

# Video Recognition:

A Necessary AI Capability for  
the Insurer of the Future

# The IoT Insurance Observatory



The IoT Insurance Observatory is a membership-based think tank uniting insurers, reinsurers, and technology leaders to advance evidence-driven innovation in insurance. Founded by [Matteo Carbone](#), it explores how connected devices—telematics, smart-home and building sensors, industrial IoT, smartphone sensors, and wearables—can reduce risk, sharpen underwriting and pricing, streamline claims, and deepen customer engagement.

Spanning auto, property, workers' comp, marine and health, its program blends comparative research with practitioner dialogue. Members gain access to rigorous case studies linking sensor-driven prevention to loss ratios and retention, and practical frameworks for scaling pilots into operations. Curated executive peer forums in North America and Europe discuss topics such as IoT program ROIs, driving-behavior analytics, water- and electrical-fire mitigation, claim triage, data governance, and vendor landscapes—always with commercial neutrality.

Across nine annual editions, the Observatory has delivered almost 4,000 hours of one-to-one workshops and hosted 45 plenary symposiums between North America and Europe; engaged 96 Insurance Groups (including 6 of the top 8 Reinsurers, 11 of the top 15 European Insurance Groups, 10 of the top 15 US P&C Insurance Groups, 2 of the top 3 Japanese P&C Insurance Groups, one of the top 2 Brazilian P&C Insurers, the largest Australian insurer, and 2 of the top 10 Global Brokers); and involved 60 tech players and vendors.

The Observatory generates and promotes innovation in the insurance sector: representing the cutting edge of global innovation, offering a strategic vision to exploit the [insurance IoT's full potential](#), and stimulating research and debate among the participants.

## Suggested citation:

IoT Insurance Observatory 2025

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# 1. Video recognition and its application to the insurance industry



Over the past decade, the IoT paradigm (the ability to sense, communicate remotely, understand, and act) has been applied in different insurance business lines around the world. The IoT Insurance Observatory research, over its nine annual editions, has mapped numerous success stories from auto telematics to connected properties, from wearables in health insurance to workers' compensation, and witnessed their robust ROIs. Many of these stories have been characterized by the usage of data generated by specific sensors, which were specialized in the specific use case that the insurers decided to address.

In recent years, insurance success stories have emerged where cameras serve as the primary sensing technology made possible by advances in video intelligence driven by improved cameras, scalable computing, and, above all, artificial intelligence. Video recognition, a subset of computer vision, enables machines to interpret video content in real time or retrospectively, mirroring the human ability to perceive and comprehend visual scenes.

Unlike passive video recording, video recognition extracts actionable meaning, identifying people, objects, behaviors, and events within a stream of images.

Such automated comprehension is doable today, in real-time, directly on an advanced camera, on a processing unit in the field used to connect old cameras, or into the cloud. This gives insurers not only an incredible opportunity to constantly have a pair of eyes on what they are insuring and to understand what is happening, but also to react promptly.

The adoption of the IoT paradigm in the insurance sector – allowing to sense events affecting the insured, transmit this information in real time to insurers, analyze the continuous data stream through artificial intelligence for understanding and deciding, and subsequently act – has its essence in the ability to take smarter actions than in the traditional analogic insurance approach. Video recognition gives a capability to sense that goes beyond the traditional sensors used by insurers in many scenarios, and, in this way, enhances their capabilities to understand and act. So, the capability to create a concrete impact on the insurance business.

The relevance of this opportunity and the flexibility of the application of this technology in different domains put video recognition among the necessary capabilities for the insurer of the future.

***The adoption of the IoT paradigm in the insurance sector – allowing to sense events affecting the insured, transmit this information in real time to insurers, analyze the continuous data stream through artificial intelligence for understanding and deciding, and subsequently act – has its essence in the ability to take smarter actions than in the traditional analogic insurance approach.***

## 1.1 The Technology

**Authored by Matteo Carbone, with the support of LightMetrics.**

Similar to any IoT architecture, a video recognition systems have a hardware component (the camera), a communication layer, analytics (which comprises layered computational processes), and applications. If cameras are the eyes of the system, the overall system, applying the archetype of the IoT paradigm (sense, understand, act), acts as the brain by interpreting what is “seen” to drive meaningful insights and actions.

Earlier generations of video systems required hand-crafted features and rule-based models to extract specific information from video. Today, end-to-end deep learning models can be trained directly on raw data to meet target objectives, significantly reducing manual effort and reducing brittleness, increasing accuracy and adaptability.

Here’s a look at the **foundational components of a modern video analytics stack**:

- **Camera and Sensor Layer:** cameras are critical for high-fidelity data capture – the better the input, the better the downstream analytics. Key considerations include: sensor types (mono, stereo, thermal, depth), HDR (High dynamic range), low light / night vision, resolution, frame rate, global shutter, field of view, lens distortion correction, power efficiency, storage and connectivity, environmental resilience, cost-effectiveness.
- **Data Ingestion and Preprocessing:** this component has to perform resolution adjustment, stabilization, denoising, deblurring, capture, encoding, etc.
- **Analytics:** AI powers the recognition, classification, and interpretation of video data.
- **Business applications** connecting the analytics to real-world workflows.
- **Infrastructure, Systems, and Ecosystem Enablement:** the backbone that enables scale, responsiveness and integration. This includes edge computing, cloud infrastructure, data management, APIs, and SDKs.
- **MLOps and DevOps:** to ensure monitoring and evolution of model performance and dataset quality.
- **User Experience:** such as dashboard, visualizations, searchable and conversational video interfaces, and copilots.
- **Governance and Security** to guarantee explainability, compliance and data protection.

The **analytics component** is the heart of the video recognition. To put it simply, it is about teaching computers to “see.” Video recognition takes raw pixels from a video frame (which is basically numbers representing colors) and processes them with algorithms to recognize patterns – simulating how our brain processes signals from our eyes.

These processes span from low-level detection to high-level semantic interpretation, structured around six key technical components:

1. **Low-level computer vision (Detection and Classification)** provides the toolkit that allows a computer to make sense of individual video frames: it turns raw pixel data into meaningful representations, finding objects of interest in each frame (like feature maps, which are high-level descriptions of the image content). These representations are then used by specific components like detectors or recognizers, which identify what those detected objects are and their attributes.
2. **Temporal Analysis**
  - **Motion Detection** refers to sensing that something has changed between frames;
  - **Motion Tracking:** By analyzing frame-to-frame changes and linking detections across frames, systems can track entities over time, establishing trajectories, dwell time, and spatial interactions.
3. **Behavior / Activity / Situation Analysis** – higher-level dynamic behavior interpretation, like recognizing that “a person is walking” versus “running” or detecting that “a crowd is gathering” or “someone has fallen down.”
4. **Metadata Extraction and Indexing**—The culmination of recognition is structured output: metadata. This includes object counts, time-location stamps, attribute tags, and behavioral descriptors. Metadata makes video content searchable and quantifiable, supporting dashboards, alerts, and trend analysis. It converts video into a form that aligns with enterprise data systems.

