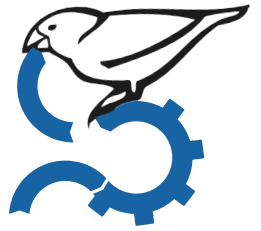


Why Industry 4.0 & the Smart Factory needs Documentation 4.0



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WHITE PAPER

Innovation in manufacturing needs to be matched by equal innovation in content and document creation and publication.

In 2023 we find ourselves in the midst of the 4th industrial revolution.

< Industry 1.0 (18th Century) >

James Watt (1736-1819), a Scottish inventor, helped kick-start the first Industrial Revolution by improving the efficiency of steam engines and adapting them to provide rotary motion. As factories started using steam power, productivity grew exponentially.

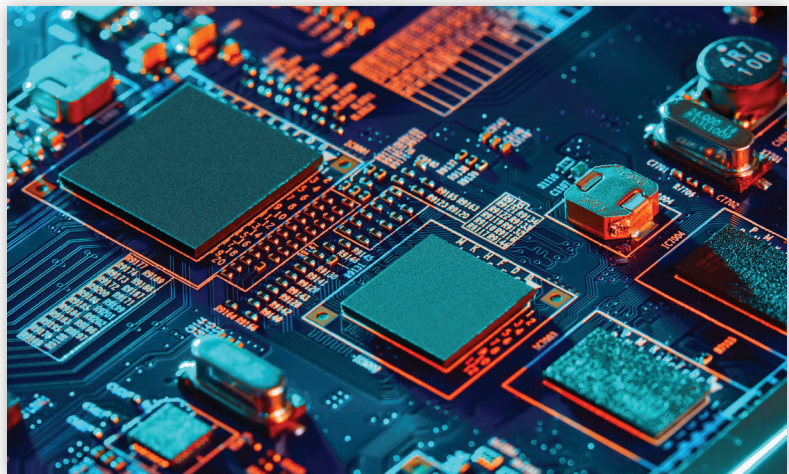
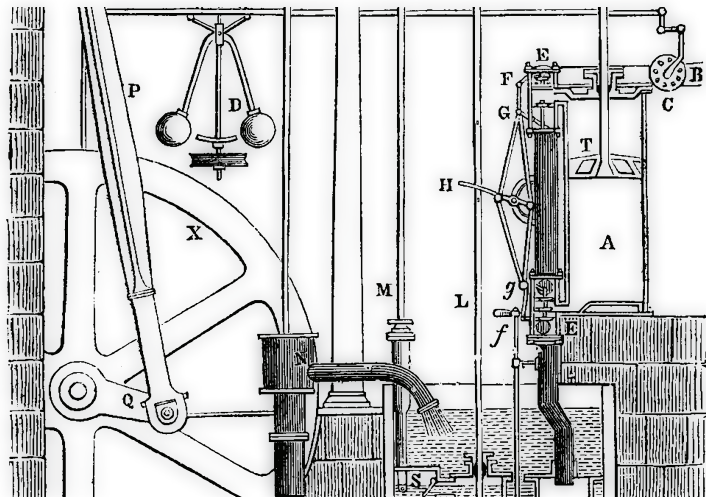
< Industry 2.0 (19th Century) >

Advances in communication and transportation drove the second industrial revolution in 1870.

The invention of the electric telegraph heralded a new way to send information instantly, while the growth of the railways meant large numbers of people could quickly move around.

< Industry 3.0 (20th Century) >

The third industrial revolution was the advancement of digital electronics, computers, and the internet that started in the late twentieth century.



< Industry 4.0 (Today) >

Now we have Industry 4.0 and the 'smart' factory, a more advanced approach to manufacturing, with even greater automation and interaction between manufacturing software systems and machines. Industrie (sic) 4.0 was originally a German government initiative to increase the computerization of manufacturing and promote product customization within a high-volume manufacturing environment.

Many other countries and organizations have since adopted and extended it.

