Knowledge Aware: The Future of Knowledge Management

How an innovative approach to Knowledge Management is poised to deliver unmatched business value with an advanced capability of capturing, activating, and applying knowledge.

Executive Summary

To keep pace with a globalized and digitized economy, Knowledge Management can no longer rely on legacy methods that manage knowledge within documents, people, or models. These traditional knowledge management approaches risk critical failure modes. They disrupt the flow of work and encumber the user with wading through vast stores of knowledge to obtain what is needed. Knowledge Aware is a next generation knowledge management approach that avoids legacy failure modes and leverages technology to deliver knowledge to end-users directly within their flow of work. This whitepaper details the innovative approach to knowledge capture and activation that makes Knowledge Aware a transformative approach for multiple industries. Today's digitized work environments create the imperative and opportunity for Knowledge Aware to streamline organizational learning, increase productivity, and enhance functions across the entire organization.

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Part 1

The Need for Knowledge Management

Organizational knowledge is an asset as valuable and in need of management as any other. With active knowledge management, businesses stand to gain significant benefits, including improved decision-making, increased efficiency, enhanced collaboration, and higher productivity.[i] Additionally, deliberate knowledge management can help eliminate wasteful redundancy and reduce errors.[ii]

The risks of ineffective knowledge management are high. There are process risks like recurring errors, lost time, rework, and inconsistencies. There are human risks of knowledge hoarding, forgetting, missing competencies, and knowledge waste. And there are relational risks associated with outsourcing, knowledge acquisition, unreliable knowledge, and unsatisfactory communication.[iii]

Given these risks and benefits, it is crucial that organizations have strategies and tools designed to optimize knowledge management.

The Most Pressing Knowledge Management Needs

Nearly half of technical managers make knowledge capture, transfer, and re-use a priority in their organization. Direct surveys reveal that knowledge management issues "are particularly urgent in R&D departments and industries such as oil and gas, chemicals, automotive, and aerospace."[iv]

Among the top concerns are:

- Finding the best way to capture knowledge so that it can be retrieved and re-used easily.
- Minimizing the time employees spend sharing and searching for information.
- Ensuring the knowledge available to employees is accurate and up to date.
- Motivating employees to participate in knowledge management and make knowledge re-use a natural, seamless way of performing work.[v]

Effective responses to these concerns must come in the form of tools and technologies specifically designed for today's enterprise knowledge management needs.

Knowledge Management that Fits Today's Work

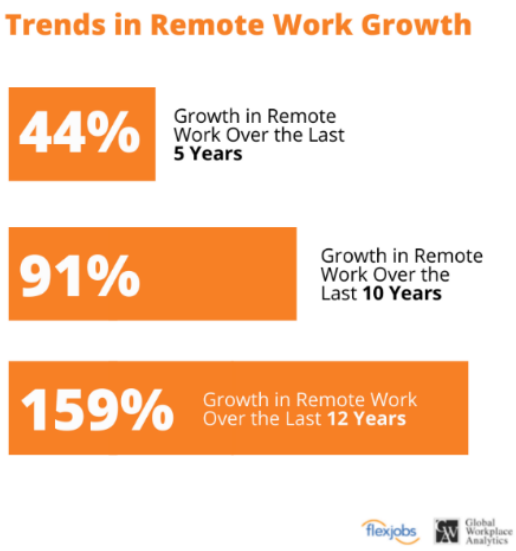


Figure 1: Over the past 12 years, the number of people working remotely has grown greatly.

With today's work being ever more digitized and globalized, the way knowledge is acquired, stored, shared, and activated will continue to be influenced by the latest work trends and developments.

Remote and distributed teams are working with more autonomy

Working remotely has increased 91% in the last decade, and 85% of businesses report that flexible work arrangements have netted increased productivity.[vi] Even on-site employees are exercising location flexibility, with nearly 70% working from home at least once a month. Knowledge management must therefore fit how teams are sharing knowledge remotely—over secure digital channels, asynchronously, independently, and with worker autonomy as a priority.

