

A man wearing a white hard hat and a blue plaid shirt is looking at a tablet in a factory. The background shows industrial machinery and equipment.

DOZUKI

The Future of Quality Management in Industry 4.0

How digital tools can help break down silos of ownership to focus on the intersection of people, processes, and technology.



Executive Summary

Quality management is going through rapid changes brought on by new digital tools and the industrial internet of things (IIoT). Large corporations have identified digital transformation as a primary strategic directive due to rapid technical advancements, but executives and quality professionals have been left wondering how these transformations will impact the future of quality management.

Throughout the history of quality, producers of goods have recognized that quality is about serving the customer and putting people first.

Now more than ever, manufacturers must recognize that the future of quality will become a balancing act between the advantages of new technology and cultivating the human-centric processes that make businesses successful.

By transforming standardization, integrating data analytics with human insights, and improving training methods—proactive companies will be able to approach the future of quality management with confidence.

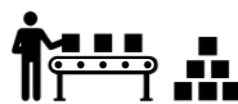
The future of quality and Industry 4.0 focuses on the intersection of people, processes, and technology.

A key advantage here is the defragmentation of siloed systems, which prevent multi-disciplinary ownership of quality and its impacts.

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Challenges for Quality Management in Industry 4.0

The most common sources of quality issues are still caused by preventable errors.



Challenges for Quality Management in Industry 4.0

When considering the growing list of technology available to manufacturers, managing quality in the era of Industry 4.0 can be daunting.

The world of quality control and management faces a unique set of challenges in this digital age; one that will allow companies to improve communication, knowledge sharing, data insights, and more. Despite advances in technology, the most common sources of quality issues are still caused by preventable errors.

85% of quality issues are caused by worker errors

Identifying Areas for Improvement

While manufacturing and other industries have seen progress in reducing quality issues, there is still plenty of opportunity for growth. In fact, 84% of executives say that digital transformation is crucial to their corporate strategy for improvement, yet only 3% are considered digital leaders in their industries. Many companies have begun the journey to digital transformation but lack coherence between strategies, tools, and companywide adoption.

Lack of Standardization

Quality relies on standardization in order to reduce defects and provide a baseline for improvements. Many companies practicing some aspects of Lean still don't properly document Standard Work. This lack of foundation is preventing companies from using new data insights to make lasting improvements.

Challenges for Quality Management in Industry 4.0

Reliance on Subjective Information

80% of manufacturers rely on employee observations to report quality issues. This reliance on hard to capture anecdotes makes it difficult to improve production. When feedback is gathered without structure and without connection to the location of the issue, it is nearly impossible to act upon and usually reported too late. Additionally, 55% of manufacturers only know about problems after they happen; due to limited real-time data.

Worker Errors

85% of quality issues are caused by worker errors. This means that either lack of procedural adherence or poor training are still where most quality issues originate.

Lack of Cultural Acceptance

Digital transformation hogs industry headlines these days, yet many companies are reluctant or even unwilling to change their ways. While 90 percent of manufacturers regard adopting new digital industrial technologies as a way to improve productivity, only 23% see opportunities to use these advances to build new revenue streams and cut costs.

Digital tools present tremendous opportunity for organizations. Companies will need to evaluate traditional QMS strategies and align them with future of Quality and Industry 4.0 — this comprehensive overview will provide a roadmap for companies to adapt and thrive in this new, technology-driven future.

84% of executives consider digital transformation as crucial to their strategy, yet *only* **3%** are considered digital leaders

A Brief History of Quality

Learning from the lessons of the past to gain insight into future digital transformation strategies.



A Brief History of Quality

Without an understanding of history of quality management, companies risk losing out on hard-learned lessons and insights from the past. This also places manufacturers in the proper context to understand how quality management will evolve alongside technology; giving insight into digital transformation strategies.

Craft Production and Mass Manufacturing

Up until the early 19th century, quality management took the form of unique symbols or stamps given by specialized guilds of craftsmen that developed strict standards for product quality. When a guild's stamp developed good reputations over time, the mark served as an indication of quality goods.

Craft production was soon replaced by mass manufacturing, which added efficiency and scalability. With this new scale of production, statistical methods were introduced to measure and analyze quality.

Standardization became increasingly important when the U.S. entered WWII and began manufacturing large amounts of armory. Parts and weapons needed to work reliably and consistently with each other, even if they were manufactured in a different place. As a result, quality standards needed to be effectively communicated and enforced.