INDUSTRY 4.0

MANUFACTURING AND
DIGITAL INNOVATION

ENGINEERING/ PROTOTYPING

ENGINEERING AND
3D PRINTING

DELIVERY/ TRACKING

QUICK DELIVERY
AND SHIPMENT TRACKING

DESIGN INNOVATION

INNOVATIVE PRODUCTS
AND NEW TECHNOLOGIES

PRODUCTION LINE

AUTOMATED
PRODUCTION LINE

DISTRIBUTION/ ASSISTANCE

RETAIL
CUSTOMER SUPPORT

Industry 4.0 has four clear design principles:

< Interconnection >

Improve effectiveness and efficiency by using wireless technology and the IIoT (Industrial Internet of Things) to connect machinery, sensors, applications, and other devices to the people responsible for the processes.

< Information transparency >

Industry 4.0 technology collects vast amounts of data and information from all points in the manufacturing process, thus aiding functionality and identifying key areas that can benefit from innovation and improvement.

< Decentralized decisions >

Interconnection and information transparency allows operators to make decisions both inside and outside of production facilities. This ability to combine local and global information simultaneously helps to drive better decision-making and increase overall productivity.

< Technical assistance >

Industry 4.0 shifts the role of humans from an operator of machines to a problem solver and decision-maker. Assistance systems are designed to support operators that need to make informed decisions to solve urgent problems on short notice.



< The Evolution of Documentation >

To date, there have been three evolution stages of documentation:

< Documentation 1.0 – Writing >

While there are several opinions on who first started representing words with shapes and letters, there is no dispute that it was over 5,000 years ago.

< Documentation 2.0 – Printing >

The Chinese invented woodblock printing, but it was Johannes Gutenberg's invention of a press that applied even pressure to the paper/type in the 1440s that mass production printing began.

As a historical note, Guttenberg never benefited from his invention and died in poverty. It took him three

years to print 200 Latin bibles, but there was no distribution network. This changed when other printers started working in ports such as Venice, and ship captains started taking printed products around the world. During the Renaissance, a printing press could produce over 3,000 pages per day, a hand printer could create approximately 40 pages, and hand-copying produced even less.

< Documentation 3.0 – On-screen display >

The third revolution in documentation was the internet and the mass availability of content online. In December 1995, there were around 16 million internet users; by January 2023, that had grown to approximately 5.3 billion. The internet has over 1.2 billion pages, and even Google has only indexed part of it.

< Documentation 4.0 >

As we embrace Industry 4.0, 'smart' factories, and 'smart' manufacturing, we must also move towards more innovative documentation.

The next evolution is Documentation 4.0, and that also has its design principles:

< Machine and site-specific documentation >

Generic documentation helps nobody; information relating to parts or functions not included in a particular build gets in the way and leads to confusion. This confusion will manifest itself both in terms of operational efficiency and maintenance/servicing difficulties.

Operators will struggle to understand how to approach tasks, and machine maintenance will take longer. If you have customizable machines, you must have customized documentation to support them.

The challenge will be how to easily create this machine-specific documentation, especially if it is to be localized.

< Evolving content >

Machines, sites, and systems evolve over their lifetime; modifications and upgrades must be reflected in the documentation. As a result, the documentation must be created in a way that lends itself to the evolution of content.

Heavy manufacturing machines have a long life expectancy; the content must be created in a future-proof way. It should also be possible to perform global updates across multiple publications.

< Intelligent content >

Intelligent content is content that 'knows' about itself; metadata is data about data. Efficient and correct use of metadata will transform how helpful content is. The ability to quickly find relevant content is vital if the efficiencies envisaged in Industry 4.0 are to be achieved.

Intelligent content can do more than just inform; it can

also generate revenue. Aftermarket sales of spare parts and consumables are a valuable revenue stream, and documentation linked to parts ordering and fulfillment systems support this.

< Content linked to other systems >

The 'smart' factory relies on connectivity between machines and systems to empower users and improve decision-making. This must be extended to support user documentation.

Content must be able to be ingested from other systems in the 'smart' factory and then used to create new publications.

< Localized content >

It is always easier to read content that is written in your first language, but badly localized content can be misleading, or in the worst case, it can be dangerous. It is vital that the localization process is properly managed.