The abundance of information has dispersed expertise

The vast abundance of information available to anyone with digital access is changing how experts are defined, how knowledge is sought, and where it can be found. Curated knowledge[vii] is highly sought after, and individuals of the digital native generation are no longer filling the role of single-area expert; rather, they are becoming experts in *how to find information* from a variety of sources.[viii] Enterprise knowledge management must understand these expertise shifts while seeking out the right tools to capture, store, and use knowledge.

Expanded awareness of human bias increases our need for diversity

Companies know that confronting conscious and hidden bias is good business practice, reducing losses by up to 25%[ix] and offering high returns for innovation.[x] In a climate that welcomes diversity and prefers decentralizing authority away from a small group at the top of the hierarchy, more people across the organization will be empowered knowledge creators and sharers than ever before. Capturing distributed knowledge will be a central need of next generation knowledge management.

Growth requires a mindset of continuous learning

In an economy experiencing regular digital disruptions, increasing competition, and higher demands, organizations rely on people's natural capacity for continuous learning[xi], as well as data and powerful machine learning tools to show us patterns, behaviors, and blind spots. Knowledge management of the future must focus on human-

centered knowledge capture as well as using data about knowledge to form insights and expand the knowledge base.

Key Principles for Knowledge Management

To meet the knowledge management needs of our evolving work environments, CIMdata, a leader in PLM education, research and strategic management consulting, offers several key guiding principles.[xii]

- Knowledge must be easy to record, review, comprehend, and apply.
- Knowledge should be applied throughout product lifecycles and often viewed comparatively (peer reviews, similar products, field failures, etc.).
- PLM/PDM/ALM systems manage resulting design content throughout a product lifecycle, but institutional knowledge lasts longer than any individual product's lifecycle.
- Knowledge has a lifecycle related to proven practices and technology application.

In addition to these principles, the American Productivity and Quality Center (APQC) outlines several best practices[xiii] with practical applications and real returns on investment. As technical managers choose the tools that will best serve their teams and organizations, they should pay particular attention to practicing the following.

Embed knowledge management into the DNA of organizations

One of the key prerequisites to embedded knowledge management is effortless access to critical knowledge.[xiv] For some organizations, this means delivering information and expertise via multiple channels, from portals and data repositories to lower tech outlets such as bulletin boards. Knowledge can also be built into reusable tools and templates. Such practical applications can reduce costs and cycle times, encourage organic knowledge sharing, and prompt incorporation of existing knowledge into work.

Align knowledge management tools to processes and workflows

Employees' day-to day activities should be guided by a project management framework. Ways to access and contribute knowledge should be integrated into the project steps, putting information and expertise directly in the path of project participants. The same principle applies to all routine processes and workflows.

Use pilots and peer feedback to spread knowledge management approaches

Best-practice organizations test new knowledge management tools and processes through targeted pilots before rolling them out to the broader work force. After the pilot, the organization can capitalize on and magnify aspects that worked particularly well and

correct any early missteps without severely impacting the timetable, credibility, or ultimate implementation. Employee advocates can promote the benefits of knowledge sharing and re-use, provide testimonials, and assist peers.

Keep quality high and make contributions visible

Every successful knowledge management program needs a mechanism to assess the quality of employee contributions and ensure the collected body of knowledge stays accurate and up to date over time. In addition, leading organizations strive to make their knowledge management processes transparent, thereby driving trust and engagement in the tools and making employees feel part of the process and solution. Specifically, employees should have access to knowing:

- What happens to the ideas, best practices, lessons, and other content employees submit;
- How often that content is accessed and used by others; and
- Any feedback from experts or peers on the accuracy or usefulness of the content.

Successful enterprises know that solving some of the most pressing problems depends on how well knowledge is managed and used to execute strategy, grow, and remain flexible. However, legacy knowledge management approaches, methods, and tools no longer adequately support today's digital and global work needs.