A Brief History of Quality

Statistical Quality Control (SQC)

In the wake of WWII, Japan couldn't compete with the large manufacturers of the United States, so they began implementing statistical analysis tools, brought forward by W. Edwards Deming, to become the world's foremost producer of high-quality products. Statistical quality control (SQC) tools allowed Japanese businesses to better understand root causes and improve quality in all aspects of business.

By focusing on quality throughout the organization, companies like Toyota saw a reduction in operations costs while simultaneously improving product quality. More importantly, by putting quality first, Japanese companies saw that customer loyalty and trust rose—proving that quality mattered to consumers.

Total Quality Management (TQM)

As Japan's quality reputation spread, they took market share away from American companies. The U.S. response to rising competition was Total Quality Management (TQM).

TQM incorporated the same statistical analysis and wholistic approach to quality that Japan had already been pursuing. Rather than using quality control charts, or statistical analysis tools as individual solutions, TQM encompassed a broader approach that made quality a part of an organization's strategic goals.



Quality Leader Spotlight

W. Edwards Deming (1900-1993)

Deming pioneered statistical quality control (SQC) and is considered the father of quality management. His ideas were first adopted in Japan and more widely adopted in the west as a part of the “Total Quality Management” methodology.

Deming’s Core Concepts:

- Constantly improve the system of production and service.
- Institute modern methods of supervision and training.
- Break down barriers between staff areas.
- Remove barriers that hinder the hourly worker.
- Institute a vigorous program of education and training.

“If you can’t describe what you’re doing as a process, you don’t know what you’re doing.”



A Brief History of Quality

International Organization of Standards (ISO)

Similar to the standardization efforts made during wartime production, the global economy also required standardization in order to provide consumers with safe and reliable goods.

In 1987 the International Organization of Standards (ISO) released the first series of global quality standards. Now widely adopted as the prominent quality standards, ISO certification is the modern equivalent of the aforementioned guild stamps; showing customers that quality matters

Quality Management Systems (QMS)

While the principles behind TQM and SQC are still relevant, total quality management has been redefined and lives within the quality management systems (QMS) of today. These sets of documented process help companies create quality products, minimize mistakes, and produce goods efficiently. QMS also allows companies outside of the manufacturing industry to realize the benefits of quality improvement.



The Benefits of QMS: It's About People

“Quality means doing it right when no one is looking.”

- Henry Ford



The Benefits of QMS: It's About People

The benefits of quality improvement have a rich history, but underpinning these advantages are the human processes. People and company culture have an integral role in quality management, because improving quality requires someone to care about the finished product; employees need to be invested in the success and goals of the organization.

Quality means meeting both the customer's and organization's requirements at the same time. Yet balancing these two fundamental needs can be challenging for even the best organizations.

American Society for Quality (ASQ) Defined Benefits of a QMS

Meet the Customer's Requirements

This helps to instill confidence in the organization, leading to more customers, more sales, and more repeat business.

Meet the Organization's Requirements

This ensures compliance with regulations and provision of products and services in the most cost- and resource-efficient manner, creating room for expansion, growth, and profit.

The Benefits of QMS: It's About People

People Control vs. Process Control

Losing sight of the human element of quality management can cause companies to have an unbalanced approach to quality control. Often times, focusing too much on the human error that leads to a mistake or defect, rather than identifying individual mistakes or operator errors as root causes.

Quality is truly improved by analyzing the underlying process and conditions that allowed for the mistakes to occur in the first place.

A Chance to Do a Good Job

Deming once said, “Knowing you did a good job and a chance to do it; that’s all people really want.” Emphasizing that the fundamental desires of any worker are the same, the chance to master and accomplish a task to the best of their ability. Deming understood that people have good intentions — quality management is about using the proper tools and analysis to let those intentions thrive.



CASE STUDY:

The Ford Pinto

An infamous story from the Ford Motor Company reminds us how easily quality can be sacrificed.

From Basic Black to Black Marks

This ambitious objective and tight deadline, meant that management signed off on unperformed safety checks to expedite development. It was later revealed that these rushed signoffs resulted in one major design flaw — the car could ignite upon impact.

This major flaw ultimately lead to an estimated 200 deaths and numerous lawsuits. Decades later, it remains a black mark on Ford's reputation.

It's easy to criticize the mistakes of a company from the outside. Like many American companies at the time, Ford incorrectly assumed that the success of their foreign competitors was due to competitive pricing. As a result, they prioritized an unrealistic goal that compromised the quality of customer requirements in order to meet internal demands.