## Evolution of analytics capabilities

The trajectory of video recognition unfolds in four distinct phases, each marked by leaps in algorithmic capability, computing power, and commercial feasibility.

### Video for Verification (Pre-2000s)

Video recognition did not appear overnight; it progressed through decades of innovation. Early video surveillance (1970s–1990s) relied on CCTV cameras and human operators, meaning it was reactive – footage was recorded and watched later or monitored live by security staff, with no automated interpretation. Even though the process was manual and sometimes slow, the impact was significant.

### Video for Proactive Alerts (2000s – Early 2010s)

In the early 2000s, the first “intelligent” video analytics emerged. Initial efforts in video analytics were rule-based and hardware-constrained. Motion detection, line-crossing alerts, and tripwire-based event detection typified these systems. Lacking adaptive intelligence, they were brittle and prone to false positives from shadows, weather, or minor scene variation. Human review teams helped screen out false positives. In surveillance settings, motion detection helped alert security teams in near real-time.

Custom rules required manual configuration, and systems often fell short of expectations outside controlled environments. With limited connectivity (primarily 3G) and (then) expensive cloud storage, uploading full video footage was impractical.

Edge processing was based on traditional computer vision techniques, sometimes enhanced with lightweight machine learning models. However, due to limited computing power, most algorithms were rule-based or relied on simple models that struggled with changing environments, lighting conditions, or unpredictable behaviors.

These systems marked the **first step toward automation**, though still reliant on human oversight.

### Advances in Machine Vision (Mid 2010s–2020)

The mid-2010s introduced a major leap with the use of GPUs to train **deep neural networks**, particularly convolutional neural networks (CNNs). These models learned directly from raw video frames, removing the need for handcrafted features and dramatically improving accuracy.

This allowed computers to be “trained” on millions

of images and videos to recognize objects and people with far greater accuracy than human-coded heuristics. Rather than engineers hand-coding rules (e.g., what a person’s outline looks like), neural networks learned directly from examples. Object detection became highly accurate across varied conditions. Facial recognition advanced from novelty to maturity. Performance gains enabled real-time analytics across multiple video streams, and false alarms dropped precipitously. The result was a shift from brittle systems to robust, scalable solutions.

During this period, research also flourished in **tracking algorithms** (some of which also started using learning for data association), and multi-camera analytics. All of this was also allowed by the hardware evolution. Cameras became IP-based and HD, or better. This provided clearer data for algorithms to chew on. A blurry analog image is hard to analyze; a crisp 1080p or 4K image makes detection easier (though more data to process). In parallel, computing power exploded with GPUs and specialized hardware. Processing high-resolution video with deep nets became feasible in real time.

This meant an analytics server could handle many camera feeds simultaneously, something impossible a decade prior without a supercomputer. Storage and network tech also caught up to handle digital video, enabling more data to train and use for analytics.

Deep learning shifted the industry toward **scalable automation**. Inference (i.e., real-time decision-making) was typically performed in the cloud or on-premise servers in industrial or surveillance contexts. This phase marked the **mainstreaming of AI-powered video analytics**, with significant reductions in manual review and operational cost.

### Current Capabilities (2020–2025)

Today’s systems achieve real-time, high-fidelity interpretation across multiple feeds. Core capabilities include:

- **Edge AI Computing:** Smart cameras equipped with vision-processing units (VPUs) perform on-device analytics, reducing latency, bandwidth usage, and privacy exposure.
- **Cloud and Hybrid Architectures:** Workloads are split between edge (detection) and cloud (aggregation, deep analysis), enabling scalability and resilience.
- **Deep Learning at Scale:** Video-based neural networks also improved capturing temporal dynamics (e.g., gesture patterns, repetitive motion) that image-only models missed. From pose estimation to behavioral

classification, AI models now deliver human-level interpretation in many domains.

- **New Training Techniques:** such as self-supervised and semi-supervised learning, enabling the usage of unlabeled data, and pre-trained backbone models, which can be fine-tuned for specific use cases, reducing data requirements.
- **User-Centric Interfaces:** dashboards, heatmaps, and natural-language querying (enabled by LLMs) democratize access to insights, shifting control from engineers to decision-makers. Visual Language Models (VLMs) combine vision and language understanding to answer questions about videos, summarize them, generate synthetic scenarios for training or simulation, and enable intelligent search and conversational UI.
- **Real-time autonomous Analytics and Closed-Loop Response:** modern systems can process video feeds in real time (often with only a fraction-of-a-second latency). This means actionable insights (like an alert or counting) are available virtually immediately as events happen. Video AI is evolving from observer to actor by initiating alarms, locking doors, or dispatching drones autonomously. Human oversight shifted to exception handling as routine tasks became machine-executed.

This maturity has shifted perception: video recognition is no longer a high-risk experiment. It is an enterprise-grade capability deployed across mobility, retail, health, manufacturing, cities, and logistics.

## Emerging Trends and Future Trajectory

Looking ahead, some macro trends define the evolution toward next-generation video intelligence:

1. **System Integration:** APIs and plug-ins allow video recognition to interface with an IoT platform, which manages different data sources, enabling context-rich understanding, and orchestrate its own applications. Together, these trends redefine the scope of video recognition, shifting it from analysis to anticipation and from detection to decision-making.
2. **Explainability, Ethical AI and Privacy by Design:** Systems now needed to justify decisions to end-users and meet regulatory standards — leading to better model transparency and secure data handling by design. Necessary features include auditability, bias mitigation, and policy enforcement. The regulatory landscape is catalyzing embedded privacy controls: face masking, federated learning, and opt-in analytics.
3. **Generative and Customizable AI:** AutoML and edge personalization will allow systems to self-adapt

***Video recognition is no longer a high-risk experiment—it is an enterprise-grade capability deployed across mobility, retail, health, manufacturing, cities, and logistics.***

to unique environments. New learning paradigms are emerging: self-supervised, weakly supervised, and unsupervised learning expand capabilities with minimal labeled data. Future analytics could continually self-optimize: e.g., a store's analytics might learn day by day the typical patterns and adapt thresholds for alerts (reducing false alarms automatically when certain motions are known to be harmless). When combined with **autonomous agents**, these models can seamlessly orchestrate entire business workflows. Importantly, they also allow for human-in-the-loop oversight, ensuring control and accountability in sensitive decisions.