Part 2

Why Legacy Approaches Are Not Keeping Up with Today's Needs

There are three traditional methods of knowledge management, all of which have valid use cases and benefits. However, the document-centered, people-centered, and model-centered approaches leave organizations with major gaps when it comes to sharing knowledge with consistency, reliability, and immediate potential for re-use.

Ultimately, these three legacy approaches utilize an outdated 'repository' mindset that does not leverage available technology. Moreover, they put organizations at risk for multiple kinds of knowledge capture, transfer, and application failures.[xv]

Why the Document-Centered Approach Fails the Knowledge Seeker

Capturing knowledge in documents is the most common method across organizations. Experts typically transfer their knowledge onto the page, and those documents get stored and made searchable. End-users then sift through this library of information hoping to find what they need.

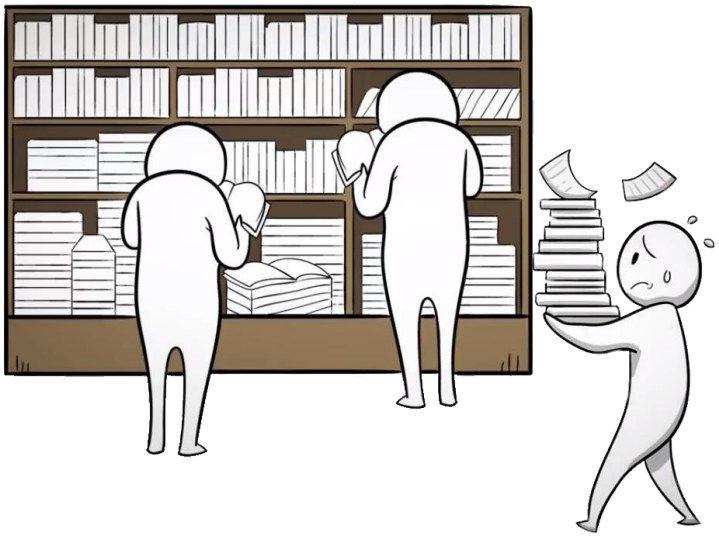


Figure 2: The Document-Centric approach requires searching through document repositories to find the next step in the process or technical know-how.

While a document-centered approach is simple for the organization to establish—requiring no new technologies or changes in their approach to knowledge management—it comes with significant risks and modes of failure.

- Even the best search engine and most thorough knowledge library risks crucial information not being found.

- Documents can quickly become out-of-date, leaving erroneous or incomplete information to be found by end-users.

- A document-centered system does not provide method or incentive to capture and contribute new knowledge.

- Subject matter experts are not expert documenters and have inconsistent skill levels when it comes to capturing knowledge that is thorough, concise, easy to understand, and ready to use.

The failures of a document-centric approach result in the decay of users' trust in the system. Documents provide less value to end-users, and ultimately, the crucial knowledge contained underserves the organization.

Why the People-Centric Approach Carries High Human Failure Risks

When individuals are the knowledge repositories, end-users enjoy a direct, efficient, and tailored system of knowledge transfer, with ease of follow-up for clarifications and queries. However, a system that stores knowledge in people risks failures due to human circumstances, limitations, and changes.

- Knowledge is accessible only at limited times, due to human time constraints, which leads to conflicts among multiple end-users trying to access the same individual.

- Knowledge is more likely to be subject to human biases during decision-making.

- Knowledge is subject to transient decay—the loss of knowledge due to lack of recall, memory failure, and simple human error.

- Knowledge is lost when individuals leave the organization with their expertise, institutional memory, experience, and end-user trust.

- Knowledge is subject to individuals' idiosyncrasies and personal preferences, which can include social reticence—the unwillingness or unreadiness to share knowledge.

Without a durable system of knowledge management, organizational knowledge remains subject to individual preferences, flaws, and movements, putting knowledge at risk to be lost, made scarce, or subjectively influenced.

