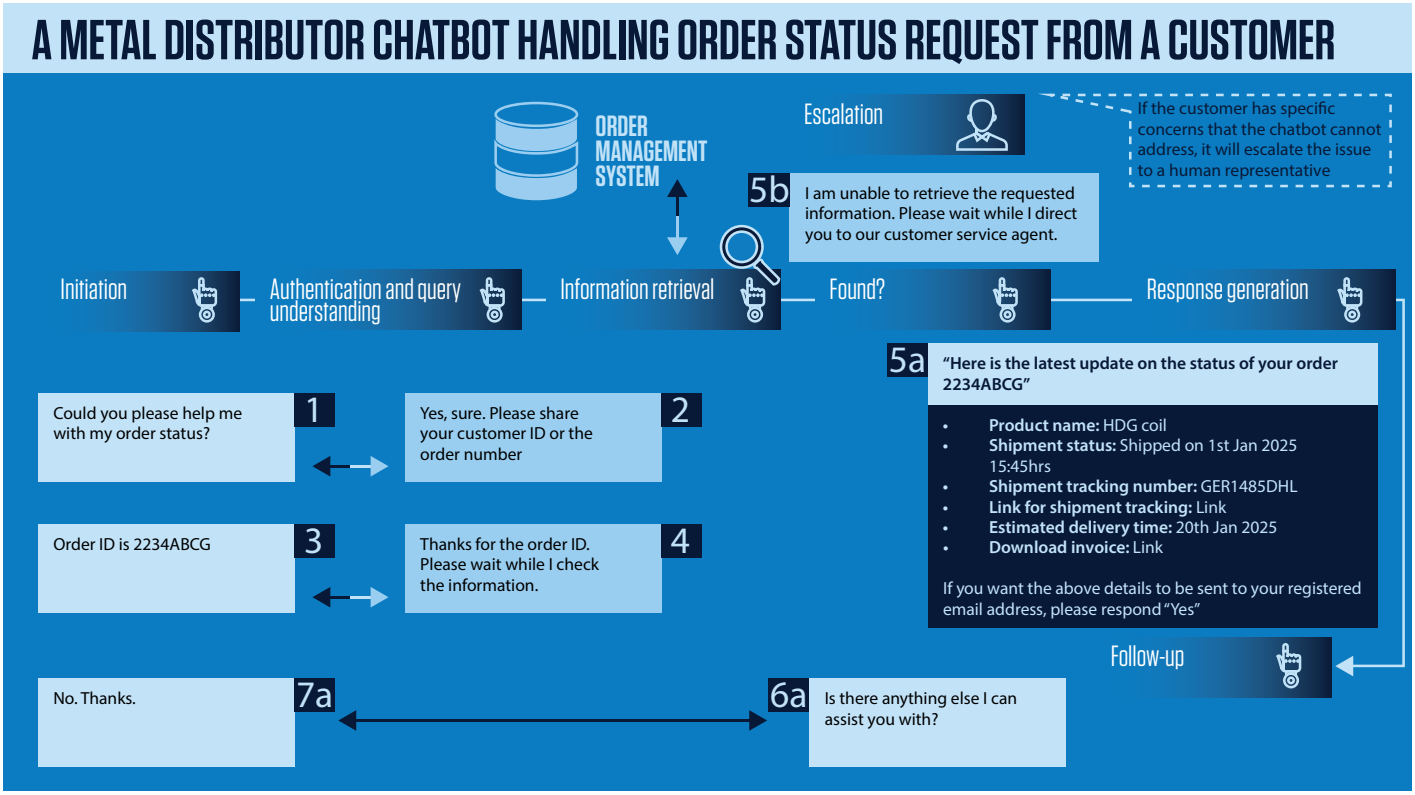


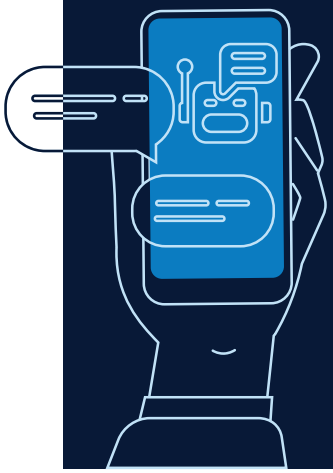

*Fig. 4: A metal distributor chatbot handling an order status request from a customer*

## Future Outlook

AI chatbots can help steel manufacturers reimagine their customer service experience and operational excellence. Advancements such as GenAI and agentic AI are primed to make chatbots smarter and more proactive. These will have capabilities such as contextual awareness, guided conversations, predictive responses, and autonomous decision making.

For steel manufacturers, this means being able to leverage chatbots that can perceive market trends such as demand change or supply chain disruption and respond intelligently through actions like finding alternative suppliers, adjusting order quantities, or changing logistics routes. Such chatbots will also be able to notify the stakeholders concerned.

In future, the market will see greater partnerships between steel producers, IT solution providers, and product manufacturers. It may even include organizations such as electric appliances manufacturers, real estate developers, energy operators, shipbuilders, and marine enterprises. Such collaboration will help attract new customers, reach new markets, enhance the customer experience, and augment market share.



## Conclusion

Despite being a traditional industry, steel manufacturing has several opportunity areas for the implementation of AI solutions. AI chatbots have proved particularly useful for early adopters. Some of the key application areas include guiding engineers with SOPs for technical tasks, helping agents handle customer queries efficiently, and optimizing supply chain activities like procurement and vendor payments.

Two key use cases that can deliver significant value for steel manufacturers include using AI chatbots to bring in operational excellence as well as to enhance customer support in downstream supply chain operations. It is important to be aware that, in their current maturity, AI chatbots have certain limitations such as low contextual awareness and technical knowledge. Integration with legacy systems and adhering to customer data protection laws are also key challenges. Nevertheless, this technology is primed to advance over the next few years thanks to developments in GenAI and agentic AI. It promises to bring transformative capabilities to steel manufacturers looking to innovate their processes and product offerings.

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