RWS

Advancing maintenance strategies: the role of intelligent content

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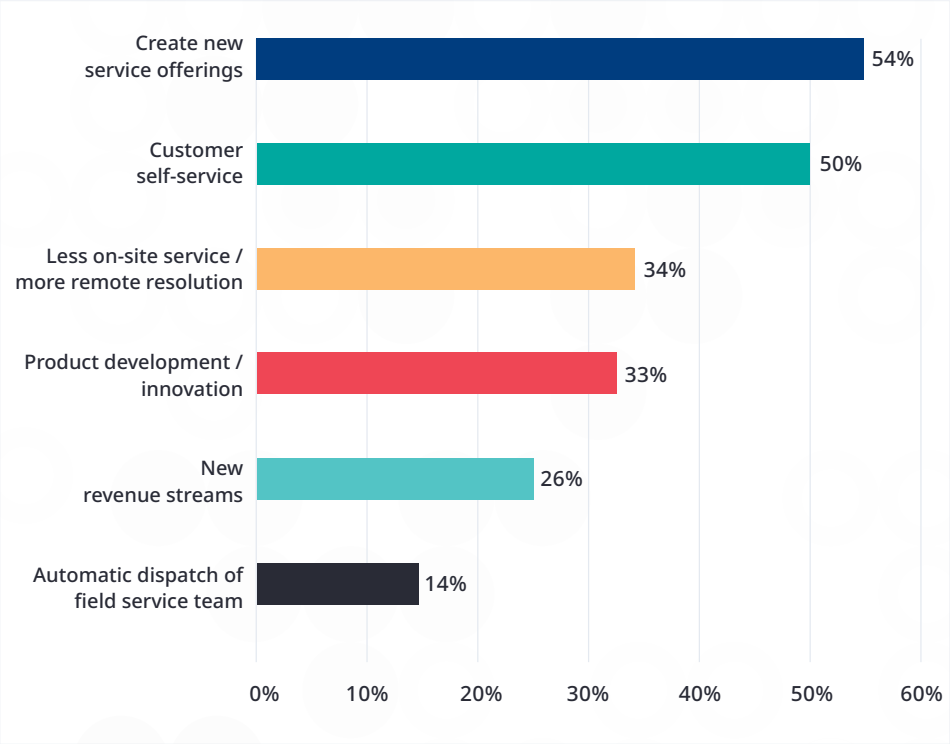
This paper sets out the advantages of a modernized approach to content management to digitalize and transform the field service experience, and to support proactive condition-based maintenance approaches.

Customer expectations have soared

As technology has advanced and products have become ever more sophisticated and digitally connected, customer expectations for product and after-sales support have soared. And as the internet of things (IoT) increasingly becomes a day-to-day reality, these expectations will only grow.

How IoT can enhance the service experience[1]



[1] Aberdeen Group, June 2017: The untold story from the field: reducing costs and creating happy customers

Transforming maintenance strategies

One of the many after-sales service transformations that customers expect of equipment manufacturers and maintainers is a transformation of their maintenance strategies. There are a range of approaches that can be used to structure maintenance programmes, including condition-based maintenance (CBM) as part of a predictive or prescriptive maintenance process.

Maintenance approaches and required technologies

	Reactive	Proactive		
Category	**Corrective**	**Preventive**	**Predictive**	**Prescriptive**
Sub-category	Fix when it breaks	Scheduled maintenance	Condition-based maintenance – diagnostic	Condition-based maintenance – prognostic
When scheduled	No scheduled maintenance	Maintenance based on a fixed time schedule for inspect, repair and overhaul	Maintenance on current condition	Maintenance based on AI-enabled forecast of remaining equipment life
Why scheduled	N/A	Intolerable failure effect may be prevented through scheduled overhaul or replacement	Maintenance scheduled based on evidence of need	Maintenance need calculated and recommended by AI data analytics
How scheduled	N/A	Based on the useful life of the component forecast during design and updated through experience	Continuous collection of condition monitoring data	Forecasting of remaining equipment life by AI data analytics
Kind of prediction	None	None	On-and-off-system, near real-time trend analysis	On-and-off-system, near real-time analysis and recommendations
Required technologies	Yesterday's tech stack	Digital maintenance schedule, static or dynamic/headless content	IoT, health monitoring system (HMS), dynamic/ headless content	IoT, HMS, dynamic/ headless content, AI-supported data analytics

Insight impacts maintenance schedules

The value of proactive maintenance

Both predictive and prescriptive maintenance are types of *proactive* maintenance, which generally allows equipment to run more efficiently and last longer through activities such as lubrication and filter changes or the replacement of failure-causing parts before they fail. Proactive maintenance reduces equipment downtime and the number of failures, resulting in savings in both maintenance and equipment replacement costs.

