



Visual Data Storytelling: A Case Study of Turning Big Data into Chinese Painting

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Abstract. Visual data storytelling is a relatively new terminology that has emerged over the last decade. The use of information technology in data visualizing is becoming more common and accessible to users. The artist apply a variety of multimedia, symbols and metaphors to independently create a visual form that expresses data and communicates with real life. The visual data are the media that provide powerful and essential means of communication. If “visual data storytelling” is viewed as a process of communication, it follows naturally that how the artist’s performances are conceived, developed, delivered and received, and how the audience is attracted, accurately understanding the data and affected by the data visualization are worth exploring. Therefore, this study is intended to propose a framework focusing on how the conception of the artist affects the creation process and how the creation process is understood by the audience. The artist’s creation activities were analyzed through the framework of four steps using a case study of turning “big data” into “Chinese painting.” The results showed that the approach could be applied to understanding data visualization and provides artists with an idea of how to concentrate their efforts at the creation stage, the easier to communicate with their audience. In addition, the research framework seems to provide a better way to explore the understanding of how data transforms into art forms, which is clearly worthy of further study.

Keywords: Big data · Data visualization · Storytelling · DIKW model

1 Introduction

In this data-driven era, there are a variety of purposes for data acquisition and application. The information made up of data can not only help people make more intelligent decisions, but also examine their view of the world from a more objective perspective [1]. Transforming data into a form that relies on the human visual system to perceive the embedded information, the resulting visual effect is as simple as discovering the underlying laws in movies [2]. On the one hand, through the research of visualization in computer science, data and facts can be presented rationally and objectively, thus making the data readable. On the other hand, there are parallel

discourses regarding the artistic visualization aesthetics, which mainly focus on the exploration of human emotions and the transmission of inner views, but unfortunately rarely involves [1, 3–5]. As Norman [6, 7] argues in a successful design, visualization has evolved into as a functional art, which not only focuses on usability goals, but also needs to provide memorable, interesting, enjoyable, and engaging experiences. Therefore, more attention needs to be paid to artistic visualization in order to tell the audience something except what it is behind data.

Artistic visualization, as a type of visualization centered on emotional experience, refers to the artist's use of beauty in data by artist to arouse the perception of the audience. Different from the visualization just for usability goal, the goal of artistic visualization is usually to communicate a concern, rather than presenting data. The data is used as material and transformed into a form of beauty that makes relevant patterns visible to demonstrate the authenticity of the concerns [3, 4]. The information anxiety mentioned by Wurman is caused by the gap between what we understand and what we think we should understand [8], which can be bridged by the communication between the outer world and the audience in a meaning way [3]. Consequently, how to communicate is the research focus of artistic visualization.

As one of the most effective means of communication, stories have long served as a medium for conveying information, cultural values, and experiences. In this increasingly computerized world, with the development of technology and culture, there more complex narrative ways for the transmission of information [2, 8]. Visualization is not only about the exploration and analysis of data, but also about eliciting profound emotional and/or intellectual responses [1, 9]. There are countless real-life stories behind the data, which are displayed in ways that depend on what the audience wants to see or hope the audience to see. Therefore, visual data storytelling absorbs the ideas from both the artist/designer and the audience [1, 10].

If “visual data storytelling” is viewed as a process of communication, the following questions are worth exploring. How are the artist's performances conceived, developed, delivered and received? How are the audiences attracted, accurately understood the data, and affected by the visualization? Therefore, this study proposes a framework to explore how the conception of the artist affect the creation process and how the creation process is understood by the audience.

2 Theoretical Background

2.1 DIKW Model

The data-information-knowledge-wisdom (hereinafter referred to as DIKW) model is a common method to explain the human understanding in the perceptual and cognitive space [11]. Nathan Shedroff [8] gives an overview of understanding, that is, a continuum from data to wisdom. Ackoff, R. L. [12] defines data as symbols that has no value until they are processed into a useable form in a given context. Information consists of processed data with more usefulness that can provide answers to “who”, “what”, “where” and “when” questions. Knowledge is the application of data and information to provide answers to “how” questions. Understanding is the appreciation

of “why”. Wisdom is the evaluation of understanding. The first four categories are related to the past, while the fifth category deals with the future. Zeleny [13] describes the components of the DIKW model for different purposes, including know-nothing (data), know-what (information), know-how (knowledge), know-why (wisdom), and know-for-sure (enlightenment) beyond wisdom. By integrating several models known as DIKW Hierarchies, Cairo [3] represents the gap that Wurman, R. S [8] describes between the data and the knowledge, and explains the process from reality to the human brain. The unstructured information from outer world can be encoded as data, which is shaped by the communicator. When the audience has a deep understanding of the acquired knowledge, relevant patterns can produce knowledge and even reach the realm of knowledge. Based on the previous studies combined with the DIKW model, the cognitive process from data to wisdom is shown in Fig. 1.

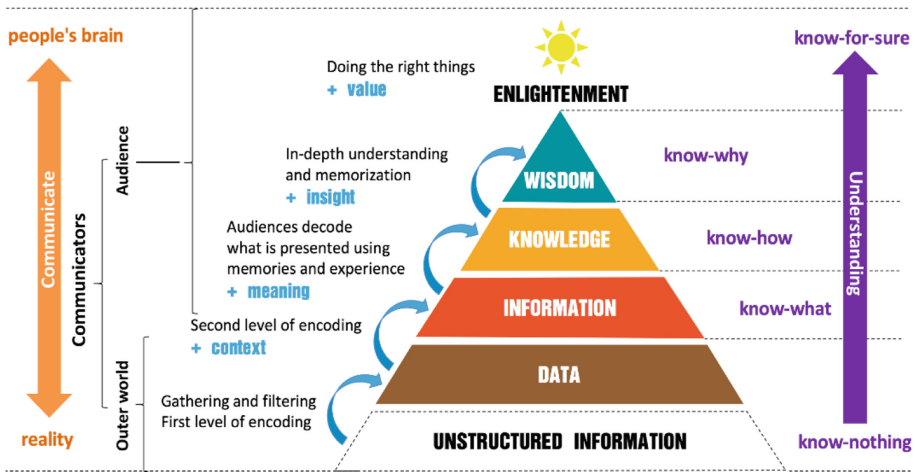


Fig. 1. Congnition from data to wisdom

2.2 Framework of Communication Research

Since the audience cannot gain personal insights directly from abstract data, the communication involving the artist as the communicator encoding and audience decoding is an important part of the discussion. There are six constitutive factors in Jakobson’s [14] communication model, which are addresser, addressee, context, message, code, and contact. This model is used to analyze an act of communication in visualization. The artist (addresser) sends a message to the audience (addressee) through his/her visualization work. To be operative, the work (message) requires a story (context) and is mastered by the audience (addressee). The meaning of work must be based on his/her message and on the shared meaning system (code) that makes up the work. Finally, physical channels and psychological connections are established between the artist and the audience (contact), enabling both of them to enter and maintain communication. Of these six factors, each factor determines the corresponding different functions,