4. **Higher Definition and 3D Vision:** as cameras go 4K, 8K, and beyond, analytics will have more detail to leverage (though at cost of processing). Also, the use of stereo cameras or multiple viewpoints could allow 3D reconstruction of scenes — useful for analyzing spatial relationships more accurately (like measuring distances, heights of persons, etc., with high precision). 3D understanding can improve things like fall detection (determining a person's pose in 3D to know they fell vs. just crouched).

## Practical Business Application: Dedicated Cameras vs. Retrofitting

A strategic consideration for businesses adopting video recognition is whether to deploy new smart cameras with built-in analytics or to retrofit existing camera infrastructure with external processing capabilities.

**Dedicated Smart Cameras:** Smart cameras integrate onboard AI chips capable of executing analytics at the edge. For businesses deploying cameras for the first time, modern edge AI-enabled devices may offer better cost-to-value ratios and lower installation complexity.

**Retrofitting Existing Cameras:** Retrofitting involves adding external processing—via servers, encoders, or cloud platforms—to existing “dumb” cameras.

- Many businesses already have CCTV systems in place. Rather than replacing expensive, ruggedized outdoor cameras, they can upgrade storage and compute (e.g., install an edge server with AI capabilities). Analog systems can be digitized via adapters, extending hardware lifespan while gaining modern intelligence.

- Fleets often install blind spot or rear-view cameras for liability or theft deterrence. These are hardwired and costly to replace. A smarter approach is upgrading the **hub** – the onboard device that processes video, stores data, and sends alerts. This unlocks new features like real-time alerts, live streaming, and AI-based safety scoring – without changing the cameras.

Some organizations now employ hybrid strategies. Smart cameras handle immediate local detection, while cloud or server infrastructure aggregates data, conducts higher-order analysis, or provides centralized management.

This model balances responsiveness, scalability, and cost-efficiency. A flexible architecture that allows future adaptation – mixing edge, cloud, and on-premise capabilities – is increasingly the norm.



### LightMetrics profile

Established in 2015, LightMetrics helps commercial fleets improve safety and reduce risk using AI-powered video telematics. Backed by Sequoia Capital India (Peak XV) and BeeNext, LightMetrics partners with telematics service providers and OEMs to provide fleets a unified dashboard with insights from conventional telematics augmented with insights from video.

Today, RideView, their video telematics platform is deployed across 4,500+ fleets via 45+ TSPs and 4 OEM integrations, with a focus on innovations that matter to fleets and partners alike: extended video retention, lower data costs, real-time risk mitigation and intuitive workflows for managing safety in a fleet. Key markets are the United States, Canada, Mexico, Brazil, Australia, and the UK, among others.

At the heart of RideView is powerful and efficient edge AI that detects distracted or unsafe driving and issues in-cab alerts to prevent crashes. Fleets have seen up to 86% reduction in speeding, 71% reduction in distraction, and 38% reduction in crashes. Risky drivers receive personalized coaching offline, driving sustained safety gains.

LightMetrics edge AI is cross-platform and can utilize any hardware acceleration available on the camera – DSP, GPU, TPU or just ARM cores. Designed to work across multiple camera models and price points, RideView ensures a consistent UX regardless of hardware—giving vehicle OEMs and partners flexibility without compromise. LightMetrics works closely with camera manufacturers to make partners who adopt RideView hardware-agnostic. Tools like automated calibration, a robust diagnostics layer, and a partner portal accelerate time-to-market for video telematics offerings.

For insurance and data ecosystem partners, LightMetrics provides GDPR-compliant APIs, secure cloud storage, and ISO 9001, 22301, and 27001 adherence, making it easy to incorporate video telematics and insights from video into the core of their operations.

## 1.2 Insurance Applications

The IoT paradigm – the capability to sense events, transmit this information in real time to insurers and analyse the continuous data stream through AI to understand, decide, learn, and subsequently act – has a transformative potential in the insurance industry. Many activities along the insurance value chain can be performed significantly better by using the IoT paradigm.

Using personal auto telematics as an example, being the most mature insurance IoT usage, the figure below represents the expected business impact of IoT on the different functions of an auto insurer. Its relevancy has already allowed multiple forward-looking insurance incumbents to identify telematics as a necessary capability of the insurer of the future.

Auto telematics is an approach traditionally based on black boxes and OBD dongles as devices to sense, which has also been successfully implemented in recent years by utilizing smartphone data and, to a lesser extent, OEM data. Some success stories, such as the second case history featured in this paper, have recently been based on dashcams.

Numerous case histories – in different insurance business lines – have scaled connected portfolios and obtained robust ROIs around the world. These masters in the IoT usage have typically built their connected portfolios on a robust business case based on only one of the following three points of solutions:

### The potential impact of Telematics on the auto insurance value chain



Source: Hernandez & Carbone (November 2023), "Nationwide Insurance: Using a Decade of Learnings to Create Next Generation Telematics Solutions"

1. **Connect & Protect (risk reduction)**, implementing processes able to reduce the expected losses. This can be obtained both with **real-time escalation processes** that act when a specific situation is detected: the focus is on mitigating the consequences of this situation or even to avoid it escalating into a claim, and with **behavioral change programs**, which are a structured and continuous set of actions focused on promoting less risky behaviors. Insurers can address different situations with this approach.

The most advanced insurers in their journey to master IoT are even setting a more ambitious vision. A **holistic and integrated adoption of the IoT paradigm** along the organization would simultaneously allow for avoiding many incidents from happening, for better matching risks to rate, and, in the event of unfortunate events, for providing a more accurate, fairer, and quicker claim management.

These impacts enable insurers to achieve their target profitability while many policyholders benefit from adequate coverage at lower premiums.

