

# Review and Evaluation of Systems Supporting Data Journalism

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## INTRODUCTION

In recent years, a new form of journalism has developed a strong dynamic: Journalism based on data. An important factor in its success is the availability of data from many public bodies and international organizations as part of the movement of open data worldwide. This form of journalism is based on the creation of stories that are based on data (storytelling), which are presented with attractive visualizations. Journalism of this type is practiced by both professional journalists and ordinary citizens (citizen journalism). The success of the move is so great that technologies and applications that support it have begun to emerge. Applications supporting data journaling have been developed in a wide range of domains that serve specific purposes in the data processing process and satisfy a wide range of users. Data processing involves many activities, but the key steps for completing the process are: data collection and cleaning, analysis and visualization, and ultimately the publication of the story. Although technologies are in a period of mature productivity, their evaluation is an area lagging in development. It is a fact that lack of evaluation based on a reliable methodology is evident in the literature. Finding a suitable methodology for this purpose is particularly important in order to (a) evaluate systems supporting data journalism resulting in a specific ranking of potential, and (b) make it easier for the user to choose the application that best suits his / her requirements and cognitive level. This study will attempt to evaluate specific applications with the assistance of appropriate methodology. A comparative evaluation of 9 applications related to the visual imaging component was attempted based on a methodological approach with usability and functionality criteria. The aim of this study is to provide a quick evaluation method, open to proposed improvements and further refinements, in order to establish a framework for qualitative assessment of data journalism applications.

## BACKGROUND

A system's evaluation is the process of testing and validating whether the system achieves its predefined goals and in what degree. Although in literature there are several qualitative and quantitative techniques

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proposed for different kinds of systems, there is not yet enough research for data journalism systems evaluation, so a goal for the area is for an evaluation framework to be established. Relative background can be found in related areas (e.g. information visualization, HCI), while the most suitable criteria for the proposal of such a framework are: functional and usability features.

Yi et. al. (2007) have collected the techniques from various research papers by creating a classification for InfoVis (Information Visualization) related to the interaction techniques. The following three classifications focus on interaction techniques, while the fourth refers to the tasks of the system's user, i.e. it focuses on his/her goals without paying attention to the interaction. The four proposed classified techniques with their related research work are:

**Low-level Techniques.** Buja et al. (1996) classified the interaction techniques into three classes: *Focusing*, *Linking*, and *Arranging* views. Chuah & Roth (1996) summarized a set of basic visualization interaction (BVI) operations: *Graphical* operations, *Set* operations, and *Data* operations. Dix & Ellis (1998) condensed the different ways in which interactivity adds value and resolves conflicts in representation: Highlighting and focus, accessing extra information – drill down and hyperlinks, Overview and context - zooming and fish-eye views, Same representation / changing parameters, Same data / changing representation, Linking representation – temporal fusion. Keim (2002) proposed that in addition to the visualization technique, it is necessary to use some interaction and distortion techniques for an effective data exploration: Dynamic projections, Interactive filtering, Interactive zooming, Interactive distortion, Interactive linking and Brushing. A categorization of interactions can also be found in Wilkinson (2005). Interaction techniques are classified into seven categories: Navigating, Manipulating, Brushing and linking, Filtering, Rotating, Transforming, Animating.

**Interaction Techniques.** Tweedie (1997) considered interaction techniques based on the following taxonomical dimensions: Interaction types (manual, mechanized, instructable, steerable, and automatic) and Directness (direct and indirect manipulation). Spence (2007) concerned with taxonomy interaction techniques as follows: continuous, stepped, passive, and composite interaction.

**Interaction Functions.** Ward & Yang (2004) proposed a framework for interaction techniques, identifying distinct classes and shared concepts. The classification of interaction operations follows:

- interaction operators
- interaction operands & spaces, data value-spaces, data structure-space, attribute-space, object-space, visualization structure-space
- interaction parameters

**User Tasks.** Concerning the taxonomies of user tasks, Zhou & Feiner (1998) proposed that visual tasks serve as an interface between presentation intents and low-level visual techniques, they can be characterized along two dimensions: visual accomplishments and visual implications. The set of features which describe various aspects of visual organization is: Visual grouping, Visual Attention, Visual Sequence, Visual Composition, Visual Signaling. Finally, Amar et al. (2005) present a set of ten low-level analysis tasks such as: Retrieve value, Filter, Compute Derived Value, Find Extremum, Sort, Determine Range, Characterize Distribution, Find Anomalies, Cluster, Correlate.

Yi et. al. (2007) bridge these approaches and propose an evaluation scheme based on three axes for evaluating interaction models:

1. Descriptive power: The ability to describe a significant range of existing interfaces.
2. Valuable power: The ability to evaluate alternative design modes.

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