Visualizing Big Data: The Critical Role of Knowledge Management

The world is witnessing an unprecedented growth in the volume of data generated by organizations, individuals, and devices. The ability to visualize and make sense of this vast ocean of information is crucial for organizations to gain valuable insights, drive innovation, and stay competitive. Knowledge management, the process of creating, sharing, and utilizing knowledge within an organization, plays a pivotal role in helping businesses visualize and leverage big data

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effectively. This article explores the significance of knowledge management's role in visualizing big data and the benefits it offers to organizations.

What is Big Data?

Big data refers to vast and diverse sets of information that are generated by individuals, organizations, and various devices at a rapid pace.[1] These data sets are characterized by their sheer volume, velocity, and variety, which make them difficult to process and analyze using traditional data management tools and techniques.

Volume refers to the amount of data that is being generated and stored. Velocity refers to the speed at which data is being produced, processed, and analyzed. Variety refers to the different types of data that are being generated. The term "Big Data" encompasses structured, semi-structured, and unstructured data, and it can come from various sources, such as social media, sensors, internet of things, multimedia, transactions, and more.

Let's take a look at these three types of data:

Structured data is data that is organized and formatted so it's easily readable by computer systems. Structured data is typically organized into a highly ordered schema so that crucial data elements can be quickly sorted, searched, and analyzed. Structured data is typically stored in databases and spreadsheets. Examples include customer names, employee information in an HR system, or transaction data.

Semi-structured data is not as rigidly formatted as structured data, but it does contain tags, markers, or other types of metadata that make it more easily searchable than unstructured data. The information architecture isn't as rigid as with structured data, which gives it more flexibility. However, this flexibility can also make it more challenging to analyze at scale. Examples include emails and some types of data generated on social media platforms.

Unstructured data doesn't have a pre-defined data model or organization, making it much more difficult to collect, process, and analyze. Unstructured data often comes in various formats, and it can be text-heavy but may also contain data such as dates, numbers, and facts. Examples include audio files, video files, social media posts, books, articles, business documents, presentations, and webpages.

The growth of big data has coincided with significant advances in data storage, processing, and analysis technologies, such as distributed computing, machine learning, and artificial intelligence.[1]

The Nexus Between Knowledge Management and Big Data Visualization

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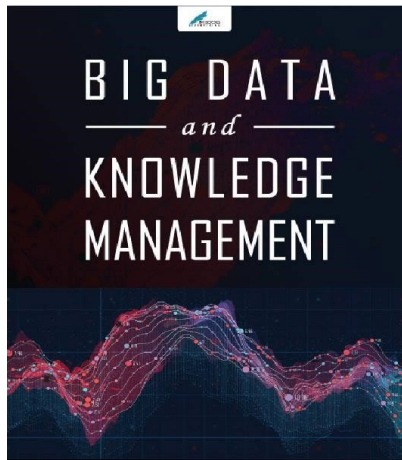
The transformation of big data into visualizations with meaningful information supports the four organizational outcomes of knowledge management listed below and can be viewed through the lenses of People, Processes, Tools, and Organization.

Improve Decision Cycle Effectiveness: Visualization tools transform big data into charts, graphs, and other visual representations that make patterns, trends, and outliers much easier to see. By representing data visually, decision-makers can quickly grasp the information and use it as a basis for their decisions.

Enhance Mission & Organizational Performance: Visualization can reveal trends and patterns in historical data that can be used for future strategic planning.

Create Agile Learning Organizations: Many visualization tools are interactive, allowing users to manipulate variables and see the potential impact of different scenarios. This can promote a culture of experimentation and learning. Data literacy, or the ability to write, communicate, and interpret data in context is an important part of creating agile learning organizations. Data literacy encompasses understanding the data sources, constructs, analytical methods, techniques, and the significance and value of the data for different purposes.

Achieve Shared Understanding Through Collaboration: Visual representations of data make complex information more digestible and easier to understand. This enables team members from different backgrounds, departments, or areas of expertise to have a common understanding of the data.

Effective data analytics and knowledge management practices play a critical role in fostering a data-driven culture within an organization. In the support of agile learning organizations, knowledge management provides processes and tools to assist in the promotion of curiosity, exploration, and innovation. This culture of data-driven inquiry encourages the development of innovative data visualizations, unveiling hidden insights and propelling strategic decision-making. Intuitive interfaces that allow users to navigate big data and extract meaningful insights include interactive dashboards, geographic information systems, network diagrams, and machine learning and AI visual interfaces. Moreover, knowledge management promotes collaboration between teams and departments, which aids in breaking down silos and facilitating cross-functional data sharing. Consequently, when different stakeholders have access to the same large data repositories and insights, they can synergistically contribute to creating more comprehensive and accurate visualizations. This integrated approach not only enhances the clarity of data representation but also steers the organization towards making more informed and effective decisions.