## Connect and protect approaches



Source: IoT Insurance Observatory

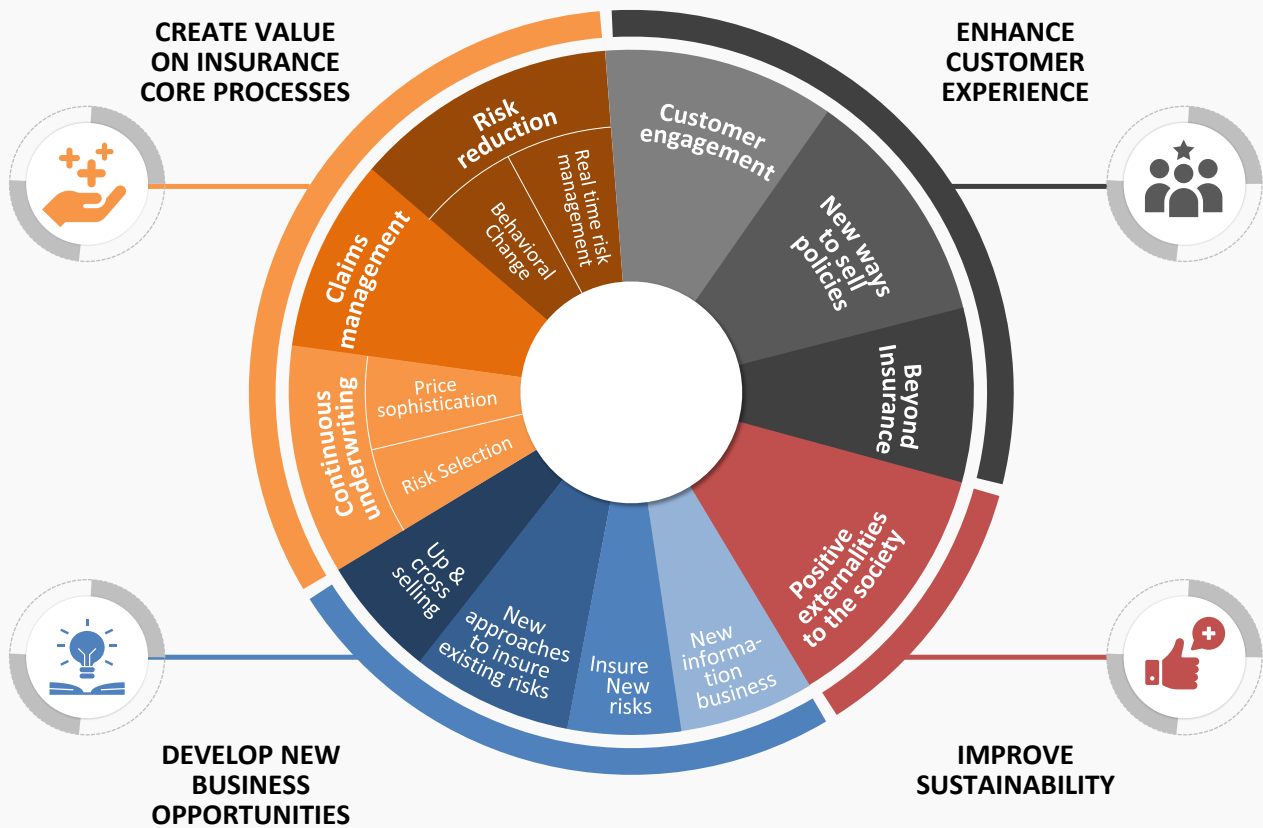
2. **Match rate to risk (risk assessment)**: a continuous stream of IoT data about what is insured enables insurers to extract information adequate to perform more accurate risk assessments and selection. Insurers can use this data to align rates more closely with actual risks. This allows for more sophisticated pricing, which can lead to better customer retention and acquisition, but also reduces the premium leakage of the riskier drivers subsidized by the safer ones in each old broader pricing cluster.
3. **Improve effectiveness and efficiency of claim management**: proactively knowing that an accident happens represents a game changer for claim management. The insurer can trigger a proactive response such as contacting the insured, notifying emergency services, and initiating the claims process. Insurers can achieve more objective and efficient decision-making by incorporating IoT-based insights, generated by applying AI algorithms to the data generated by sensors, into the claims process. These insights can also be used to verify claims and better manage fraudulent activities and inflated requests.

This contributes to improving the availability and affordability of coverages, together with the enhanced safety and environmental protection driven by the connect & protect solutions, clearly positioning insurance IoT as a social good for its externalities to the entire society.

Insurers have also used the IoT paradigm to:

- **Improve Customer Experience**: by creating more personalized, responsive, and valuable interactions, insurers can build stronger relationships with their clients and encourage engagement. Connected insurance approaches have been used to offer beyond insurance services and implement new ways of offering insurance;
- **Develop New Business Opportunities**: IoT data enables insurers to implement personalized cross-selling or upselling approaches, to create new ways to insure current risks (e.g., parametric), and to insure new emerging risks. Some insurance groups have also created new information-based businesses that are built on the IoT capabilities created along their connected insurance journey.

# Map of the insurance IoT use cases



Source: IoT Insurance Observatory

These business applications have relied on IoT data from specialized sensors, occasionally integrated with contextual data, and analyzed through AI algorithms. Insurers have employed these tailored architectures to detect specific situations relevant to the targeted use case and peril insured by the policy.

Thanks to the evolution of video recognition outlined earlier in this paper, **cameras now serve as an additional data source for these insurance use cases** – either as an alternative to existing sensors in certain scenarios or as a complement in others, such as in the first case study presented in this paper, where the device integrates a camera with GPS and accelerometer sensors. In many cases, insurers’ IoT approaches benefit from this added visual perspective (pair of eyes), gaining a clearer understanding of events and enabling more effective actions than traditional sensors.

Moreover, video recognition is adequate for sensing in multiple contexts and use cases. This aspect positions it as a capability that can be applied by an insurer in different domains and for different purposes. So, investments in developing this capability should generate a significant return for a multi-specialized insurance carrier.

This perspective positions **video recognition among the necessary capabilities for the insurer of the future**, both in personal and commercial lines.

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## 2. The Hartford camera-based worker safety approach



**Authored by Matteo Carbone, with inputs from The Hartford's Risk Engineering Team.**

**The Worker Safety and Productivity Program** is a value proposition within The Hartford's Risk Engineering Organization, offered both to existing middle to large business workers' compensation policyholders in manufacturing, wholesale, and distribution. Combining consultative services with data collection and risk management technologies, it supports optimal work environments, employee safety, and consistent operational effectiveness.

Depending on the specific policy and individual account risk characteristics, incentives for the adoption of worker safety technology may include:

- a fixed, up-front participation discount,
- an opportunity to earn loss-sensitive dividends, rewarding investments in safety improvements that result in fewer claims,
- subsidization of the technology costs.

This worker safety approach is based on computer vision solutions from different vetted vendors that generate detailed risk reports from raw video footage captured at worksites. By employing artificial intelligence, these solutions autonomously detect potential hazards and provide actionable insights to enhance safety protocols and minimize workplace risks. The Hartford's Risk Engineering Team then works directly with the policyholder to analyze the information and provide guidance on safety priorities and strategies.

The software processes video data from the facility's existing security cameras, eliminating the need for additional hardware unless supplementary cameras are required to cover high-traffic areas. For customers without camera monitoring systems, The Hartford can recommend suitable cameras and install them to ensure comprehensive coverage and optimal functionality.

### The story of this innovation

The Hartford has been leveraging IoT technology to mitigate risks over the past six years, recognizing that "the majority of insurance claims are in some form predictable or preventable, and the best claim is a claim that doesn't happen" as noted by Dan Campany and Bobbie Schaefer [in a recent interview](#).

