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Utilization and Acceptance of interactive infographics in online newspapers

118 – Data literacy and visualization for casual users

Abstract

Interactive infographics are a powerful tool to represent and communicate complex information. Especially in online journalism they are increasingly used by journalists. However, casual users are still unfamiliar with interactive infographics. The results of a user survey among readers of online newspapers point out how users interact with interactive infographics and how they assess the availability and findability of interactive infographics in online newspapers.

Keywords:

Interactive infographics, information graphics, information visualization, interaction, data-driven journalism, online journalism, online newspaper

Introduction

Data-driven journalism (short: DDJ) collects, evaluates, interprets and presents large amounts of data. In an innovative and unique way data-driven journalism explains new insights and clarifies facts while telling complex stories on the basis of large amounts of retrieved data (Matzat 2016) (Gray et al. 2012). Lorenz (2010) defines data-driven journalism as a workflow, where data is the basis for analysis, visualization and – most important – storytelling. The growth potential of data-driven journalism is enormous and according to Weinacht und Spiller (2014) it is one of the big issues in specialist publications on journalism and in education of journalists in Germany.

Data-driven journalism can help a journalist to tell a complex story through engaging information graphics (Gray et al. 2012) (Weber / Rall 2013). In the reporting phase, information visualization can help journalists to identify themes and questions, to identify outliers or to find typical examples. Journalists tell stories based on their investigations and data visualization is an appropriate communication medium for storytelling (Kosara / Mackinlay 2013). An emerging number of stories is enhanced with narratives including complex graphics and especially interactive infographics.

Information visualization is the use of (interactive) visual representations of abstract data to amplify cognition (Chen 2010) (Ware 2012) and supports users, especially casual users, to perceive, recognize and interpret complex information effectively and efficiently. However, users and especially casual users

– like readers of online newspapers – have to be able to easily access infographics with a high degree of usability. Online media allow infographics to be interactive, i.e., they provide users with one or more options to control which and how much information shall be shown. However, interactivity introduces an additional level of required skills (i.e., data literacy) to users. Although interactive infographics are increasingly used in online media, readers really have to view them and to be able to use the control tools intuitively. Thus, we analyze how readers of online newspapers assess the availability and findability of interactive infographics, which types of interaction they utilize and which skills they need.

Interactive Infographics

Information graphics (short: infographics) combine graphics, image and text to communicate information, data or knowledge effectively using graphic visual representations (Alexander 2013) (Yau 2011) (Yau 2013). Infographics aim at providing the percipient with new insights and a quick overview on complex facts on subjects like politics, science, technology, and nature that are hard to understand just using text-based information. Information graphics communicate complex topics efficiently and draw the attention of percipients to them.

Types of Infographics

Infographics can be categorized in three basic types (Figure 1): (Jansen / Scharfe 1999) (Stapelkamp 2013)

- Principle representation
- Cartographic infographics
- Statistics chart



Figure 1: Three types of infographics (Source: Jansen / Scharfe 1999)

The principle representation – also denoted as functional graphics – describes complex causal relationships in real or abstract form. Principle representations are made up of fact graphics, structure graphics, and process graphics. The cartographic infographics (map) convey space-oriented information in a clearly arranged, simple and understandable way that provides orientation. This type consists of event space map, topic map, and weather map. Statistics charts help to illustrate quantities and compare them, especially large, complex sets of numbers and relations. This type consists of pie chart, bar chart,

curve chart, area diagram, scatter plot, Sankey diagram, and radar chart. (Jansen / Scharfe 1999) (Stapelkamp 2013)

Interaction in Infographics

Many technical systems offer interactive performance. However, the interactive elements have to be accessed and utilized by users easily. This level of action is made up of a control dimension and a transmission dimension that allows the system to react on user input. The control dimension is subdivided into options for selection (selection of existing content; e.g., click on a hyperlink) and options for modification (change of system range by input; e.g., input of text) (Quiring / Schweiger 2006).

There exist several methods of interaction to manipulate a visual representation, like scrolling, overview plus detail, or focus plus context, filtering, or data reordering (Mazza 2009: 104-123). Weber and Wenzel (2013) define interactive infographics as being a visual representation of information that integrates several modes (at least two), e.g., image/video, spoken or written text, audio, layout, etc. (image mode is constitutive), to a coherent ensemble that offers at least one option of control to the user. The provided option of control can be, e.g.,

- Start or Stop button
- Forward or backward button
- Menu item to select
- Timeline or time controller
- Filter, data request or input box

Classification of Interactive Infographics

Interactive infographics can be characterized by five features which cover interaction as well as narrative issues: degree of interactivity, activity model, communicative intent, “W-questions” and topic (Weber / Wenzel 2013) (Weber 2013). The most important features for the acceptance of casual users with a major influence on the usability of interactive infographics are the *degree of interactivity* and the *activity model*.

