# Digital Artifact

## Concise Definition

A digital artifact is any combination of professional data, information, knowledge, and wisdom ([DIKW](#_DIKW_Pyramid)) expressed in digital form and exchanged within a digital ecosystem.

## The Concept

A digital artifact is any combination of professional data, information, knowledge, and wisdom ([DIKW](#_DIKW_Pyramid)) expressed in digital form and exchanged within a digital ecosystem. During an exchange, the originator’s digital form of DIKW remains intact and is interpretable by the recipient. Professionals and tradespersons create digital artifacts when they produce DIKW in, or convert items to, digital forms with the aid of digital technologies. The digital artifact encodes data, behaviors, attributes, or properties that software applications use to retrieve and display the digital forms of professional DIKW.

## Explanation

Many professional disciplines create, store, and display a variety of their DIKW to share with large numbers of stakeholders by way of numerous [digital technologies](#_Digital_Technology). Thus, there are uncountable ways to express the unique combinations of multidisciplinary DIKW, stakeholders’ information needs, and digital technologies. To classify the digital expressions of professional DIKW, the Digital Engineering Community develop the concept of a Digital Artifact as the universal set of digital forms that practitioners use to express their thoughts. As a subset, there are engineering digital artifacts that are relevant and useful in conveying engineering DIKW in digital forms. Therefore, a unique combination of engineering DIKW expressed in digital form is an engineering digital artifact.

### Characteristics

To distinguish the digital artifact from raw digital data with no context, the Digital Engineering Community established a set of characteristics to classify digital data as a digital artifact. The characteristics of a digital artifact are as follows:

* Resides in a digital device or system
* Human interpretable
* Executable and computational
* Has metadata
* Interrelated to other digital artifacts
* Complies with a set of conventions & standards
* Serves a functional purpose for stakeholders
* Contains data, information, knowledge or wisdom

## Common Usage

* The system engineers gave the product design engineers access to their finite set of ***digital artifacts*** for the X-1 subassembly’s parametric, behavioral, and functional characteristics.
* I need a set of ***digital artifacts*** that describes how the As-Designed rubber tire’s pressure and failure mechanism will respond in multi-terrain and multi-environmental conditions.
* The manufacturer has ***digital artifacts*** that show the geometry and metrology of all the parts it sampled from the production line.

## Examples

A digital artifact may be descriptive model elements, database records, query records, unstructured text fields, software modules, geometric primitives, video frames, audio frames, or any combination.

## Similar concepts and definitions:

[**Digital Artifact**](https://www.dau.mil/glossary/pages/3624.aspx)**,** as stated by the Defense Acquisition University’s Glossary Website, describes the concept as follows:

*An artifact produced within, or generated from, the digital engineering ecosystem. These artifacts provide data for alternative views to visualize, communicate, and deliver data, information, and knowledge to stakeholders* [1]*.*

[**Digital Entity**](https://definedterm.com/a/definition/243581) as stated on Society of American Archivists on the Defined Term Website describes the concept as follows:

“Digital Entities are highly abstract representations of concepts. They may be considered to embody more than information because the entity indicates how the data elements that form the information (attributes) relate to one another and how the information as a whole relates to a larger information environment. Digital entities are often used to represent digital objects in models, and some software packages automatically map entities to object-oriented maps” [2].

[**Digital Object**](https://definedterm.com/a/definition/243583) as stated on *Society of American Archivists’* website titled “Defined Term” describes the concept as follows:

Digital objects are an abstraction that can refer to any type of information. The object may be simple or complex, ranging from values used in databases to graphics and sounds. … Objects are not necessarily self-contained [2].

[**Digital Asset**](https://www.techopedia.com/definition/23367/digital-asset) as defined by the Technopedia website titled “Digital Asset” describes the concept as follows

A digital asset is any text or media that is formatted into a binary source and includes the right to use it; digital files that do not include this right are not considered digital assets. Digital assets are categorized into images and multimedia, called media assets, and textual content. [3]

## References

To be added

## Related Terminology

[Digital Ecosystem](http://www.hp.com/hpinfo/execteam/speeches/fiorina/ceo_worldres_00.html) on HP Speeches Website at <http://www.hp.com/hpinfo/execteam/speeches/fiorina/ceo_worldres_00.html>

[DIKW Pyramid](https://en.wikipedia.org/wiki/DIKW_pyramid) on Wikipedia.org at <https://en.wikipedia.org/wiki/DIKW_pyramid>

# Digital Viewpoint

## Concise Definition

A design of a digital view that uses conventions, formalisms and standards to define the systematic procedures to select, compile, layout, and present digital artifacts in a digital ecosystem such that is meets stakeholders’ unique needs.