Workers' Compensation has been one of the areas of focus for The Hartford's IoT Innovation Lab driven by a vision that IoT solutions can significantly reduce expected losses:

- Worker Safety technologies enable businesses to proactively predict and prevent incidents through real-time monitoring and intervention. These systems generate valuable data insights that increase awareness of safety risks among policyholders, offering actionable recommendations to enhance workplace safety.
- With continued data collection, The Hartford enhances its predictive capabilities, identifying potential losses and advising clients on targeted investments to create safer environments for workers and customers. This proactive approach helps mitigate risks, reduce costs, and avoid litigation stemming from workplace incidents.

This initiative represents a foundational element of a broader vision [presented in an article by Dan and Matteo Carbone last year](#), where the IoT capabilities enable a business transformation among different Workers' Compensation business functions with the ambition "to win and retain profitable business by improving customer value with better ROI on employment expenses and lowering their total cost of risk as a natural by-product".

### The capabilities of this technology

Once a policyholder is enrolled and the vendor partner selected, The Hartford's Risk Engineering Team works with the customer to select and position adequate cameras to adequately monitor the worksite (e.g., ensuring camera angles do not overlap, there are clear views of operations, etc.)

Although setup varies by provider, 24/7 risk monitoring computer software solutions typically include an edge computing device designed to function at remote worksites:

The solutions process a continuous stream of raw video footage from connected worksite cameras, using advanced image recognition algorithms – done on premises through an edge device or in the cloud depending on the provider – to identify hazardous situations, lack of prevention, and happened accidents across multiple categories:

- **Ergonomics:** detects risks such as manual material handling or awkward postures that could lead to musculoskeletal injuries.
- **Powered Equipment Operation:** monitors activities like traffic patterns, visibility issues, speeding, missed stopping, tailgating, seatbelt usage, falling load hazards, and potential collisions or near-misses.
- **Slip/Trip/Fall:** identifies hazards like poor housekeeping, jumping or climbing actions, obstructed vision, unprotected edges, and unsafe ladder use.
- **Caught-In Hazards:** tracks machine guarding, worker exclusion zones, no-pedestrian zones, and pin hazards.
- **Blocked exists and aisles**
- **Missing PPE** (hard hats, safety vests, harnesses, gloves, glasses, etc.)

The algorithm generates automated reports with actionable insights to enhance workplace safety and reduce risks effectively. The Hartford’s Risk Engineering Team assists customers with the analysis of the data to help identify insights, opportunities and provide guidance on safety strategies.

### The impacts on the insurance value chain and results achieved

This approach centers on reducing the expected losses within the Workers’ Compensation book of business, leveraging image recognition capabilities to minimize risk, enhance workplace safety, and optimize financial outcomes.

In the event an actual accident is identified, the detections can also be used for root cause investigation and determining actions needed to prevent reoccurrence.

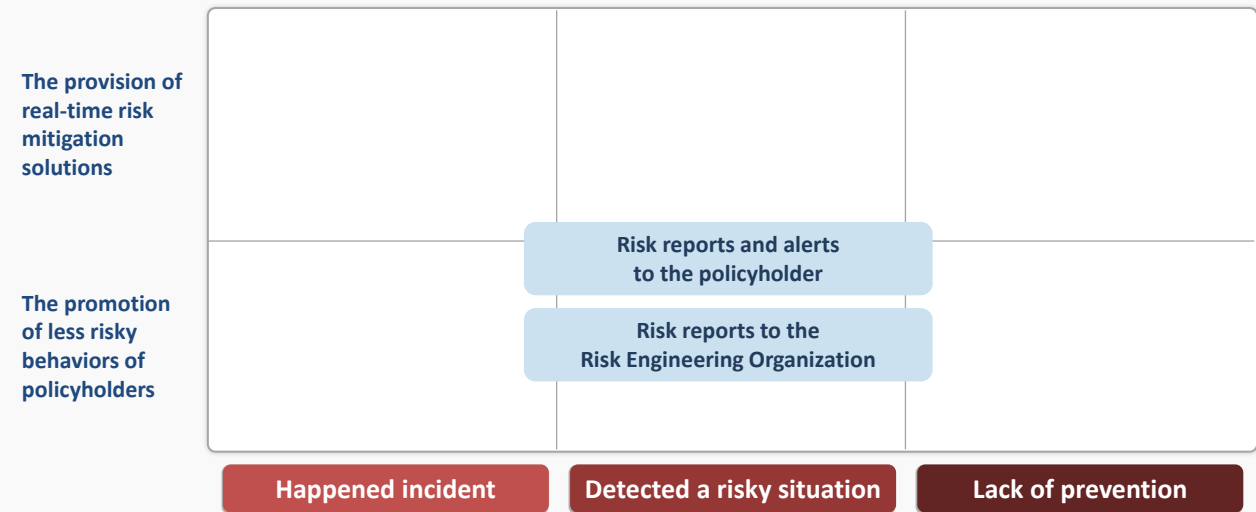
The transformative potential of IoT technology lies in its ability to deliver continuous, in some cases in real time, insights from connected cameras. This technology allows faster decision-making so that safety professionals can help workers “on the ground” mitigate risk.

By leveraging data and analytics, The Hartford’s Risk Engineering Organization, in close partnership with the customer, based on the data and insights provided by the computer vision software, can identify trends, such as the likelihood of certain types of injuries in a worksite. This enables the insurer to provide guidance on priorities and strategies aiming at reducing or eliminating risks while improving operational processes. The insights derived from this data prove particularly valuable for redesigning workstations and identifying other improvement opportunities. These analytics also provide a strong foundation for building business cases to justify investments in workplace safety and efficiency enhancements.

Additionally, policyholders can access web portals to review detected events and analyze trends over time, fostering proactive safety measures and strategic decision-making. They can even set up real-time notifications for individual event types.

Technology delivers unprecedented transparency by offering a clear and comprehensive view of actual risks and hazards across operations. It enhances observational capabilities, encompassing every aspect of operational workflows.

### The Hartford’s connect & protect approach



This holistic approach creates a detailed and accurate risk landscape, serving as a foundation for developing advanced IoT-based use cases and unlocking future innovations in risk management and operational efficiency.

*Over the span of two months, these strategic actions yielded tangible results, achieving a 32% decrease in risky powered industrial truck operation events per hour of forklift activity.*

The Hartford has documented numerous cases where customers successfully implemented programs leveraging advanced data analytics and technology to identify trends and leading indicators of risk. These initiatives have yielded significant positive outcomes, driving both behavioral and engineering changes. By analyzing the insights provided by these technologies, organizations have been able to proactively address potential hazards, enhance operational processes, and foster safer, more efficient workplaces.