Why the Model-Centric Approach Fails to Offer a Comprehensive Solution

Engineering, financial, or process models can help overcome some of the problems of the people-centric and document-centric systems, namely by providing better access and more actionable knowledge that is maintained within the flow of work. However, models are subject to their own failures, largely due to their complexity.

- Creating models is time-consuming and requires complex, non-domain expertise.
- Because models aggregate a wide array of expert knowledge, updating them requires the coordinated and lengthy participation from multiple experts.
- Data from models must be translated into accessible and usable information before they begin providing organizational value.
- Because models require their own structure of knowledge, they create the need for their own repository, thereby not allowing for a single, streamlined knowledge management system.

While models can be an effective way of delivering knowledge to end-users, this approach tends to be limited in where it can be used, difficult to create, and expensive to maintain.

It is clear from these legacy failures that organizations need a knowledge management system that preserves the benefits of documents, people, and models while eliminating their pitfalls and risks. Overtime, organizations have come to accept the consequences of poor knowledge management. Requisite alarm is not sounded when organizations experience recurring errors, redundancy, and inability to improve.

To consider options for an innovative knowledge management solution, enterprise needs must be kept in mind.

Enterprise end-users need knowledge that is:

- Trusted, up to date, and accurate.
- Preserved and shared widely.
- Actionable and readied for re-use.
- Available within the flow of work.

Part 3

Introducing Knowledge Aware

The modern organization requires a fundamentally new approach to knowledge management, beyond an incremental improvement to legacy systems.

> ***Knowledge Aware is a comprehensive approach to continuously collect, deliver, and actively apply trusted knowledge within the flow of work.***

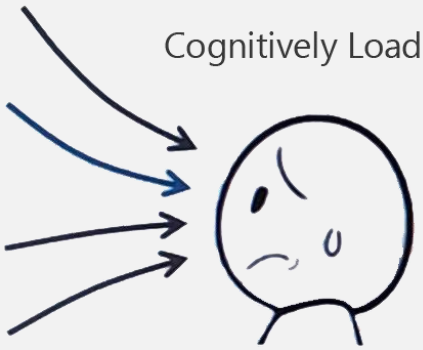
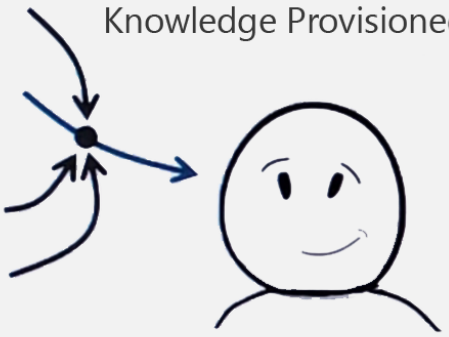
A new approach, called Knowledge Aware, redefines captured knowledge from a passive reference asset into an active influencer integrated into the flow of work.[xvi] As an approach to knowledge management, this innovative paradigm makes processes "aware" of and able to react with the continuously evolving, enterprise-wide knowledge base.

Understanding the Transformative Power of Knowledge Aware

The most coherent way to illustrate how Knowledge Aware transforms knowledge and its uses is the analogy of the evolution from 'paper maps' to GPS navigation:

> *Paper maps, the legacy system of navigation, offer the end-user a static presentation of all navigational possibilities. It is then up to the end-user to chart a route, follow it step-by-step, and react to inconsistencies along the way. GPS navigation, however, transforms all the information on a map into information specific to the end-user's particular route. Importantly, this information is provisioned precisely and only when it is needed.*

Several key differences that affect usability and durability of knowledge become clear when comparing paper maps and GPS navigation:

Paper Map	GPS Navigation
	
Displays all possible roads and turns at once regardless of where the end-user is located.	Provisions only roads and turns that are relevant to the end-user's route and the end-user's current position.
The map is 'static' and does not update as roads change.	Map information is updated as roads change.
Static maps do not display current conditions nor produce useful insights and can often require immediate re-assessment and time off task.	The system collects and learns from driver data, producing valuable insights including traffic, accurate estimated time of arrival, temporary closures, etc.