Until recently, the most common form of proactive maintenance has been time-driven or scheduled preventive maintenance. Under this proactive approach, major maintenance occurs based on predetermined time intervals, which are based on average historical failure rates, engineering estimates or predetermined cycles.

While time-driven maintenance is easy to schedule, it fails to account for unexpected failures and doesn't incorporate the possible benefits of manual or automated condition inspection. As a result, it tends to result in under- or over-maintenance. As a proactive approach to maintenance, it falls short of a true predictive strategy triggered by an assessment of actual equipment condition, i.e. condition-based maintenance (CBM).

Towards a CBM-enabled after-sales experience

Today, IoT and artificial intelligence (AI) technologies are driving the transition to more effective proactive maintenance strategies – either predictive or prescriptive. These technologies enable effective CBM because they can detect or predict when a platform, system or component will start to malfunction or fail, far more effectively and earlier than an operator or service technician.

This early warning capability, combined with AI data analytics, dramatically reduces maintenance hours by avoiding over-maintenance and ensuring that the right tools, spares and skills are available when maintenance is triggered. It means even fewer equipment failures, a corresponding increase in equipment life, and reduced total lifecycle costs.

Pros and cons of maintenance approaches

Corrective maintenance
'Run-to-failure maintenance'

Cons
- High risk of secondary failure
- High downtime
- High cost of spare parts
- Overtime labour
- Safety hazards

Pros
+ No over-maintenance
+ No CBM-related costs

Preventive maintenance
'Fix before it breaks'

Cons
- Repair without faults
- Tendency to over-maintenance
- Repair could cause more harm than good
- Still 'unscheduled' breakdowns

Pros
+ Maintenance performed in a controlled manner
+ Fewer catastrophic failures
+ Greater control over stored parts and costs
+ Reduction of unexpected failures

Predictive maintenance
'If it isn't broken, don't fix it'

Cons
- High investment costs
- Additional skills required

Pros
+ Unexpected breakdowns reduced
+ Parts ordered when needed
+ Maintenance performed when required
+ Equipment life extended

Prescriptive maintenance
'Fix at the right time'

Cons
- High investment costs
- Additional skills required
- Requires a change in philosophy and business model

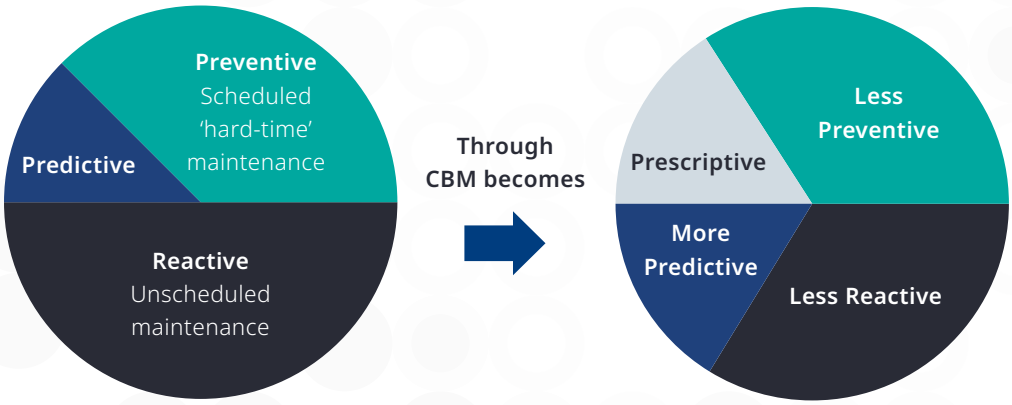
Pros
+ Equipment life extended
+ Reduced downtime
+ Equipment reliability improved
+ Fewer failures