A notable success story involved a warehouse policyholder who partnered with The Hartford to address frequent losses related to powered industrial trucks and ergonomic challenges. The collaboration centered on deploying Computer Vision software to enhance safety.

The technology quickly identified critical risks, pinpointing limited visibility during truck operation and unsecured loads as the primary hazards. Over 200 risky events were detected within just two weeks, offering actionable insights to mitigate these dangers.

This rapid analysis enabled the warehouse to implement precise interventions, significantly reducing risk exposure and fostering a safer work environment. By leveraging the insights provided by the software, the enterprise gained awareness of the frequency and nature of these events. This understanding guided targeted improvement measures, including employee coaching, enhanced training programs, and focused safety observations.

Over the span of two months, these strategic actions yielded tangible results, achieving a **32% decrease in risky** powered industrial truck operation events per hour of forklift activity.

Additionally, the key ergonomic risks identified by the algorithm were excessive waist bending and overhead lifting. In response, the company introduced a series of measures, including job rotation, the adoption of specialized equipment, and targeted employee training. Over the subsequent two months, these interventions led to a remarkable **30% reduction in ergonomic incidents per hour of work**. This data also provided a compelling case for increased investment in automation to further mitigate exposure to these risks.

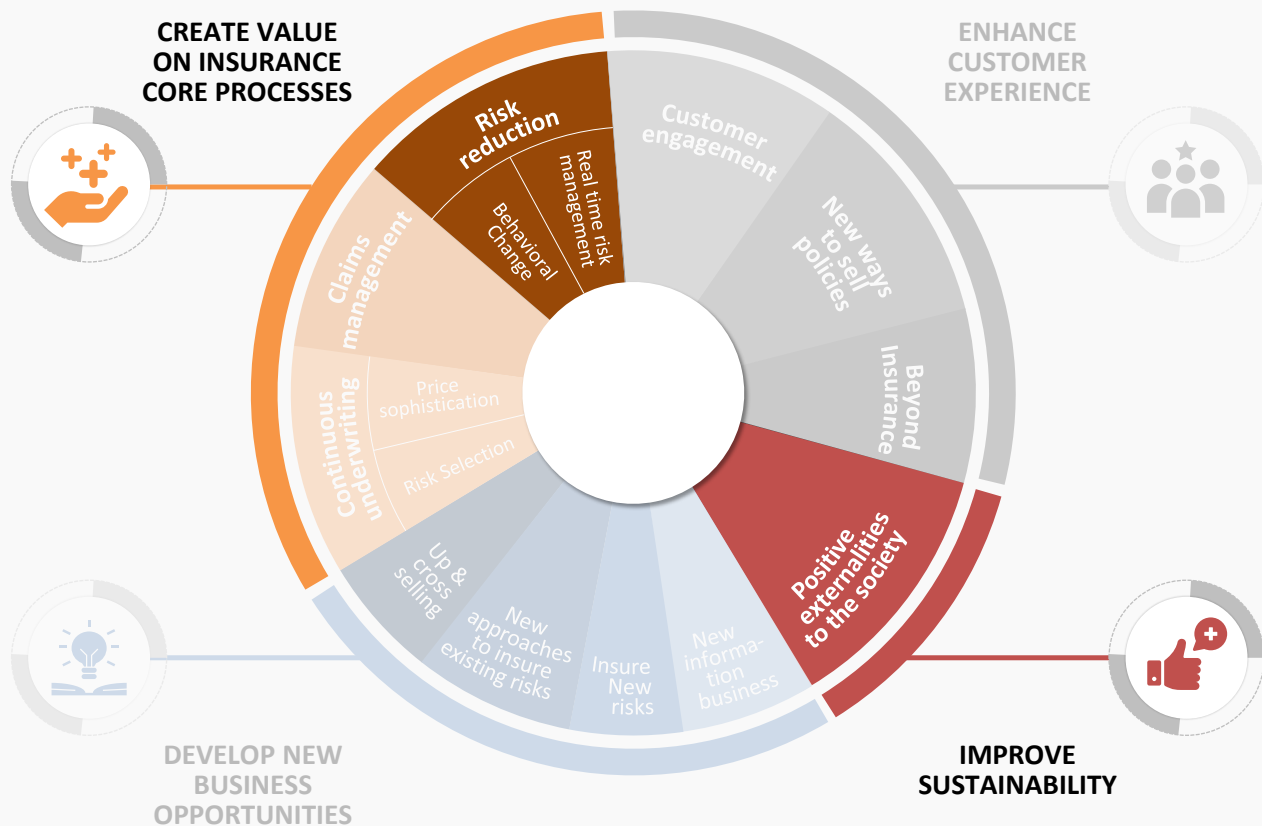
The solution enabled the customer to monitor these risks and continuously identify emerging trends over time. This advancement not only mitigated immediate hazards but also laid the foundation for sustained safety and enhanced operational efficiency in the long term.

This substantial impact on risk reduction extends beyond the workplace, showcasing The Hartford's **positive externalities on society at large**. By preventing acute injuries and mitigating the long-term negative health consequences experienced by frontline employees, the benefits reverberate through various aspects of the community:

- **Enhanced Quality of Life for Employees:** reducing workplace injuries directly contributes to the well-being of employees, enabling them to lead healthier and more productive lives both at work and at home. This promotes long-term physical and mental well-being, minimizing the risk of chronic conditions.
- **Economic Advantages for Society:** fewer workplace injuries, lower medical costs, and easing the burden on public healthcare, while maintaining workforce productivity and economic stability.
- **Social Stability and Community Support:** protecting frontline workers strengthens community ties and promotes a culture of safety, contributing to a more secure environment for families.
- **Long-Term Societal Gains:** preventing occupational hazards lowers disability rates and fosters a more inclusive workforce, encouraging sustainable practices that align with societal goals of equity and well-being.

These outcomes exemplify how The Hartford's efforts in leveraging technology and data for workplace safety contribute not only to its clients but also to society at large, aligning business goals with social responsibility and fostering a healthier, more sustainable future.

These initial successes have encouraged The Hartford to deepen its investment in these capabilities within its Workers' Compensation (WC) business, with a strategic focus on the following objectives:



Source: IoT Insurance Observatory

- **Data-Driven Process Improvements:** Leverage analytics to engineer streamlined processes and promote safer workplace behaviors, thereby reducing the frequency of insurance claims. The resulting combination of fewer claims and enhanced customer value—achieved through superior risk control and lower costs of risk—drives profitable growth.
- **Customer-Centric Value Creation:** Utilize emerging IoT technologies within the Risk Engineering framework to bolster worker safety. This approach aims to differentiate The Hartford's offerings, facilitating both the acquisition and retention of WC business.
- **Enhanced Diagnostic Capabilities:** Unlock new opportunities in Risk Engineering, such as ergonomic optimization, by applying IoT-driven diagnostics to identify and address root cause safety issues.
- **Employee Empowerment and Engagement:** Integrate these initiatives with employee rewards programs to foster behavioral change, empowering workers to make informed, safety-conscious decisions in the workplace.