The Knowledge Aware system transforms knowledge management in the same way GPS navigation has transformed paper map usage. Static document repositories of knowledge require end-users to filter, perform synthesis, and discern value. This cumbersome approach is replaced with an integrated method, where knowledge is provisioned to the end-user precisely as it is needed for optimal re-use based on the end-user's specific context.

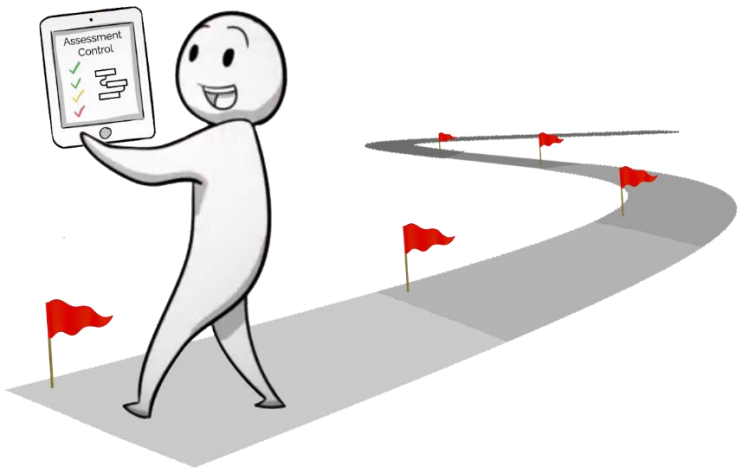


Figure 3: The Knowledge Aware approach provides only the precise knowledge needed, when it is needed, to help end-users work efficiently and make well informed decisions.

To achieve this vision, Knowledge Aware introduces two important new technologies: The Knowledge Packet and Assessment Control.

Knowledge Packets Ready Knowledge for Re-Use

In the same way that GPS navigation distills an entire map into curated, granular, and modular navigational units, the Knowledge Aware approach distills repositories of documents and tacit knowledge residing in expert's heads into bite-sized and ready-to-use units called **Knowledge Packets**.

Knowledge Packets are structured, granular units of retained know-how; purpose-built to efficiently capture, share, re-use, and provision knowledge.

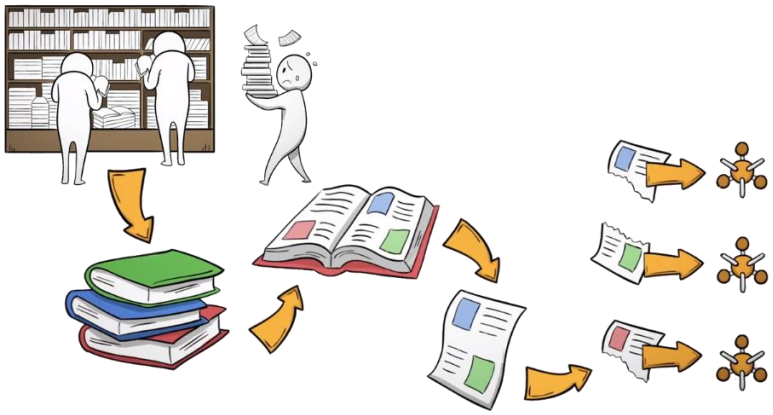


Figure 4: Knowledge Packets replace the document form of knowledge capture.

Knowledge Packets ensure that knowledge made available to the end-user is **granular**, **modular**, and **actionable**. Knowledge represented at a consistent level of granularity ensures knowledge can be efficiently and accurately applied. Modularity ensures that Knowledge Packets interact, connect, or share interfaces, reducing complexity and redundancy of knowledge. Actionable Knowledge Packets, that are free from distracting, extraneous information, ensure that end-users receive only that which can be applied. Granular, modular, and actionable knowledge ensures that knowledge is readied for re-use.