Ford's concept of quality became too narrow and they lost sight of the simple fact that quality is about people — employees and customers.

Quality Management and Industry 4.0

The future of quality and Industry 4.0 focuses on the intersection of people, processes, and technology. Breaking down siloed systems, which prevent multi-disciplinary ownership of quality and its impacts.



Quality Management and Industry 4.0

Quality improvement and risk management are two sides of the same coin. Improving quality reduces risk, however, the act of improving or changing a process can carry its own risks. Organizations should be challenged to assess both, opportunities and risks, associated with improvement efforts. Evaluating a QMS and adapting to technological advancements requires a thoughtful and strategic approach.

Digital tools and advanced technologies are constantly creating new opportunities for manufacturers to improve efficiency and communication. Often described as “the next industrial revolution,” Industry 4.0 encompasses production environments where hardware and technology are connected to create complex and efficient systems that communicate with each other to correct errors, adapt, and improve.

“Business culture loves the idea of revolutionary, immediate change. But turnaround efforts often fail because radical change sets off our brain’s fear response and shuts down our powers to think clearly and creatively.”

Dr. Robert Maurer
Author, *The Spirit of Kaizen*

An Evolution, Not a Revolution

When smart technology and the industrial internet of things (IIoT) emerged, many people thought that digital transformation would revolutionize the industry. However, with time it’s become clear that these advances are a process of evolution, not a quick revolution.

IIoT is often portrayed as a replacement for legacy technology and methods, but it’s real application isn’t as radical as the “rip-and-replace” strategy that’s often presented. Rather, through small, incremental upgrades companies can sustainably improve quality and processes.

This staged approach helps make the transformation to Industry 4.0 more approachable and much less daunting. By outlining a path of intentional and systematic implementation, employees of all levels have an easier time adjusting to change, allowing them to continue to focus on upholding the culture of quality.

Quality Management and Industry 4.0

The Future of QMS in Industry 4.0

With the digital advancements that Industry 4.0 provides, implementing and prioritizing a QMS has never been easier. Modern technology has made communication more streamlined and accessible than ever, while automation has presented unprecedented opportunities for data collection and efficiency. By embracing these new tools, manufacturers have an opportunity to significantly reduce their quality costs.

The future of quality and Industry 4.0 focuses on the intersection of people, processes, and technology. A key advantage here is the defragmentation of previously siloed systems, which prevented multi-disciplinary ownership of quality and its impacts.

People

Culture

Technologies help provide insights to cross-functional teams, allowing them an opportunity to connect and view quality initiatives and key culture components.

Leadership

Visibility into quality strategies and progress gives leadership teams the ability to encourage buy-in and instill ownership across all levels—tying quality to high level strategies.

Training

Benchmarking competency and scaling the sharing of knowledge allow companies to reduce 'brain drain' and ensure approved processes are being implemented across the board.

Quality Management and Industry 4.0

Processes

Management Systems

Linking previously silo-ed systems makes adopting quality measures more approachable. Teams no longer focus on only executing quality initiatives, they are also able to provide ideas for improvement.

Compliance

Digital tools create the opportunity to automate compliance and reduce overhead, with having configurable and out-of-the box solutions for validation.

Technology

Connectivity

Tablets, sensors, and moveable workstations enable companies to automatically integrate feedback into other business systems. This breaks down barriers of information across departments, allowing for faster improvements and data-driven decision making.

Data and Analytics

Advanced technologies allow companies to gather real-time metrics to ensure accuracy and transparency. These tools can help prescribe future actions to prevent repeating errors—shifting from reactive to proactive responses.

Collaboration

Gathering feedback from automated tools and employee insights can happen instantly, rather than waiting for scheduled meetings or relying on empty suggestion boxes.

Scalability

Cloud computing allows for controlled reconciliation of best practices, competencies and improvement updates across locations. Not only can this key information grow to almost unlimited size, it can be tracked, updated, and distributed instantly—from anywhere.

4 Ways Digital Tools Improve Quality

Clearly define company needs in order to find the right tool.



4 Ways Digital Tools Improve Quality

With a plethora of tools and technology available, companies need to hold themselves to strict standards when it comes to choosing the right tools to suit their unique needs. Generic tools have generic results. In order to leverage the advantages of digital tools to continuously improve quality, decision makers need to clearly define their needs and thoroughly search for the appropriate solution.

