



Digital Manufacturing & Paperless Quality Management

Olanrewaju, Adebayo Bamidele

One reality in the global market is the constant evolvement of customer's habits and expectations. This constant change poses a challenge adapting and finding new, better and more efficient ways of manufacturing. Digital manufacturing happens to be the most appropriate solution to the challenge.

The adoption of digital manufacturing is spreading very rapidly across industries including aerospace, automobile and defence. Siemens proved to be a high achiever in their adoption of digital manufacturing starting from 2010, in their plant in Amberg, Germany. It was reported that the plant evolved from 25% automated system to 75%, with productivity increasing by over 1,300%. Yes, over 1,300%.

Paul Wellener et.al in a report from Deloitte's Research Centre for Energy and Industrial Group, stated that digital factory investments resulted to an average increase of 10 percent in production output, 11% in factory capacity utilization, and 12% in labor productivity.

All these show the immense benefits of adopting digital manufacturing. But then, what is digital manufacturing?

Overview of Digital Manufacturing and the Past

Digital manufacturing refers to an integrated approach, centred on leveraging technologies to manufacturing operations, supply chains, products and processes, allowing an iterative production process, beneficial to meet the requirements and demand of the customers. It refers to creating a factory that is a connected, networked and fully integrated with both the physical and digital environment.

This integrated approach enables manufacturer use real-time data analytics to optimize the entire manufacturing process, from product design and innovation to the supply chain, resulting to very high productivity and customer satisfaction level.

From the above descriptions, we can easily see that digital manufacturing is broadly categorized into three (3) branches, namely:

- **Product Life Cycle:** This encompasses engineering design, raw material sourcing, production and service life of the final product, utilizing digital data for revisions to design specifications during the manufacturing process.
- **Smart Factory:** This require the use of smart equipment, sensors and others to provide real time feedback about the manufacturing processes, enhancing greater visibility of production processes, control, and optimisation.
- **Value Chain Management:** This involves reducing resources to create optimal processes with reduced inventories while maintaining high product quality and customer satisfaction.

Practical Benefits of Digital Manufacturing

In addition to some of the obvious benefits stated above, other very important benefits of digital manufacturing include the following:

- **Predictive Maintenance:** Digital manufacturing enables potential breakdown to be foreseen and averted to avoid costly breakdowns.
- **Real-Time Monitoring:** Digital manufacturing enables sensing and quality detection to monitor test equipment and products in real time with visual analytics. This enables proactive defect detection and correction before the final products.
- **Predictive Efficiency:** Digital manufacturing enhances predictive efficiency such as applying temperature monitoring tools to make needed adjustment to convert higher temperature for other uses within the same manufacturing system.
- **Shop Floor Optimization:** Digital manufacturing enhances more efficient shop floor optimization to benefit the entire production line.
- **Continuous Workflow:** Digital manufacturing aids smart conveyance to automate continuous flow of in-process material, eliminating backups and delays.
- **Real-Time Asset Tracking:** It enhances real-time tracking of production equipment and personnel, enabling a more effective communication between the systems.

The Future of Digital Manufacturing

With increase in information for automated manufacturing processes, digital manufacturing is set to continue and grow in the future, with systems being able to interact with each other for joined-up production to improve and streamline processes.

Impact of Paperless Approach to Quality & Process Improvement

An organization's ability to identify and track issues on the production floor is an important competitive advantage that can greatly increase its profitability and, deliver a significant return on investment year after year. It's quite surprising to know that some manufacturing companies still depend on paper-based quality management processes.

Paperless quality system enables shop floor employees spend less time on the preparation and collection of work instructions, work orders, checklists and quality data forms. Companies who face the additional demands of strict compliance standards, short manufacturing lead times, and stiff cost competition are able to eliminate the problems and put a company on the path to success.

The following are some benefits of paperless quality initiatives:

- **Systematic Dissemination of Critical Data Across all Facilities**

A paperless process improvement & quality management culture enables a systematic way of evaluating incoming data to make effective decisions much sooner than paper-based approach. Managers are able to get a holistic view of the enterprise that results in improved quality due to instant access to data from all company locations.

- **Enables Elimination of Redundant Processes**

Paperless approach enables elimination of redundant processes which in turn boots productivity, reduces labor costs, and ensures consistency of operation. A database eliminates the need for double entry of data and eliminates risk for errors.

- **Improved Revision Processes**

Change on a continuous basis often takes place on the production floor. These changes (engineering changes, process changes and updates to industry standards) require consistent tracking. The tracking process using Paper-based approaches often slows workflow and hinders quality and effective process improvement.

A paperless solution eliminates such slowness which are often in the form of paper documentation and/or legacy systems for build history, as-built data collection, non-conformance processing, and tool recording. Revision control with real-time query compared with manual search for objective evidence of change saves valuable production hours. Document revision control minimizes risk of products built to prior versions.

- **Authoring of Electronic Work Instruction**

Automated processes and improvement of efficiency are enabled using a paperless solution. Online work instructions can easily be updated in order to ensure completeness. Detailed inspection and shop work instructions with attachments, variable and attribute data collection, documentation and workflow management of nonconforming material can be utilized by shop floor personnel using a paperless approach.

- **Integrated Real-Time Quality and Manufacturing Date**

Visibility into inspection process and inspection documentation history enables manufacturing and quality teams to work together in order to ensure greater control of the manufacturing process, helping to immediately identify potential for costly errors without slowing down production.

- **Training Control**

It enables effortless tracking of training activities and requirements for personnel. Objective evidence of job skill training, machinery and process skills and industry skills such as FAA,

FDA, AS9100, & EASA are available within the system to ensure customer and regulatory compliance.

- **Central Repository for Quality/Process Improvement-Related Documents**

All necessary quality and/or process improvement data are validated and maintained in electronic formats and are visible throughout the enterprise. Access level controls simplify approval process and provide necessary security for sensitive data. Complete digital traceability within the system are enabled within a paperless system, including comprehensive product documentation history which ensures audit readiness.

About the Author

***Olanrewaju, Adebayo Bamidele** is a Lead Auditor of ISO 9001, FSSC 22000 / ISO 22000, 14001, 45001, Certified Six Sigma Master Black Belt (CSSMBB), process engineer, and quality management professional with strong working experience and proven skills in manufacturing excellence, ISO management systems implementation, lean / digital manufacturing, and project management. He is an author of over 15 books and has published over 45 online courses on various e-learning platforms including Udemy, Alison, Learndesk & Study Plex.*



Contact

Phone: +2347037710839, +2348077486016;

Email: adebayoolanrewaju206@gmail.com

Social Media Accounts: LinkedIn, Facebook & Instagram