Collectively these three primary characteristics of Knowledge Packets both simplify the process of collecting and updating knowledge, as well as make knowledge uniformly easier to understand and apply.

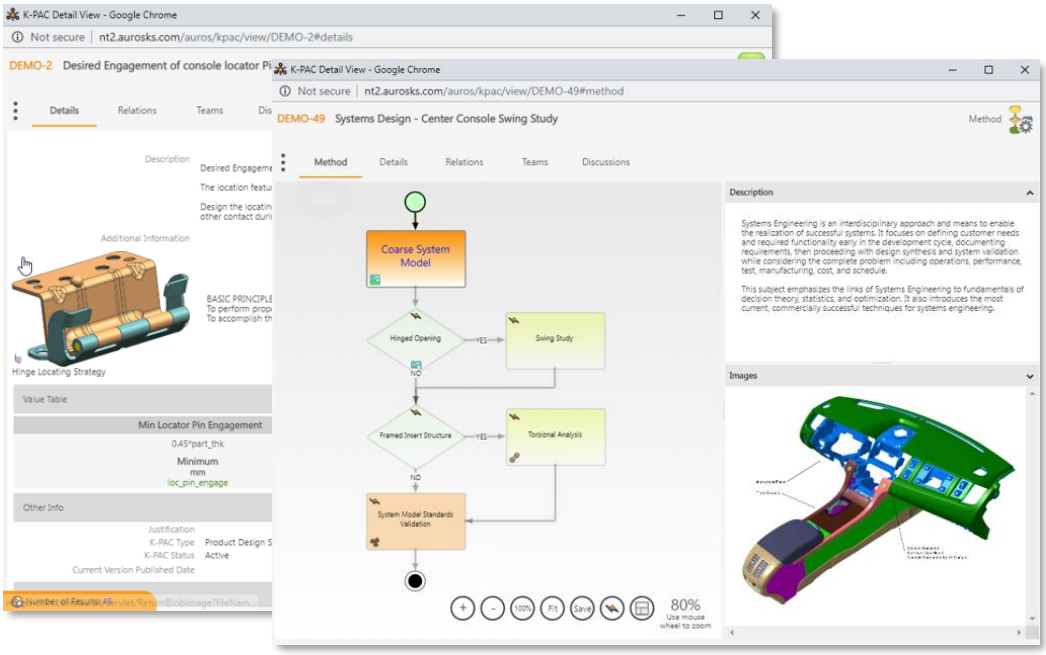


Figure 5: Examples of Knowledge Packets (K-PACs).

Assessment Controls Activate Knowledge within the Flow of Work

The navigation app takes in context from GPS and helps the end-user to apply specifically provisioned map information while navigating. Similarly, the Knowledge Aware approach takes in project context from the flow of work and helps the end-user to apply specifically provisioned Knowledge Packet with a tool called an **Assessment Control**.

The Assessment Control is a comprehensive tool set used to efficiently provision, apply, and track collections of Knowledge Packets within the flow of work.

The Assessment Control accomplishes three critical functions in the Knowledge Aware process.

First, the Assessment Control intelligently retrieves and provisions Knowledge Packets based on a end-user's unique workflow, alleviating the time consuming need for end-users to stop and search for knowledge. Only the precise collection of Knowledge Packets are delivered to the end-user as they are needed.

Second, the Assessment Control assists the end-user in applying knowledge, communicating status, and solving problems. The Assessment Control connects the

end-user to past applications of the specific Knowledge Packet, allowing the end-user to directly benefit from past experiences.

Thirdly, the Assessment Control continuously collects data as Knowledge Packets get re-used and applied. This data is critical in creating insights, seeding learning processes, and assisting Artificial Intelligence (AI) techniques that bolster decision making capability. Organizations can learn from collected data like how Knowledge Packets are used, how frequently, for what duration, whether they are bypassed or dismissed, what options are chosen and how often, and under what condition steps get missed. By using this data, valuable closed-loop learning is achieved.