### 3. Tokio Marine's Drive Agent Personal



**Authored by Matteo Carbone, with inputs from Tokio Marine (Ken Ito and Junichiro Kuroda)**

With a successful track record of seven years, Tokio Marine & Nichido (TM) has a portfolio of over **one million personal retail clients who are constantly connected with a dashcam**. These personal auto policyholders have subscribed to an additional service, Drive Agent Personal (DAP), for about \$5 per month.

TM provides an **advanced dashcam with communication functions** for clients who subscribe to the DAP service. This technology is the foundation for providing customers with “safety and peace of mind” through various services, not only in the event of an accident but also when driving as usual.

The customer value proposition is articulated on three main features:

- an advanced accident response service;
- a real-time risk prevention addressing specific situations;
- periodic safe driving diagnosis reports.



When the dashcam detects an accident, the footage is transmitted in real-time to TM, enabling the storage of key event details that can protect the policyholder from third-party requests. In cases of significant impact—measured by acceleration beyond a set threshold—TM's Accident Reception Center receives an alert along with the recording and immediately contacts the client to offer assistance. This feature is the primary selling point of the service.

DAP allows customers to speak with a TM operator and access emergency services as needed. Two operators are always on duty: one contacts emergency services, while the other assists the customer. This ensures a seamless response to accidents, from report handling

to service coordination. The system's major advantage is providing immediate support at the most critical time for accident victims. TM has saved lives by swiftly arranging ambulances for its customers.

The prevention support service provided by the advanced dashcam is based on real-time warnings—acoustic and visual—to the driver when the dashcam detects a risky situation (such as the vehicle approaching a hazardous area or the driver falling asleep). Risk mitigation is also provided by TM when the driver requests assistance by pressing the emergency button (e-call) on the camera. TM's contact center will give appropriate advice, there preventing accidents before they occur and providing safety to the subscriber.

Last, a safe driving diagnosis report is prepared based on the customer's driving characteristics. This awareness is a foundation for promoting safer behaviors in the portfolio. Policyholders and their family members can review their driving habits and develop safer ones.

#### The story of this innovation

The Group (TM) has matured a strategic view to contribute more actively to the safety and security of policyholders in preventing traffic accidents and support immediately after an accident. This has led to focus the innovation efforts around “telematics service utilizing the IoT.

In 2017, Japanese retail customers showed an increasing demand for dashcams to preserve evidence in the event of an accident. The company decided to be the first Japanese non-life insurance company to commercialize a dashcam-based service with the purpose of providing both pre- and post-accident peace of mind. This service, sold for about \$5 per month, has tended to become more sophisticated and less expensive for individual customers than the retail alternatives on the market.

#### The capabilities of this technology

The dashcam is a Full HD Recording Camera with VoIP voice conversation features. This device is equipped with GPS, a three-axis accelerometer, and an LTE communication protocol.

This dashcam and its sensors allow it to detect crashes, record the video footage of the event, and send it to the cloud. When the acceleration detected shows a strong impact, an alert and the video footage are dispatched to TM's Accident Reception Center in real-time.

First, operators check the accident video and contact the driver to provide advice using the camera conversation features. If the case can be judged to be serious, not only can paramedics rush to the scene, but a doctor helicopter can be called immediately and a doctor can also rush to the scene of the accident to begin treatment.

The dashcam’s conversation features allow Operators who work in TM’s Accident Reception Center to interact with and advise the user. The user can even ask for this support (e-call) by pressing the emergency button, which also records video footage.

For every detected accident, AI automatically analyzes the video from the dashcam, reconstructs the accident scenario, and calculates the percentage of fault. This report and video footage are promptly shared with the claim handler.

Two versions of the device are currently in the portfolio: the original one with only a front camera and the newest version with an internal camera that also looks at the driver.

Focusing on the capabilities mentioned above to detect risky situations and dispatch real-time warnings to the driver, AI capabilities allow to identify:

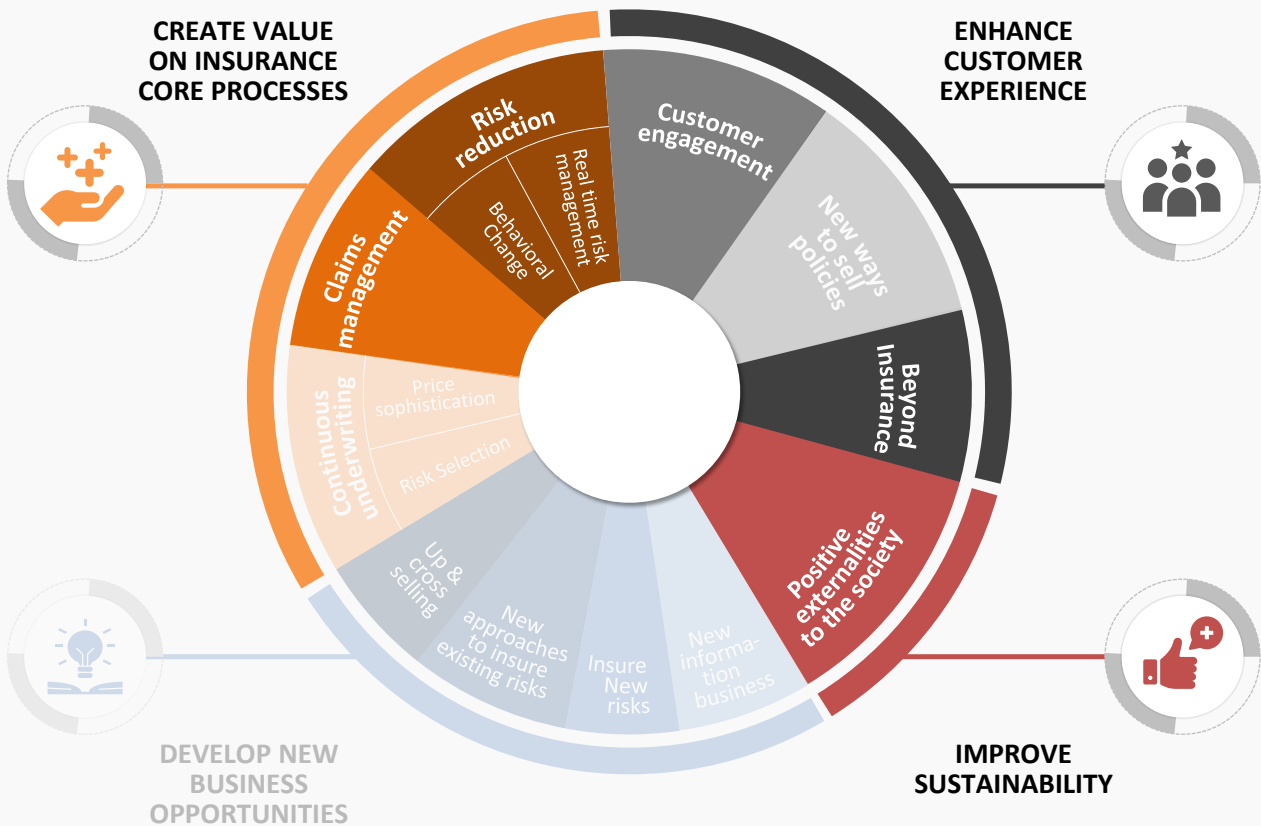
- a vehicle approaching in front or driving too close to the vehicle, a vehicle veering out of its lane, an incoming risky area, and dangerous driving behaviors such as sudden acceleration, sudden steering, and sudden braking by analyzing the data from the front camera and the sensors
- a driver looking away from the road or falling asleep by analyzing the data from the second camera.