## The Concept

The digital viewpoint defines the digital view. It uses conventions, formalisms, and standards to define the systematic procedures to select, compile, layout, and present digital artifacts in a digital ecosystem; such that, they address specific activities performed by stakeholders. The digital viewpoint also identifies sources of content that support the object-of-interests and facilitates information exchange between different stakeholders involved in the lifecycle and the supply chain. The viewpoint is digital because it is applied to a set of digital artifacts using software and digital technology to product the digital view. An author of a digital viewpoint would design it to fulfill the requirements that stakeholders’ need to perform decision-making activities, conduct their responsibilities, or both. The digital viewpoint defines one or more digital artifacts, the standards and conventions to compile the digital artifacts, or the operations to present digital artifacts in a variety of digital multimedia formats. The digital viewpoint may include models, designs, or computer algorithms that specify the type, structure and organization of content. Thus, the digital viewpoint is a design for digital multimedia presentations of digital artifacts based on stakeholder requirements, content sources, and standards.

## Explanation

The digital engineering community formed the concept of a digital viewpoint out of a need to describe how engineering practitioners use sources and types of digital artifacts, like models, and assemble and present them in forms that diverse stakeholders need and understand. The DE community borrowed the original concept from the system architecture community and re-conceptualized it to fit the digital engineering community’s need to leverage digital technologies to create, exchange, and present their digital work products. However, it is more than a static document that specifies the digital view. It may be a digital model of the digital view using standards such as Information Flow Modeling Language (IFML). Alternatively, it may be an application-programming interface (API) or other executable software code that assembles digital artifacts and renders the digital view according to the design.

### Characteristics

The digital viewpoint may be an executable software that pulls and creates the digital view, it may be a digital data model that defines the digital view, or it can be a digital text based document. It should include the following information:

* Metadata
	+ Stakeholders
	+ Stakeholders’ Needs
	+ Intended Use
	+ List of digital artifact elements
	+ Authoritative sources for digital artifact elements
* Digital View Design
	+ Data Model
	+ Digital Multimedia Design
	+ Any executable software code that implements the design of the digital view

### Common usage

* The project management team enjoyed the hypermedia website that allowed them to see changes to cost and schedule because of a ***digital viewpoint*** that defined a digital view to assess change impacts to active requirements models
* Three teams of finite element analyst needed a ***digital viewpoint*** to present an animated simulation of their digital artifacts that explained complex material interactions to the manufacturers.

### Examples

Designs of presentation layers or digital multimedia using methods, formalisms, and standards such Web Modeling Language (WebML), Virtual Reality Modeling Language (VRML), Object Oriented Hypermedia Design Method (OOHDM), Application Programming Interfaces (API), Open Graphics Library (OpenGL), query languages (QL), data & information models, Extensible Markup Languages (XML), and file formats, to name a few.

## Similar concepts and definitions:

[**Model View Definition**](http://www.buildingsmart-tech.org/specifications/ifc-view-definition)is a similar concept described by National Building Information Modeling (BIM) Standard-United States (NBIMS-US™) as follows:

A specification for data exchange. All the myriad data included in a Building information model (BIM), must be broken down into discrete packages to facilitate information exchange between the different parties involved in design, construction, and operation of a facility. These packages are specified by Model View Definitions (MVD’s). The optimal specification ties the data terms back to the overarching IFC model. [5]

[**Architecture Viewpoint**](https://www.iso.org/standard/50508.html) is a similar concept described by International Standard (ISO) 42010:2011 as follows

[A] work product establishing the conventions for the construction, interpretation and use of architecture views to frame specific system concerns. The viewpoint establishes the conventions for constructing, interpreting and analyzing the view to address concerns framed by that viewpoint. Viewpoint conventions can include languages, notations, model kinds, design rules, and/or modelling methods, analysis techniques and other operations on views. [4]

## Related Terminology

Multimedia design, visual communications design,

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# Digital View

## Concise Definition

A visual presentation on an electronic display device for one or more processed digital artifacts; the digital artifact content addresses stakeholders’ unique activities at any phase or step in the system life cycle.

## Description

A visual presentation on an electronic display device for one or more processed digital artifacts; the digital artifact content addresses stakeholders’ unique activities at any phase or step in the system life cycle; and, it conforms to the conventions established by the digital viewpoint. The digital view composes or renders multiple digital artifacts on a digital display. The digital view relies on a wide variety of digital technologies and software applications for viewing. The most relevant are digital displays or monitors. Many digital artifacts are born digital and many rely on graphical software linked to databases, computational software, and graphical software. With the advantages of digital technology, the stakeholder can specify what type of content they need and how they would like it presented to them. With the advances in interactive multimedia and hypermedia, the stakeholder can take advantage of the digital technology capabilities to navigate complex information relationships and visualize the digital artifacts in new and intuitive ways.