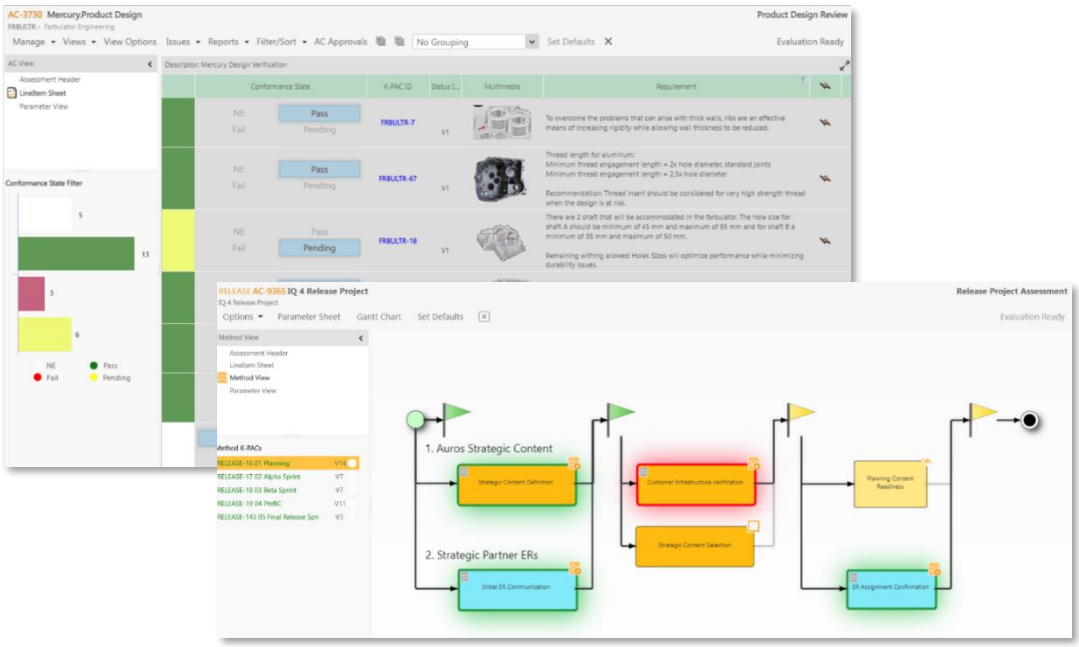


Figure 6: Examples of Assessment Controls (ACs).

An example of how Knowledge Aware impacts a design team

Consider the following example of a design team, whose success depends on the flow of knowledge from multiple experts across different domains. A design team must optimize a wide variety of needs and constraints during the flow of work. With Knowledge Aware, these needs and constraints are provisioned to the design team as Knowledge Packets based on context such as project phase and project type. Each Knowledge Packet contains knowledge useful to the design team in making informed decisions and avoiding mistakes. Importantly, the provisioning is precise and timely, similar to the provisioning of map tiles in the navigation app.

The Assessment Control binds the provisioned Knowledge Packets into a collection and assists the design team in evaluating, applying, and tracking the Knowledge Packets within the flow of work. Where digital systems like CAD drive the flow of work, the

Assessment Control can be used to automate Knowledge Packet evaluation and validation of design.

When the design team encounters a tradeoff, inconsistency, or problem, the Assessment Control efficiently connects the team to other contexts that faced a similar issue. This important connection can be made because of the systematic and granular way the Knowledge Aware approach captures and applies knowledge uniformly across all teams and domains.

Knowledge Aware allows the design team to continuously receive expertise across multiple domains. The design team can then visualize, optimize, and communicate design considerations across projects and stakeholders in a single unified process.