< Intelligent delivery >

Printed material is cumbersome and difficult to maintain. Out-of-date printed publications such as SOPs (standard operating procedures), user guides, maintenance manuals, etc., must be collected and destroyed to ensure current guidelines are being followed.

Intelligent electronic delivery ensures the right content is always delivered to the relevant device or platform, including content published to IIoT (industrial internet of things) devices.

Interactive service documentation portals provide a single point for all publication types. Content consumers can use hand-held devices, on-machine HMIs, or PCs to access the latest information.

< Intelligent Management >

To achieve all of the above, content be properly managed throughout its life cycle. This means audit trails, and tools to ensure regulatory compliance.

< The Bluestream approach to the challenges of Documentation 4.0 >

Bluestream's solution for the challenges of Documentation 4.0 is the XDocs Manufacturing Suite which delivers all of the above and more.

< Machine and site-specific documentation >

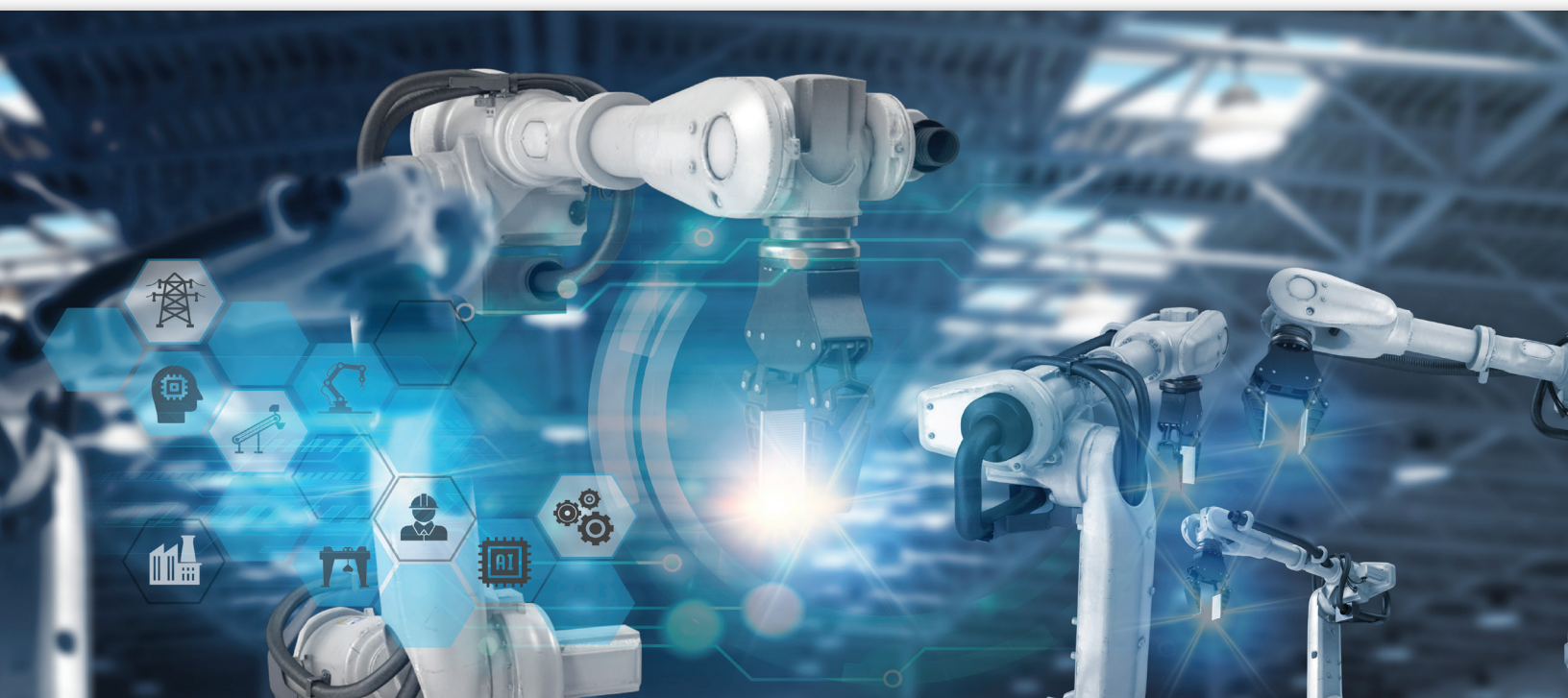
The XDocs Manufacturing Suite has connectors to other systems in the 'smart' factory, including ERP, PIM, PLM, and CAD. BOMs (Bills of Materials) are used in these systems to specify what components are to be used for a particular machine or site. These BOMs can be imported and managed by the XDocs Manufacturing Suite and then used to generate site/build specific documentation.

