

DTP for optimized Digital Operations



Background

In today's world, heavily engineered products play a critical part in business operations—be it manufacturing, domain-specific field operations (aerospace, medical, oil, gas, forestry, farming, construction, etc.), or general business use. Service quality and profit maximization hinge on the efficient operation of machinery, the breakdown of which can disrupt business needs, hamper spare-parts availability, thwart efficient service, and compromise business continuity. Invariably, customers operating these products or machineries require proper instruction for optimized usage and continued maintenance.

Symptom	Cause
Inefficient use of the product in the operating environment	Unavailability of trained operator
Inefficient maintenance or overhaul of the machinery	Unavailability of knowledge base
Inefficient service cycle due to unavailability of parts and/or technician	Unavailability of trained service technician
Replacement with unsuitable part, resulting in abuse of machinery	Unavailability of accurate information

Businesses are continuously challenged to improve their efficiencies by reducing disruptions caused by the following major factors:

Product literature, service manuals, repair manuals, and work instructions form the basis of keeping technicians and operators optimally informed and ensure that complex machinery is efficiently deployed and operated.

The need for business efficiency in the aerospace, off-highway, marine, industrial, and medical industries is driving demand for skilled technicians and operators but the existing knowledge base and information dispensation methods are simply insufficient for digital operator(s) of the future.

Digital Operator—Challenges

With younger generations more comfortable with computers than wrenches, the average Millennial does not relate to traditional forms of information or knowledge dispensation that rely on physical copies of manuals or work instructions. Such technicians become inefficient when information in the field is disconnected from backend knowledge or information systems. When it comes to improving efficiencies, digital operators and technicians are better integrated with mobile, tablets, IoT wearables, AR/VR/MR devices, or overlays on operators' work benches.

A digital operator's efficiency is determined by constraints imposed by the field environment, client relationships, serviceability, and the design limitations of the product, including:

- Long training or orientation cycles to understand product use in a business context
- Certification requirements for both product usage (operations) and product serviceability (maintenance, repair) in critical shared-service industries like aerospace, automotive, medical, and industrial
- Errors in work instruction steps caused by numerous customized product variants
- Missing "ready references" to frequently viewed or reviewed materials
- Quick references to operational constraints and configuration parameters
- Integrated view of configuration parameters within the workflow of the operator
- Additional decision challenges caused by complex dependencies
- Quick reference fault-isolation techniques for fault-triage processes
- Access to reams of paper manuals hindering field or workshop operations.

Digital Solutions for a Digital World

In today's digital realms, digital operators are exposed to variety of digital solutions using various technologies, both in terms of product usage and product servicing. The information and knowledge that was once static and non-digital is digitally and contextually integrated with various tools and frameworks available to the digital operator. Capgemini's digital technical Publications (DTP) strategies allow companies to employ digital tools in various spheres of business activities, including training, operations, maintenance, and service.

Companies are increasingly employing digital content distribution for more than just reducing content publishing costs while creating a quick reference to various work instructions through different media. Some of these digital tools include:

- 3D PDF and 3D HTML materials provide synthetic and animated visualization of the product in use or the service work instructions with a three dimensional view and they are interactive with 3D models (in 3D PDF) for easier understanding of the product's operating characteristics. Providing this content on nomadic or portable devices enables omnipresent access to digital content, both offline and online.
- Nomadic device-based materials provide quick, infield access to information that is customized according to the category and classification of work activities a digital operator gets involved, through remote updates and pushing these content from remote servers. This information can be available either offline or online, depending on connectivity options and device capability. These solutions provide easy access to product reference through quick search and bookmark features.
- Augmented manuals overlay product information in line of product view using camera based vision interface. The digital operator can instantly relate the functional elements of the product with annotations explaining the functional nature of the machinery. In specific situations when machinery breakdown must be triaged, fault inspection workflow overlaying the product view can help the digital operator resolve issues already documented in the knowledge database.
- Augmented manuals using both 2D and 3D-based animation provide step-by-step instruction with synthetic or natural voice over to help digital operators review instructions without having to go through several pages of text. This content is deployed via devices including mobile, tablets, glass, and headgear.
- Virtual classrooms employ VR techniques by creating virtual operating rooms where individuals engage with the product (with or without an external simulated environment). Different platforms exist in pure VR and MR (mixed reality) spaces that create synthetic aspects of product visualization and information (both live and augmented). This rich visualization instructs the digital operator to review the different usage patterns and subsequent behavior of the product or explains the product and its use. Similarly, the digital operator can learn study the work instructions with integrated animation and interaction with the product and its service items.
- Service excellence (maintainance): Critical to product success is how easily or quickly it can be serviced and maintained. This is true of both consumer and non-consumer products, but is especially relevant for engineered products for which there is often a shortage of skilled and capable technicians. Even seasoned technicians can be challenged by certain aspects of the instructions that can be pivotal to the quality of service delivered. Easy serviceability and minimal breakdown turnaround become critical to businesses that invest heavily in such products.

The Capgemini DTP team has developed digital solutions that optimize the customer's existing assets for improved information dispensation to different stakeholders (i.e. technicians, operators) in the field, where such information can determine business outcome. These solutions deliver increased value to our customer operations by:

- Reducing operator or technician deployment cycles in the operating environment (manufacturing or the field)
- Providing highly integrated product configurations in sequence of work instruction in line with operators activities
- Reducing error due to quick overview of
 1. safety warnings
 2. configuration limits
 3. parameterized options.

Capgemini solutions are based on open and industry-standard frameworks that allow great flexibility in seamless development and deployment of technical content across a wide range of environments. Some of these industry standards for AR and VR frameworks are listed in the Appendix.

Capgemini's DTP, Digital Technical Publications, is an evolution in consuming and managing technical content by bringing an element of interaction to virtualized products. DTP enables simplification and visualization of work instructions for both product use and product serviceability. DTP initiates a digital transformation through modernization of legacy technical data to compatible standards and formats, including 3D models integrated with animation.

Appendix

• VR platforms

VR platforms providing virtual classroom-type visualization through varying degrees of user interaction are noted below:

	Oculus Rift	HTC Vive	Google Daydream	Samsung Gear
HW platform	PC	PC	Google Daydream VR	Android
SW platform	StreamVR	Oculus	Android Nougat	GearVR by Oculus
Controls	Motion controllers	Touch, Game Pad	Handheld remote	Handheld remote, Touch
Sensors	Motion, camera, external motion tracking	Motion, external visual positioning	Motion	Motion

Reference: <http://in.pcmag.com/consumer-electronics/101251/guide/the-best-vr-virtual-reality-headsets-of-2017>

- **AR platforms**

AR platforms providing augmented manual-type visualization through varying degrees of user interaction and recognition characteristics are noted below:

	Vuforia	EasyAR	Wikitude	ARToolkit
HW platform	PC	PC	Google Daydream VR	Android
Supported platform	Android, iOS, UWP, Unity Editor	Android, iOS, UWP, Windows, Mac, and Unity Editor	Android, iOS, Smart Glasses	Android, iOS, Linux, Windows, Mac OS, and Smart Glasses
Licensing	Free, Full, Subscription	Free	Free, Full	Free
Recognition	Image, 3D object, Cloud, Smart Glass	Image, 3D object, Smart Glass	Image, 3D object, Cloud, Smart Glass	Image, 3D object, Smart Glass
Tracking	Extended		Extended	Extended

Reference: <https://thinkmobiles.com/blog/best-ar-sdk-review/>



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