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Humans and AI Creating the Future

Building Real-Time Operational Systems for Complexity and Change



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The Future of Real-Time Systems

Many industries – including manufacturing, defense, healthcare, public safety, and disaster management – depend on increasingly complex networks of devices, sensors, systems and people to coordinate their operations and respond to changing conditions. As new applications multiply and existing ones expand, their interdependencies become harder to manage. Meanwhile, the time available to understand and respond to events is shrinking. Managing these interdependencies requires continuous, real-time coordination at scale across systems, devices, sensors, and people.

The systems that support these operations must also adapt as requirements, risks, and technological advancement. New information, shifting priorities, and operational experience can reveal the need for different responses or new capabilities. Setting up systems and leaving them to run unchanged is no longer sufficient. Organizations need to evolve these systems without interrupting operations.

Delivering these systems will depend on two equally important partnerships: humans and AI both designing together and operating together. During design, people bring purpose, experience, and judgment; AI helps explore alternatives, develop architectures, and implement software. Once operational, AI interprets incoming information and supports coordinated action, while people contribute context, set priorities, make consequential decisions, and respond to changing conditions.

As operational complexity grows and response times shrink, organizations need systems that can coordinate across devices, systems, AI, and people in real time.



Human judgment and AI analysis shape both the system's design and its daily operation.

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Neither partnership is sufficient alone. A sophisticated design delivers its value through effective daily operation, and effective operation depends on a system designed for people and AI to work together.

Daily operations also reveal requirements that design alone cannot anticipate. People and AI can use that experience to refine the system, giving operators better ways to understand events and respond as conditions change.

From Events to Situations

Consider a real-time remote patient monitoring system that brings together information from wearables, blood pressure devices, oxygen sensors, etc., to monitor a patient for falls and health changes. Detecting a fallen person is only the beginning. Is the person injured? What do nearby cameras show? Which responders are available? Can an ambulance reach the location? Each answer can change the appropriate response. Systems, AI, and people need to bring this information together, understand the situation, and coordinate a real-time response.



Home monitoring connects multiple signals in real time with remote human clinical oversight.

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When a blocked road cuts off emergency access, Vantiq connects drone observations, crew reports, and AI to coordinate routes, responders, and supplies in real time, under human command

Consider these other use cases:

- **Disaster Management in Real Time:** Consider a disaster response system that combines drone observations with reports from emergency crews. A blocked road is only the beginning. Which teams can still reach affected areas? Where is medical assistance most urgent? Vantiq coordinates the command truck, drone, systems, AI, and responders together to coordinate routes, crews, and supplies in real time, with human command retaining authority.

- **Supply Chains as Connected Operations:** Consider a supply chain system that connects shipment events, inventory, and transport availability. A delayed container ship is only the beginning. Which production schedules are affected? Can inventory be reassigned? Should an urgent shipment move by truck or air? Vantiq coordinates revised schedules across warehouses and transport to meet production needs and delivery commitments.

- **Defense Perimeter and Border Monitoring:** Consider a perimeter monitoring system that connects cameras, ground sensors, drones, and patrol teams. A sensor alert is only the beginning. What do nearby cameras show? Do other observations confirm the incident? Which patrol is closest? Vantiq combines these observations and provides authorized personnel with the context needed to assess the situation and coordinate a response.

In each of these use cases, Vantiq integrates devices, sensors, existing systems, AI, deterministic software, and people to sense, analyze, decide, coordinate, act, and adapt. The objective is to quickly understand relationships among events and turn that understanding into fast, coordinated action.

AI, systems, and people play different roles in turning information into coordinated action. AI expands what a system can recognize, analyze, and recommend. The system enforces rules governing permissions, approvals, and action limits.

People contribute judgment, empathy, priorities, and responsibility, particularly when situations are uncertain or decisions affect people. For these capabilities to work together, people and AI must collaborate in both designing and operating the system.

Humans and AI Designing and Operating Together

Consider a system that coordinates a city's services. During design, city experts and AI define priorities, connect information, and establish response rules. During operation, AI relates an emerging traffic disruption to emergency routes and available crews. A dispatcher contributes local knowledge, weighs competing needs, and approves an appropriate response. Vantiq coordinates the authorized actions and tracks their results. People and AI then assess what worked and didn't work.

AI connects the signals. People bring judgment. Vantiq turns their combined intelligence into fast, coordinated action within defined rules and human authority.

This example shows how people and AI work together once the system is in use. It also illustrates the necessity to design that working relationship into the system from the beginning. Business designers, AI architects, and operators each contribute to creating a system that meets the city's needs and to improving it as they learn from daily operations.



Designers, architects, and operators connect human expertise and AI throughoutthe system's life.

The business designer works with AI to define outcomes, workflows, and priorities, for example, how city services should respond when a traffic disruption affects an emergency route. The designer also establishes which actions can be automatic and which require human approval.