## Explanation

The presentation of one or more digital artifacts on electronic displays in forms specific to the stakeholders needs; it addresses stakeholders’ unique activities at any phase or step in the system life cycle; and, it conforms to the conventions established by the digital viewpoint.

### Characteristics or Functions

Describe feature, attributes, or characteristics. If applicable, describe functions, activities, or capabilities provided by the concept

### Common usage

Give examples of how one would use the descriptive word or phrase in a sentence.

### Examples

It can be the presentation of digital artifacts on electronic displays in the forms of dynamic data visualization, dynamic textual content, 2-dimenstional graphics, 3-dimentional articulating graphics, virtual reality, augmented reality, animated simulations, digital audio, digital video, panoramic digital images, interactive multimedia, hypermedia, mobile applications, or any combination.

## Similar concepts and definitions:

[**Architecture View**](https://www.iso.org/standard/50508.html) is a similar concept described by International Standard (ISO) 42010:2011 as follows:

[A] work product expressing the architecture of a system from the perspective of specific system concerns. An architecture view expresses the architecture of the system-of-interest in accordance with an architecture viewpoint (or simply, viewpoint). There are two aspects to a viewpoint: the concerns it frames for stakeholders and the conventions it establishes on views. An architecture view is composed of one or more architecture models [4]

[**BIM Deliverables**](http://www.buildingsmart-tech.org/specifications/ifc-view-definition) is a similar concept described by National Building Information Modeling (BIM) Standard-United States (NBIMS-US™) as follows:

Information (a package of data or models in numerous formats) to be provided to another party in connection with a BIM related service over the facility's life-cycle [5].

[**Virtual Exhibitions**](http://www3.ntu.edu.sg/home/sfoo/publications/2009/2009Handbook-DL-SF_fmt.pdf) are a similar digital concept described by Foo, S. et. al. as follows

Original artifacts are digitally captured and rendered into 2D or 3D objects which are packaged together and linked by hyperlinks to allow non-linearity or multiple-linearity by users (exhibition visitors). Virtual exhibitions are viewed as dynamic entities as they often undergo ongoing change in terms of design, activity and content, including encouraging users to contribute towards its collective memory, thereby adding to its dynamism. [6]

## References

## Related Terminology

[**Interactive multimedia**](https://www.britannica.com/technology/interactive-multimedia) is “any computer-delivered electronic system that allows the user to control, combine, and manipulate different types of media, such as text, sound, video, computer graphics, and animation. Interactive multimedia integrate computer, memory storage, digital (binary) data, telephone, television, and other information technologies [7].”

[**Multimedia**](https://encyclopedia2.thefreedictionary.com/multimedia), “in personal computing, software and applications that combine text, high-quality sound, two- and three-dimensional graphics, animation, photo images, and full-motion video [8].

[**Data Display**](https://encyclopedia2.thefreedictionary.com/Data%2BDisplay): A “visual presentation of processed data by specially designed electronic or electromechanical devices through interconnection (either on- or off-line) with digital computers or component equipment's [9]”.

[**Data Visualization**](https://www.techopedia.com/definition/30180/data-visualization) is “the process of displaying data/information in graphical charts, figures and bars; b. It is used as means to deliver visual reporting to users for the performance, operations or general statistics of an application, network, hardware or virtually any IT asset [10].”

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# Digital System Model

## Concise Definition

Description of the subject at the beginning, pronunciation, parts of speech, their meaning, pronunciation, use, and grammatical forms,

## Description

Detailed explanation of the form, fit, and function of the concept.

## Explanation

Insert information on origins, purpose, classifications, relevance, relationships to other concepts, etc.

### Characteristics or Functions

Describe feature, attributes, or characteristics. If applicable, describe functions, activities, or capabilities provided by the concept

### Common usage

Give examples of how one would use the descriptive word or phrase in a sentence.

### Examples

Give examples people, places, things, or activities that would represent the concept.

## Similar concepts and definitions:

Quote terms and their definitions and cite references for similar concepts and ideas defined in this entry.

References

List full references

## Related Terminology

A list of key concepts or terms that the author mentions in this entry that has a separate, dedicated entry in this knowledge base.

# Digital Twin

## Concise Definition

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#  Digital Thread

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# Digital Environment

## Concise Definition

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# End-to-End Digital Enterprise

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# Digital Engineering

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# Digital Engineering Transformation

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# Authoritative Source of Truth

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# Electronic Technical Baseline

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# Digital Artifact Reviews

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# Digital Artifact Curation

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# Digital Artifact Procurement

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