1. Standardization 4.0

In traditional manufacturing environments, standards are manually recorded and updated using either paper binders or clunky spreadsheets and powerpoint presentations. With digital tools, standards can be effortlessly shared and engaged with on a continual basis.

In addition to free-flowing information, this new wave of standardization in Industry 4.0 allows for more precise control over revisions and information access.

The Right Tool

The right digital tool provides consistency and standardization across your organization, while also providing the flexibility to adjust and improve along the way.

2. Infusing Data into Human Processes

Relying on subjective anecdotes or infrequent audits to monitor and improve processes is retroactive and lacks real-time insight. On the other hand, automated data collection and analytics tools lack the knowledge and insight that your experienced employees can provide. By infusing data collection into the human component of processes, operators can record key safety and quality information while completing their work.

The power of data should not overshadow the indispensable human ingenuity that makes businesses thrive.

This change in the way information is recorded and communicated will help operators stay more engaged during their work and provide valuable, real-time insight into the status of processes.

The Right Tool

The right digital tool recognizes that the human aspects of process improvement are essential to create lasting change. The power of data should not overshadow the indispensable human ingenuity that makes businesses thrive.

4 Ways Digital Tools Improve Quality

3. Reducing Errors with Better Training

55% of manufacturers believe that better worker training is the biggest opportunity for decreasing quality costs. Previously limited to paper work instruction and job shadowing, companies can now use digital tools to incorporate visual cues, images, video clips, interactive content, and more.

This provides a more effective way to train and educate employees, while also freeing up resources and improving retention of the material. When combined with standards created using digital tools, companies can also ensure that employees are being trained to the approved methods.

The Right Tool

The right digital tool leverages visuals, incorporates approved standards, and makes content easily accessible in the training environments.

55% of manufacturers believe that better training will decrease quality costs

4. Capturing Improvement Insights

The best insights and innovative improvements happen on the floor, when employees are thinking critically about the processes in progress. Requesting feedback and improvement suggestions is ineffective when done out of context. Digital tools give everyone the ability to provide feedback anywhere their work takes them. Not only is this more efficient, but it allows key insights to be captured in the proper context, instead of a conference room.

Furthermore, the standardization created by digital tools shifts the focus from reducing human errors to improving the underlying process. This cultivates a positive culture of continuous improvement, that doesn't dwell on worker errors or placing blame.

The Right Tool

The right digital tool makes providing feedback easier, reduces friction when communicating changes, and encourages employees to think critically about current processes.

The Dozuki Solution

Improve quality systems through a software designed to connect people, processes, and technology.



The Dozuki Solution

Standardization 4.0

Dozuki brings standardization to Industry 4.0 by standardizing documentation practices quality and process improvement. Our highly visual guides display all processes in a standardized format, allowing users to communicate work instructions, SOPs, training materials, and more. Additionally, Dozuki centralizes procedures on one platform, making it easy to store and search for information.