Effective knowledge management has long supported the use of visualizations to answer descriptive ("what happened") and diagnostic ("why it happened") analytics. With the rise of big data, it must now support more flexible visual capabilities that better identify risks, opportunities, and potential outcomes that lead directly to actionable recommendations. That is, to leverage big data, visualizations must now support predictive ("what might happen next") and prescriptive ("what should we do next") analytics. Driven behind the scenes by sophisticated analytical capabilities, the visualization tools of today must be flexible enough to drill down, drill through, and reduce large amounts of diverse data in order to allow the user to visually identify trends, patterns, and hidden insights.

Knowledge management is essential for enhancing the data proficiency of staff members. By offering training and resources, organizations can ensure their workforce is better equipped to interpret and communicate the insights derived from big data visualizations. A data-literate workforce is more likely to utilize data effectively and make informed decisions, ultimately driving improvement.[2]

Visualizing big data can help organizations gain a deeper understanding of their customers' locations, behaviors, preferences, and needs. This insight enables organizations and Army leadership to personalize their offerings, improve customer experiences, and aid decision-making.
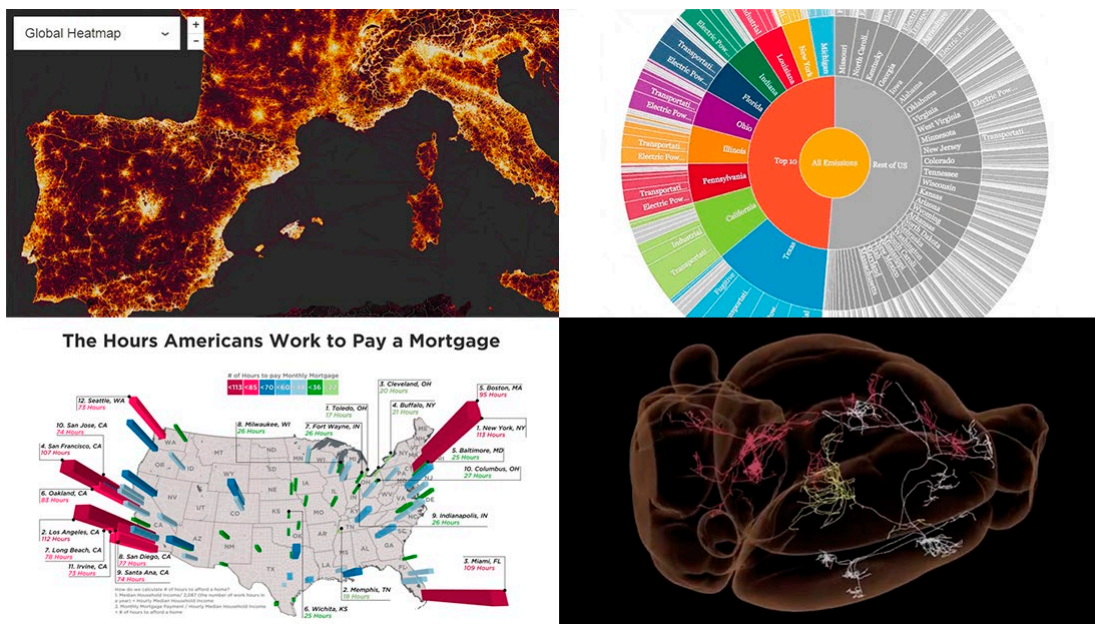
Knowledge management significantly contributes to an organization's ability to effectively comprehend and visualize large data sets. By providing context, fostering collaboration, and enhancing data literacy, knowledge management allows organizations to unlock the full potential of their data assets. As a result, organizations can gain valuable insights, make data-driven decisions, and maintain a competitive edge in an increasingly data-driven world. By prioritizing knowledge management, organizations can ensure they are well-positioned to harness the power of big data and drive long-term success.

This TRADOC OCKO publication was written by Nathan Truckenbrod in May 2023. Want to learn more? Respond to this article or access related articles, blogs, media presentations, and more at https://www.milsuite.mil/book/groups/tradoc-km.

Notes
1. Marr, Bernard, (2017, March 14), "The Complete Beginner's Guide to Big Data Everyone Can Understand," Forbes, The Complete Beginner's Guide To Big Data Everyone Can Understand (forbes.com).
2. Lamont, Judith, (2012, March 31), "Big Data Has Big Implications for Knowledge Management," KM World, Big data has big implications for knowledge management (kmworld.com)

When you need to innovate, you need to collaborate!
Contact the TRADOC OCKO for support, development, and training: dashboards, collaboration sites, SharePoint, metrics, KPIs, process mapping, Microsoft Teams, Multimedia production, and much more.