### The impacts on the insurance value chain and results achieved

This application of the IoT paradigm to TM’s auto insurance business has:

- created value in the core insurance processes;
- enhanced the customer experience;
- improved sustainability.

Looking at the **core auto insurance processes**, DAP impacts the claim processes by providing claim handlers with the AI report and video footage of the incident to support their claim adjudication.



Source: IoT Insurance Observatory

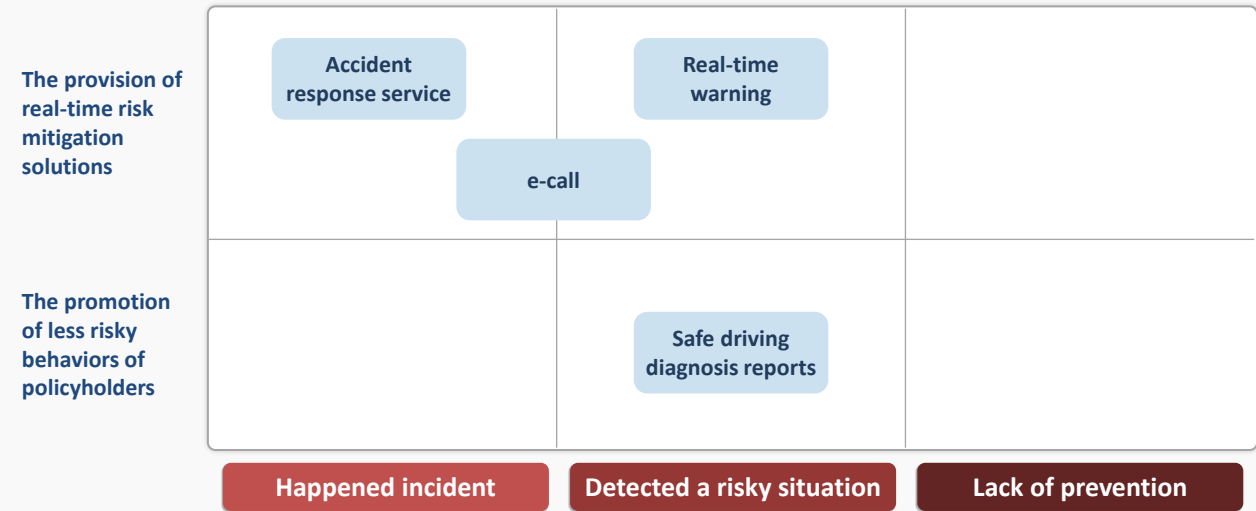
In Japan, the share of responsibility (negligence ratio) is determined through negotiations between the parties involved, based on the circumstances of the accident as interviewed by the parties and referring to past precedents (the basic percentage of fault is determined based on actual accident cases in the past): the AI-generated report and the video footage support claim-handling activities and making decisions throughout this process.

This approach has **reduced the number of days** required for negligence **negotiations by about 15%**. (The number of video evidence is approximately 35% of all the accidents in this one million policyholder portfolio). This benefits the policyholders by alleviating the psychological burden and also benefits the insurance company by reducing employee workload, associated costs, and psychological burdens on employees.

The second impact on the core insurance processes is risk reduction. DAP has **risk reduction** as a core mission, coherently with the strategic view of actively contributing to safety and security.

The accident response service, including the eventual emergency assistance, allows one to act promptly when an accident happens and mitigate its consequences. The warnings to drivers allow them to minimize risky situations in real-time. The e-call functionality allows the user to request assistance in case of an accident or a risky situation. Last, the awareness created by the safe driving diagnosis report supports the promotion of less risky behaviors.

### Tokio Marine’s connect & protect approach



The result is a win-win situation for both the client and the carrier.

Within the continuous innovation effort, TM is working on further improving the algorithm to:

- detect events with very small impacts and minimize fraudulent and inflated requests
- estimate the damages.

Tokio Marine measured robust actuarial evidence about the success in contributing to safety and security:

**A 20% reduction in the loss ratio** emerges comparing the claims of this group of policyholders before and after using the service. The current innovation focuses on enhancing the algorithm to detect risky situations and further prevent accidents from occurring.

**A 20% reduction in the loss ratio emerges comparing the claims of this group of policyholders before and after using the service.**

This impact on risk reduction also represents TM's **positive externalities to the entire society** because both accidents have been avoided on the streets, and the consequences of the accidents have been mitigated (e.g., saving lives). In this direction, the Group is positively considering utilizing technology that can use data obtained through DAP, and it is open to collaboration with any company that shares its purposes and has the appropriate technologies. One example is the collaboration with the Japanese Minister of Land, Infrastructure, Transport, and Tourism for the provision of data about natural disasters.

DAP has been an innovation success story for TM, and it has also contributed to the top line by selling additional services that go beyond the traditional transfer of auto risks. There are approximately 1,060,000 paying about \$5 per month for this additional service. The **renewal rate** of the auto policyholders with DAP is **97.8%** (compared to 96% of the rest of the portfolio).

The Group aims to extend this innovation success story further by increasing the current 7% penetration in the auto insurance portfolio. This will provide a wider population with access to the life-saving emergency call service, faster accident response, reduced burdens, and accident prevention benefits. To achieve this, TM is focusing on better communication of the initiative and increasing engagement with insurance agents who have been less active in promoting the service.