Infusing Data into Human Processes

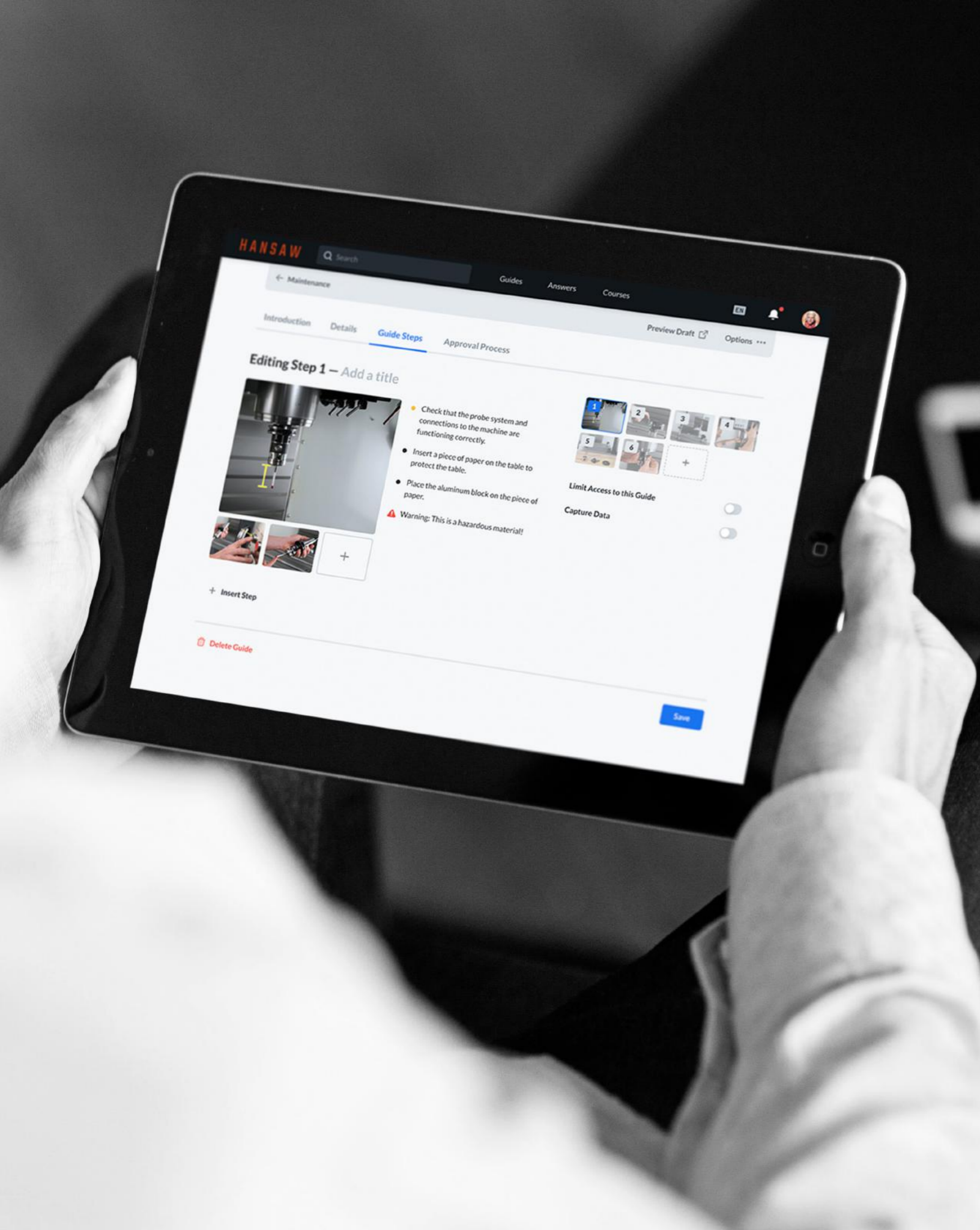
Dozuki uses digital forms to collect key process information directly from operators, such as safety checkpoints or quality audits. Additional data—cycle time, build status, and more—can be viewed on real-time dashboards or exported.

Reducing Errors with Better Training

Our standardized visual format reinforces knowledge retention and makes learning new methods more efficient. Courses allow companies to automate training and retraining, making it easy to know who is trained to the current standard.

Capturing Improvement Insights

Dozuki offers users the ability to provide process feedback via integrated comments. Users can tag authors or have an open dialogue with others to communicate suggestions directly within procedures. Authors and engineers can then take this feedback and apply the appropriate changes, all within the same system.



About Dozuki

Our software platform helps companies achieve quality goals through increased accessibility, intuitive control, and better communication.

With increased control and a visual-first format, our standardized formatting has helped customers reduce the cost of mistakes by 40%, reduce training time by 90%, and reduce authoring time by 57%.

Hundreds of businesses leverage the Dozuki platform to implement standardized work instructions and transform their manufacturing operations, with a strong focus on employee performance.

Learn more about how Dozuki can help your business at dozuki.com

Resources

“History of Quality.” American Society for Quality, <http://asq.org/learn-about-quality/history-of-quality/overview/overview.html>

Maurer, Robert. The Spirit of Kaizen. McGraw-Hill Education, 2012

“Pioneers of Project Management: Deming vs Juran vs Crosby.” SimpliLearn, 2018, <https://www.simplilearn.com/deming-vs-juran-vs-crosbycomparison-article>

“SAP Digital Transformation Executive Study: 4 Ways Leaders Set Themselves Apart.” SAP and Oxford Economics, 2017

“Strategy, not Technology, Drives Digital Transformation.” MIT Sloan Management Review, 2015

“Visibility in Manufacturing: The 2014 Smart Manufacturing Technologies Survey.” Ubisense, 2014

“W. Edwards Deming.” American Society for Quality, <https://asq.org/about-asq/honorary-members/deming>

“Winning with the Industrial Internet of Things.” Accenture, 2018, <https://www.accenture.com/us-en/insight-industrial-internet-of-things>