By moving to CBM you can:

- Offer extended warranties that will be cheaper to fulfil if products are properly maintained
- Reduce delayed or missed service intervals
- Reduce costs of spare parts management
- Reduce service notifications
- Increase productivity for the customer
- Increase overall value of equipment over time
- Provide the best available product for each customer (revamp, modify or repair)
- Increase customer satisfaction and loyalty by predicting customer needs – saving them money and frustration

CBM leads to smaller overall maintenance requirement

The reality for many field service operations is that they will operate with a mix of approaches, expanding their use of condition-based maintenance to reduce reactive and preventive maintenance over time in favour of more predictive and prescriptive maintenance.



The role of content

Predictive and prescriptive maintenance require investment in a range of Industry 4.0 technologies and a transformation of maintenance processes. But one of the most overlooked determinants of success or failure is whether or not your content architecture is fit for this operational transformation.

Too many equipment manufacturers and maintainers remain rooted in the world of print. Print-based content processes that have worked very effectively for decades are struggling to meet the new demands of a digital world – never mind one where automation, IoT and AI are fast becoming the reality of cutting-edge maintenance.

The existence of a knowledge management platform was shown to be correlated with >50% reduction in mean time to repair

TSIA, 2019 Field Services Technology Stack

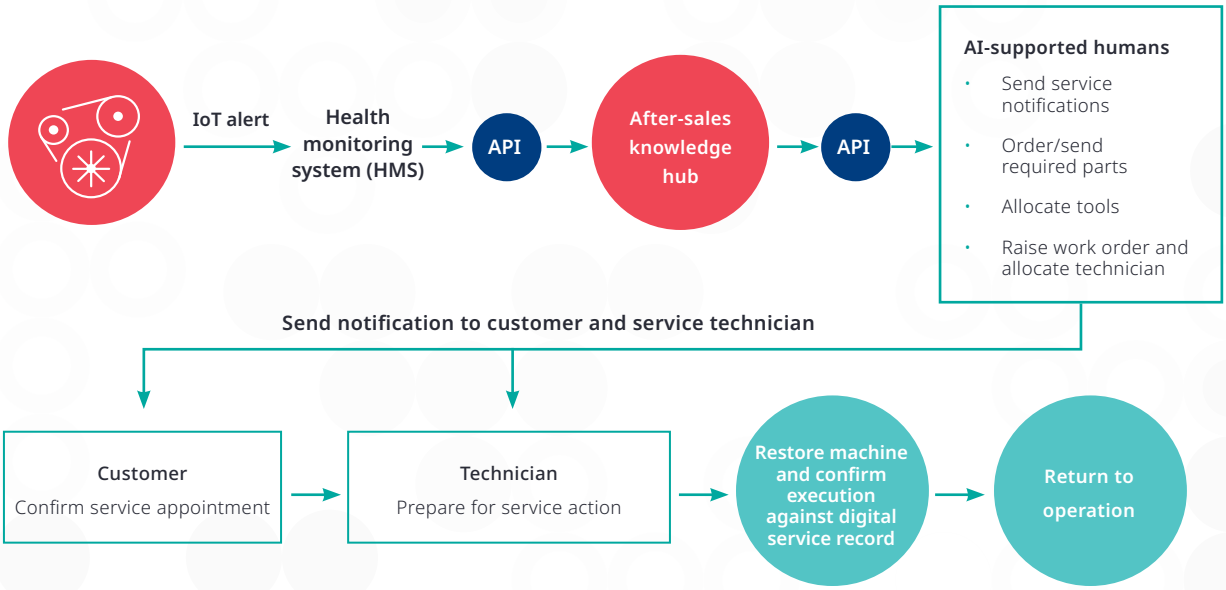
Challenges of an outdated approach to content

- Hard for service technicians to find the detailed information they need, quickly, in large paper-based or PDF manuals that they have to flip through
- No feedback or content interaction between field and after-sales management
- Difficult to deliver content in multiple formats or achieve consistency across channels
- Painful to update content
- Laborious to translate content into multiple languages
- A struggle to cope with the growing volume of content

As the diagram below shows, the more advanced your maintenance process, the more it calls for content systems and structures that are automation- and AI-friendly. But even if you're not ready for predictive or prescriptive maintenance, there are huge benefits to advancing content production and delivery beyond the printed and static digital formats that are typical of maintenance operations today. Any maintenance process, even if it's reactive, can be transformed by reducing the need for 'page-flipping' by service technicians trying to find the information they need in the field.