The AI architect designs the working relationship between people, AI, and software. Working with AI, the architect connects information and existing systems, selects AI models, and defines how findings are checked. The architect also establishes what information the dispatcher receives, how a response can be directed or overridden, and what happens when information is incomplete or systems fail.

The dispatcher contributes both during design and once the system is live. During design, the dispatcher's experience helps the team define what information operators need, which actions require approval, and when they must be able to intervene. During operation, the dispatcher works with AI as situations unfold, adding local knowledge, questioning recommendations, setting priorities, and authorizing judgment-based actions.

The two partnerships reinforce each other. What the dispatcher and other operators learn from daily operations can help designers and architects refine requirements, test changes, and improve the system. Better design then gives operators and AI better ways to understand events and respond together.

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People and AI learn together in operation and build on that learning in design. Each improvement strengthens their ability to understand events, exercise judgment, and act together.



Neonatal Care Designed and Operated by Clinicians and AI: Clinicians and technical designers work with AI to build a newborn monitoring system that defines what it should observe, how to interpret findings, and when caregivers must act. Video flags movements for seizure assessment, cry analysis flags distress, and thermal imaging measures breathing without attaching sensors to fragile skin. Combined with vital signs, feeding history, and clinical observations, these inputs help AI surface concerning patterns and relevant history. Caregivers examine the baby and determine the response. Vantiq notifies assigned caregivers, tracks acknowledgment, and escalates unanswered urgent alerts against clinician-defined deadlines. Clinicians retain diagnostic and treatment authority, working with AI to review care history and refine monitoring and care plans.



Manufacturing Designed Together and Operated Together: Plant experts work with AI to build a real-time production operational system. Together, they map dependencies, test scenarios, and define how production teams will work with AI. People establish priorities, safety limits, and approval rules; AI helps develop integrations and software. During operation, AI relates emerging equipment problems to inventory, schedules, and delivery commitments. Operators add observations, review recommendations, set priorities, and authorize responses such as rescheduling production or advancing maintenance. The system coordinates approved changes across production, maintenance, and logistics. Operators and AI monitor outcomes, adapt as conditions change, and use operational lessons to improve the system's design.

Trustworthy, Reliable and Adaptable

As people and AI work together to build, operate and improve these systems, they must trust the system's recommendations and rely on it as conditions change. That requires safeguards around AI, continuity when components or networks fail, and the ability to evolve without interrupting operations.

Trustworthiness begins with clear safeguards around how AI is used. A critic AI can review another AI's recommendations, several AIs can vote on an answer, and models trained specifically for review can check outputs before action is taken. Deterministic software enforces explicit business policies that define what the system may do and when it must seek approval. People remain involved in reviewing uncertain, conflicting, or consequential decisions. These checks reduce errors and maintain accountability.

The system must also remain reliable as operations are distributed across locations and connectivity changes. If a component fails or a network goes down, essential local activity must continue using established policies and available information. When connections return, the system can share updates and restore coordination. Clear limits determine which actions can continue locally and which require additional information or human approval. As operations grow, the system must also coordinate more devices, people, locations, and simultaneous activities while maintaining shared operational context and oversight.

Trust in real-time operational systems requires safeguards around AI, reliability when components or networks fail, and the ability to evolve without interrupting operations.

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With Vantiq, humans and AI can build and evolve real-time systems that save lives, transform industries, and use resources more efficiently.

Reliability must be maintained as the system evolves. Vantiq lets you add, upgrade, or replace business rules, AI, sensors, and applications while the wider system keeps operating. You can test changes, introduce them gradually, and reverse them when needed. Vantiq also lets you distribute capabilities across locations based on operational needs. Edge computing runs capabilities where they are needed, such as in a plant or on a drone, while the cloud coordinates across locations.

The Future of Real-Time Systems

Humans and AI must work together to design and operate the real-time systems that will help organizations understand changing situations, coordinate decisions, and take action across complex operations. During design, people and AI will create the capabilities these systems need; during operation, they will work together to respond as events unfold. Together, they will help save lives, improve health, increase productivity, and use resources more efficiently. Their impact will extend beyond automating today's tasks, reshaping industries and essential services in ways we cannot yet fully envision.

Vantiq provides a foundation for this future. It connects people, AI, devices, sensors, and systems to create systems that capture events, assimilate them to understand context, decide on a response (with a human in the middle as needed), and coordinate action in real time.

It provides the scalability to support hundreds of thousands of asynchronous events per second, the reliability to continue mission-critical operations when a component fails, and edge computing to support local operations when network connectivity is weak or unavailable.

As requirements change, people and AI can use what they learn from daily operations to improve the systems they build with Vantiq. This continuing partnership – involving designing, operating, and evolving real-time operational systems – can provide the foundation for a far more capable world.