< Evolving content >

The XDocs Manufacturing Suite is built around Bluestream XDocs DITA CCMS (Component Content Management System). DITA is an XML standard that uses a modular approach to build publications. Content is created as Topics – blocks of information that make sense on their own but can also be assembled into a larger document and published.

- XML separates content from formatting and enables multichannel publishing – a single set of Topics can be published as a PDF, HTML, WebHelp, eBook, etc.
- XML structured content is future-proof; it is not dependent on a single application to create or publish content, and DITA is an open-source standard.
- With DITA, it is possible to update a single Topic and then update all publications where that Topic is used.

For example, if a sub-assembly is used in multiple versions of a machine and you need to make changes to the instructions relating to maintenance of that sub-assembly. You can update the maintenance Topic and then simultaneously update all publications across all the machine types.



< Intelligent content >

The XDocs Manufacturing Suite has unprecedented metadata support.

- Metadata is automatically harvested as Topics are checked-in.
- Full support for Taxonomies and Ontologies.
- Metadata can be used for searches making content easier to find and for publishing.

< Content linked to other systems >

The XDocs Manufacturing Suite lets you connect to other manufacturing software applications such as ERP, PIM, and PLM. It imports content from these systems, i.e., BOMs and diagrams, which can be used to generate IPCs (Illustrated Parts Catalogs) automatically.

These IPCs can, in turn, be linked-to fulfillment systems, allowing users to quickly identify the correct part and order it at the touch of a button.

The parts information is also available to the technical authors, allowing them to easily find and insert parts information into the documentation. XDocs DITA CCMS also supports publishing to IIoT devices.

< Localized content >

The XDocs Manufacturing Suite has industry-leading localization control – connect directly to your LSP (Language Service Provider) and automatically round-trip content. It can also be connected directly to XTM.

- All links and references are validated when content is checked-in to XDocs DITA CCMS.

< About Bluestream XDocs DITA CCMS >

XDocs DITA CCMS is the leading single vendor solution for organizations looking to improve and enhance their information workflow. With a unique rapid-to-deploy methodology coupled with unrivaled functionality, XDocs DITA CCMS is inspiring teams of authors to create powerful user-focused content that is flexibly delivered to any device or platform.

< Intelligent delivery >

The XDocs Manufacturing Suite can use Bluestream's XDelivery platform to build Interactive Service Documentation Portals where all types of content can be stored and published. XDelivery supports bulk uploads of legacy PDFs as well as audio and video files.

Content can also be pushed to on-machine HMIs (Human-Machine-Interfaces), providing users with the latest operational and troubleshooting guides.

< Intelligent Management >

Lastly, XDocs Manufacturing Suite's integration with Bluestream's enterprise-class DITA CCMS provides complete control over the full content life-cycle.

- **Link Management** – All links, cross-references, etc. are automatically validated on check-in/check-out.
- **Report** – Built-in reports and easy-to-use report builder.
- **Control** – BPMN 2.0 compliant workflow engine for extra control over processes, design your workflows within XDocs DITA CCMS or import them from other systems.
- **Review** – Easy online review and collaboration using WEX – Bluestream's custom web app. Bring your SMEs (Subject Matter Experts) into the content life-cycle.
- **Release Management** - ability to have multiple versions of the document in various languages with the ability to work on and subsequently merge and publish versions at will.