Chatbots, voice assistants and augmented/virtual reality (AR/VR) applications also offer a more efficient way to support customers and service technicians. But to deploy and use these effectively, you need content that can easily and unambiguously be found and used by machines and humans alike.

CBM-enabled after-sales experience



"By 2025, 50% of field service management deployments will include mobile augmented reality collaboration and knowledge sharing tools – up from less than 10% in 2019."

Future of Field Service, "The 2020 Gartner Magic Quadrant for Field Service Management Paints a Picture of Progress", July 2020

Time to get intelligent with content

How do you deliver content that can transform the experience of service technicians in the field and allow you to take advantage of new interfaces and formats for information presentation?

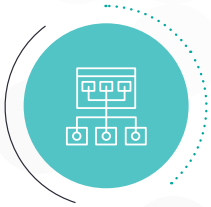
You need a solution that can deliver the right information to the right person or machine – and use the right information from people and machines – at the right moment.

We call this 'intelligent content', and it requires a content platform that gives you:

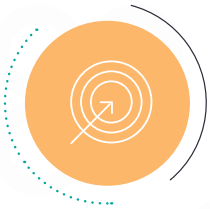
Immediacy
Enables experience and discovery of information on demand each and every time without fail

Integration
Allows you to embed your content processes into maintenance and other support processes

Hyper-personalization
Uses real-time behavioural and other data to create highly contextual experiences that are relevant to the user and machine



Accessibility
Creates ways to access information beyond a single format and delivery channel



Findability
Makes it possible to find precise and exact information at a click (or voice command) which is timely and relevant