Knowledge Aware Creates a Culture of Knowledge Capture

Legacy systems of managing knowledge typically fail at capturing and keeping knowledge up to date. The Knowledge Aware approach resolves this problem by creating a direct incentive for both knowledge re-use and for knowledge contribution. When effective use and benefits are recognized across the organization, participation and continued learning increase organically within a virtuous cycle:

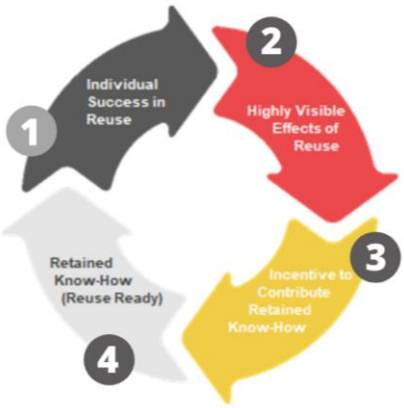


Figure 7: The Virtuous Cycle of the Knowledge Aware approach.

1. Quantifiable and visible end-user success in knowledge re-use
   Leads to…
2. Organizational support and trust
   Leads to…
3. Increased individual and team-based incentive to contribute new learnings
   Leads to…
4. New and refined knowledge readied for re-use
   Leads back to individual end-user success…

The result is a virtuous cycle that causes the knowledge base to grow and improve over time. Legacy repositories of document-based knowledge tend to experience the inverse of the virtuous cycle; where poor end-user experience leads to lack of trust and eventually leads to neglect and decay of the knowledge base.

Applications and Uses of Knowledge Aware

As an enterprise solution, Knowledge Aware unifies distinct silos by serving as a common communication method, provisioning knowledge directly to the project, and applying knowledge to project changes to mitigate risk and improve performance. CIMdata concludes that Knowledge Aware "offers an appealing choice for any discrete manufacturing company who has the need to capture and proactively apply knowledge. Application is especially valuable in companies that produce similar products in parallel, year after year."[xvii]

Specifically, the Knowledge Aware approach works best where:

The omission of knowledge is painful

Anywhere an organization deploys a checklist to prevent knowledge loss and ensure individuals and teams have encountered every consideration, constraint, standard, point of view, or procedure within a complicated process.

> *Examples: checklists, lessons learned, best practices, design review, engineering sign-off.*

Uniformity or standardized work is crucial

Anywhere people or teams need to perform similar work, share and adhere to best practices, or maintain consistency across time, geography, or projects.

> *Examples: business and project templates, standard procedures, standard work, work instructions.*

Key decisions require documentation and/or traceability

Anywhere that actions need to be available for audit, verification, or receipt.

> *Examples: compliance, audit or confirmation processes, any key decisions legally requiring documentation.*

Conclusion

Without an effective and efficient method of managing knowledge, organizations risk repeating past mistakes and wasting time. The Knowledge Aware approach formalizes the capture of essential knowledge, breaks it down into modular bite-sized pieces readied for re-use, and delivers these pieces when and where they are needed. The Knowledge Aware approach gathers data about knowledge re-use and uses that data to reveal insights and create closed-loop learning. As a result, technical decision-making, efficiency, and effectiveness are positively influenced - saving the organization resources and time.

Whitepaper Supplements

1. Knowledge Aware Benefits
2. Knowledge Aware Ten Tenets
3. Knowledge Aware and Digital Environment
4. Why your organization will create and manage Knowledge Packets
5. Knowledge Aware Learning Cycles
6. Knowledge Aware Requirements
7. Knowledge Flows Model
8. Knowledge Aware Maturity Model

About Auros Knowledge Systems

Auros Knowledge Systems is the developer and leader in providing Knowledge Aware software and services. Our enterprise solution is a fundamentally new approach to managing technical knowledge, with applications in manufacturing engineering, plant operations, product development, project management, supplier quality, and quality. Auros Knowledge Systems is the knowledge management system of choice for over 36,000 users in globally recognized organizations.

For more information about Auros Knowledge Systems, visit AurosKS.com or follow Auros on social media.

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