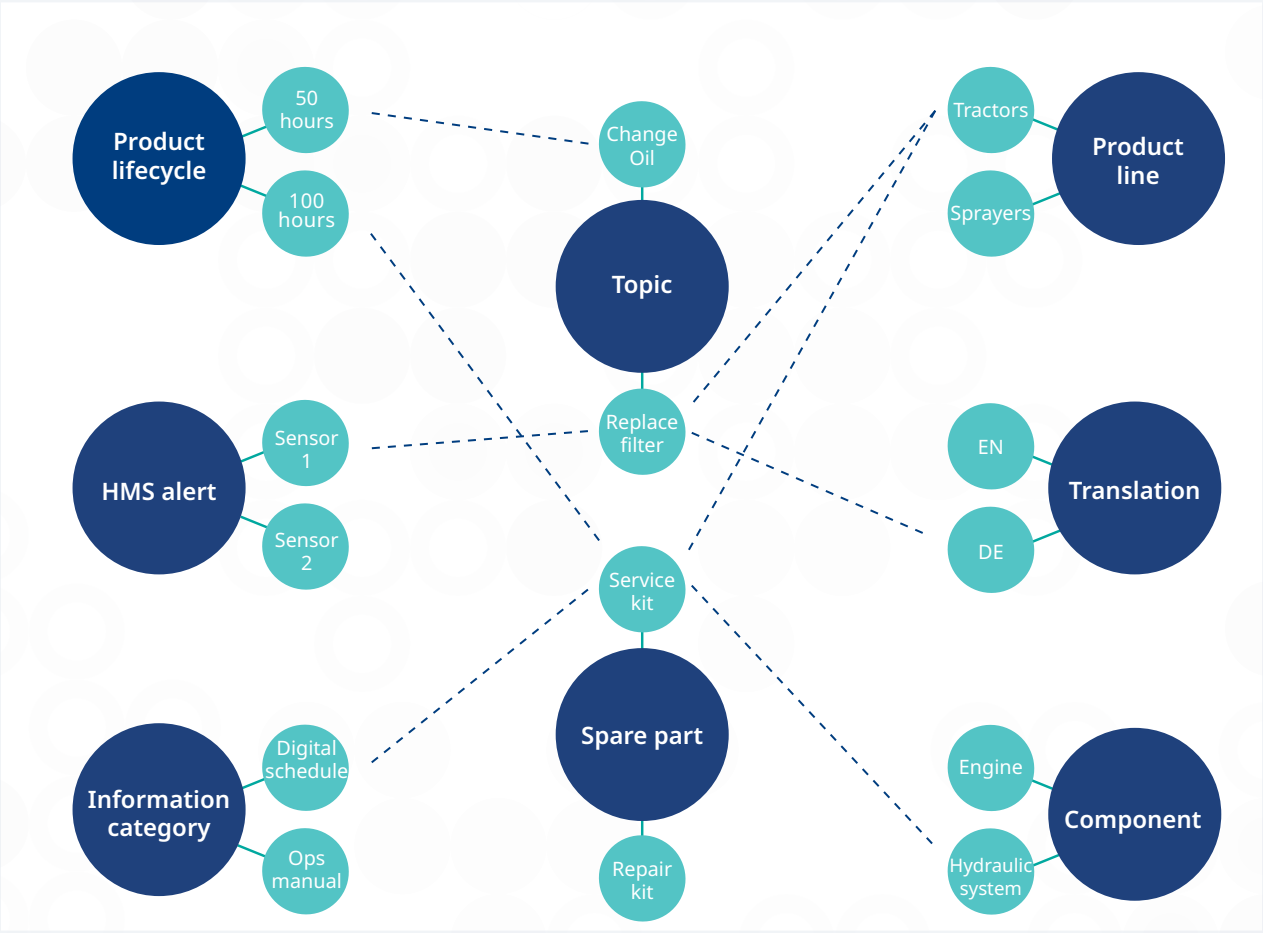
How to create intelligent content

To deliver intelligent content, a content platform must deal with its content in specific ways:

- **Content is written and stored in small chunks rather than as whole pages or documents.** These modular chunks (also known as components or topics) can be combined in different combinations without duplication, so each component is its own 'single source of truth' – thus making it easy to write, reuse and update.
- **Content is also semantically rich.** This means it is tagged with metadata that makes it easy to find, and uses semantic AI to improve content classification and transform search results. Semantic AI combines machine learning with sophisticated knowledge management techniques such as knowledge graphs (see next page).
- **Content is held separately from its output format.** This is known as headless content management and allows you to use the same content in a variety of channels and formats, displayed on a variety of devices, while still maintaining it as a single source of truth.

In other words, if you're looking for an intelligent content platform, look for a headless component content management system (CCMS) with semantic AI capabilities.

Knowledge graphs connect data and content wherever it's held to illustrate and discover semantic relationships



What's a knowledge graph?

Also known as a semantic network, a knowledge graph is a network of objects, concepts, events and other entities, all linked via their relationships to one another.

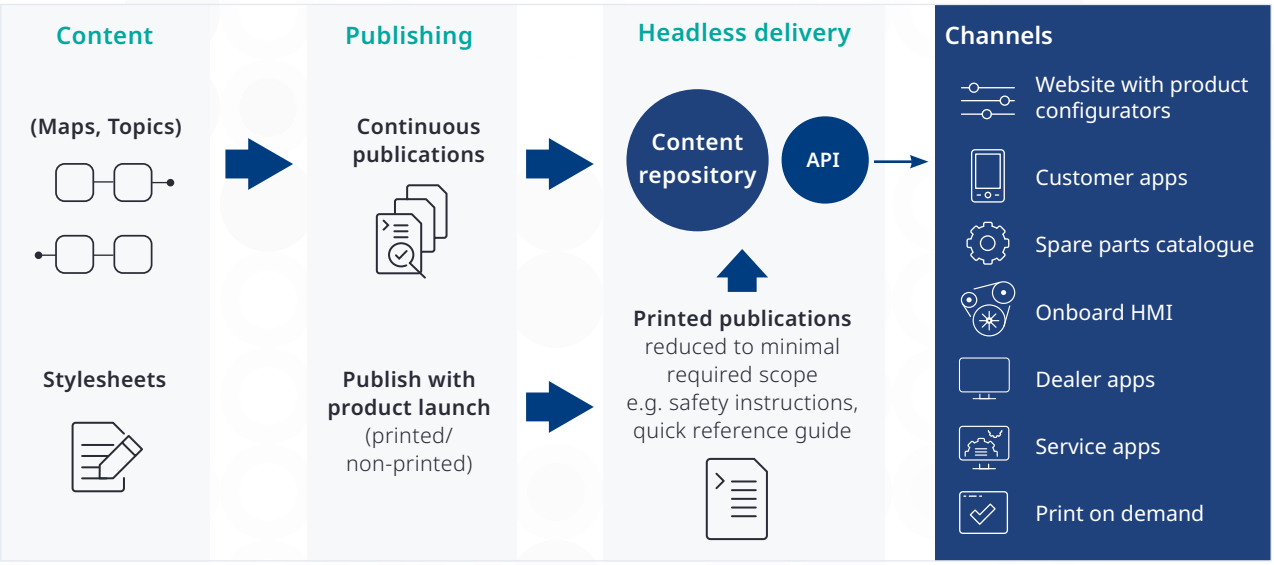
For example, if you take a concept such as 'philosophy', a knowledge graph could link it to people such as 'Plato' and 'Aristotle' via the relationship 'practitioner of', and they in turn would link to 'Ancient Greece' via the relationship 'born in'.

These semantic networks are used to enrich online experiences in many ways – from providing contextual search results to predicting areas of interest.

"Making the transition from conventional data processing environments to knowledge graph is a cultural challenge, not a technical one."

Analysis from the 2021 Knowledge Graph Industry Survey

Headless component content management



In a headless CCMS, content components can be reused and easily updated in multiple places simultaneously – massively reducing the manual burden of having to create new content each time or search for each place the content has been used.

The format-free components are exposed via API and can be pulled together and automatically formatted for the needs of each delivery channel, rather than requiring content creators to create and format deliverables for each channel separately.

A headless CCMS architecture significantly improves agility and efficiency, reduces publication and distribution efforts, and keeps delays to a minimum – all while improving consistency. But it does require a change in approach to content creation. Content is no longer created primarily with a product or feature structure in mind. It needs to be organized, structured, classified and managed in a customer- and technician-centric way.

This change may take time and effort, but once the information types and related stylesheets are understood, the process becomes much simpler and easier for everyone to manage and follow. With an editing experience focused on pure content management, together with semantic AI-powered classification assistance, it's also easier to enrich content with metadata or personalization rules.

Traditional processes are not completely abandoned – a headless CCMS still requires content to be authored and multimedia assets to be uploaded. And content will continue to be validated through approval workflows before its publication – content editors still need functionality such as versioning, simple editing interfaces, and reporting.

All together now

Intelligent content creation should be an organization-wide initiative that breaks down departmental silos to unify content across the organization. Unified intelligent content has several benefits:

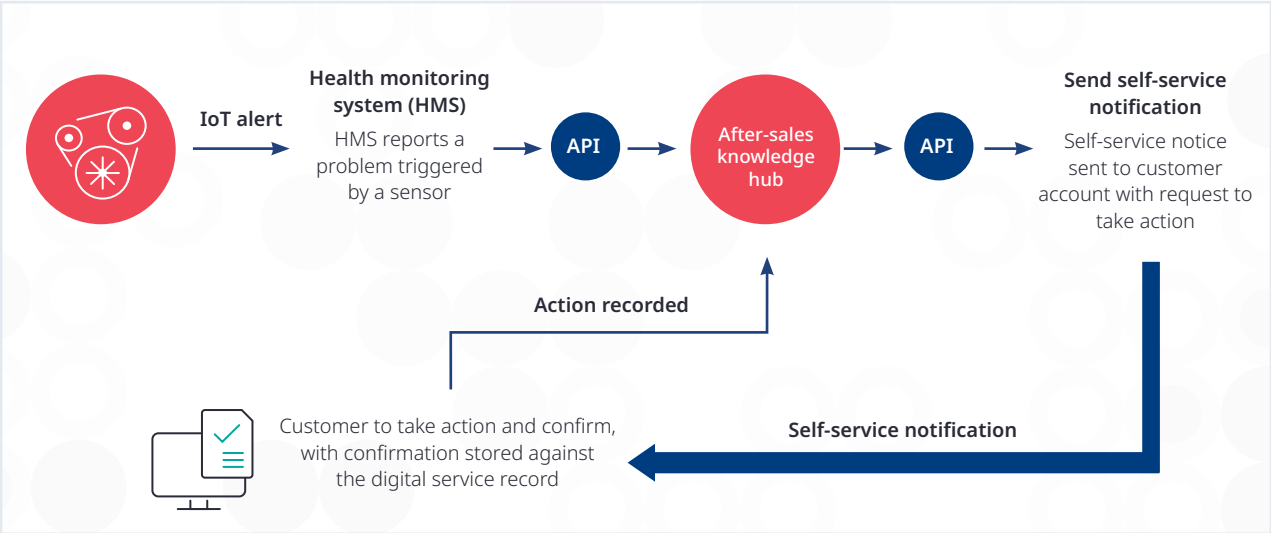
- Cost savings with content reuse
- Information governance with access rights and tracked changes
- Discovery of insights usually hidden away due to departmental silos
- An important source for all service and maintenance interactions

Semantic AI delivers relevant information on demand

By combining knowledge graphs with machine learning, the semantic AI capability of an intelligent content platform allows you to identify the sentiment, intent and subject of a search query made by a service technician (or a customer), and respond with precisely the right information.

Despite often multiple disparate engineering and monitoring systems, it's possible to deliver immediate, relevant and applicable maintenance and repair information to service technicians, or efficiently guide customers to execute regular product maintenance or solve specific problems. As IoT-enabled devices become more commonplace, you can also automate the delivery of guided diagnostics and repair in a customer self-service model. Once action is taken, the customer should be able to record their action in an integrated digital service record.

Outline of an IoT-triggered customer/operator self-service use case



67%

of respondents have yet to incorporate AI into their knowledge management strategy beyond a limited extent

Deloitte Global Human Capital Trends survey, 2020

Making it happen

Intelligent content is just one piece of the puzzle when you need to transform field service operations to meet growing customer expectations. It's helpful to think of this transformation as a journey from a less to a more mature operation.

Initial

- No automation – organization still using paper manuals and work orders.
- Communication with head office and team members is limited to phone or text.

Established

- Lightweight automation – work orders are automated through an ERP or FSM system.
- Documentation is partly digitized, partly paper-based.
- PDFs are in use, but not integrate with FSM/other systems.

Managed

- Full automation – organization manages complete lifecycle of field service jobs through FSM system.
- FSM and knowledge base are integrated for easy retrieval of service documents.
- Use of mobile devices to access content is commonplace.

Optimized

- Industry 4.0 – equipment is monitored by IoT sensors to predict maintenance needs.
- AR/VR is used by technicians for expertise and guidance in the field.
- There's less on-site service, more self-service/remote resolution.

Use this scale to figure out your own organization's field service maturity, and ask yourself how well positioned your current technologies, processes and people are to support you to the next level.

And if you need help taking your next step on the content management part of the journey, talk to us. RWS has deep experience helping manufacturers to roll out intelligent content solutions for their service operations, and our headless CCMS, Tridion Docs, is a leader in the space.

Take your next step

Explore: rws.com/tridion/field-services

Contact: rws.com/tridion/contact

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RWS Holdings plc is a unique, world-leading provider of technology-enabled language, content and intellectual property services. Through content transformation and multilingual data analysis, our unique combination of technology and cultural expertise helps our clients to grow by ensuring they are understood anywhere, in any language.

Our purpose is unlocking global understanding. By combining cultural understanding, client understanding and technical understanding, our services and technology assist our clients to acquire and retain customers, deliver engaging user experiences, maintain compliance and gain actionable insights into their data and content.

Our clients include 90 of the world's top 100 brands, the top 20 pharmaceutical companies and 19 of the top 20 patent filers. Our client base spans Europe, Asia Pacific, and North and South America. We work in the automotive, chemical, financial, legal, medical, pharmaceutical, technology and telecommunications sectors, which we serve from 80+ global locations across five continents.

Founded in 1958, RWS is headquartered in the UK and publicly listed on AIM, the London Stock Exchange regulated market (RWS.L).

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