The degree of interactivity of interactive infographics is made up of the three levels (Weber / Wenzel 2013):

- Low interactivity
- Medium interactivity
- High interactivity

A low level of interactivity allows users to navigate within the infographics and select content, e.g., by using internal links, zooming, mouseover effects for showing details, Next or Start buttons, but without changing the infographics. On a medium level of interactivity users can manipulate the infographics, e.g., by a timeline slider or menu items, thus applying changes and comparing information. A high level of interactivity enables users to explore the infographics and to interact with data and information, e.g., by inputs, filtering, or data retrieval.

Interactive infographics can be classified by three grades of the activity model identifying the way users can interact (Weber / Wenzel 2013) (Weber 2013):

- Linear

- Nonlinear
- Linear-nonlinear

Linear interactivity enables the user to move (forward or backward) through a predetermined linear sequence (Sims 1997). The linear type is based on a step-by-step course defined by the author, i.e., author-driven (Segel / Heer 2010). The user follows a strict path and does not have to explore the visualization by himself. Navigation tools like *Start*, *Stop*, *Forward*, *Backward* or *Next* are used to navigate in a linear course. (Weber 2013)

A nonlinear visualization does not provide a prescribed ordering and requires a high degree of interactivity by the user – its narrative being reader-driven (Segel / Heer 2010). Nonlinear infographics provide the user with many ways to explore and query the visualization, including free exploration without predefined navigation paths. Navigation tools for nonlinear infographics include filter, input box, data query, or brushing. (Weber 2013)

The linear-nonlinear type is a hybrid of the author-driven and reader-driven approach that enables the author to communicate his message using a predefined path, but still allowing the user a certain amount of selection. Navigation tools for linear-nonlinear infographics include interactive timelines, time controller, and integrated navigation menu. (Weber 2013)

Utilization of Interactive Infographics by Readers

During an evaluation research investigating the application of interactive infographics in German-speaking newspapers it turned out that interactive infographics are hard to identify in online newspapers (Zwinger 2016a). Most newspapers have no dedicated sections aggregating interactive infographics and even the integrated search function often fails. Especially casual users of infographics will find it hard to identify infographics and apply their interactive elements.

In particular, in the two Austrian online newspapers „Der Standard“ and „Kurier“, that had been evaluated by Zwinger (2016a), it was difficult to identify interactive infographics. Therefore, we analyze how Austrian readers of online newspapers assess the availability and findability of interactive infographics and how they use the facilities for interaction. Readers of online newspapers are case by case users, but typically not frequent users of interactive infographics and should be able to easily access this innovative type of visualization. Our goal is to point out whether readers of online newspapers search purposeful for interactive infographics or just use them by pure chance. We examine how laborious and time-consuming readers estimate searching for infographics. The intensity of the use of infographics and the frequency of the utilization of the individual facilities for interaction are determined.

Method

To figure out the opinion of readers of online newspapers a quantitative research approach has been chosen (Baur / Blasius 2014). Since it can be assumed that the target group is familiar with online tools, we chose to conduct a unrepresentative online survey (Wagner / Hering 2014). The online survey was made up of 24 questions that included both closed questions (single choice, multiple choice) and matrix questions with different evaluation scales (Mummendey / Grau 2014).

Only readers of online newspapers have been surveyed. Persons that participated in the survey, but do not read online newspapers, were identified at the beginning using a knockout question. The survey was published in the off-topic forum of the Austrian newspaper “DerStandard”, on the Facebook page of the Austrian newspaper “Kurier”, and additionally on the Facebook account of one of the authors and

among students of the University of Applied Sciences Burgenland (Zwinger 2016b). Survey period: June and July 2016.

259 persons participated in the survey. Due to the research design mainly Austrian readers of online newspapers have been surveyed. 215 persons (83.01 %) answered the preceding knockout question positive and were identified as readers of online newspapers. The following results of the survey refer to this group (N=215).

Results

86.98 % of the respondents (187 persons of 215) declared that they deliberately take a look at interactive infographics. In a follow-up question the newspaper readers were asked why they view interactive infographics. The most frequent reasons, that have been mentioned, correspond to typical advantages of infographics: illustration of all relevant numbers/facts (77.54 %), a clearly structured overview (63.64 %), or good memorability due to the combination of text and image (51.34 %). Table 1 summarizes the most frequently mentioned reasons (multiple references possible).

Answer option	Percentage	#
Illustration of all relevant numbers/facts	77.54 %	145
Clearly structured overview put into graphs	63.64 %	119
Good memorability due to the combination of text and image	51.34 %	96
Relevant information can be filtered and visualized	34.22 %	64
Easy search for data/information	26.74 %	50
I do not like to read long text	21.93 %	41
Offers to view data/information in various representations	16.04 %	30
Other	1.60%	3

Table 1: Reasons for using interactive infographics (Source: Zwinger 2016b)

The participants could rate on a five-point Likert scale (scale from “very intensive” to “less intensive”) how intensively they use the provided possibilities of interaction. More than half of the participants use them “moderately intensive” (54.01 %, 101 persons). The infographics are “very intensively” used by only 6.42 % respondents (12 persons). 25.13 % (47 persons) used them “intensively”. The option “rather less intensive” has been named by 13 persons (6.95 %) and there are 14 users (7.49 %) who use the infographics “less intensive” (Figure 2).

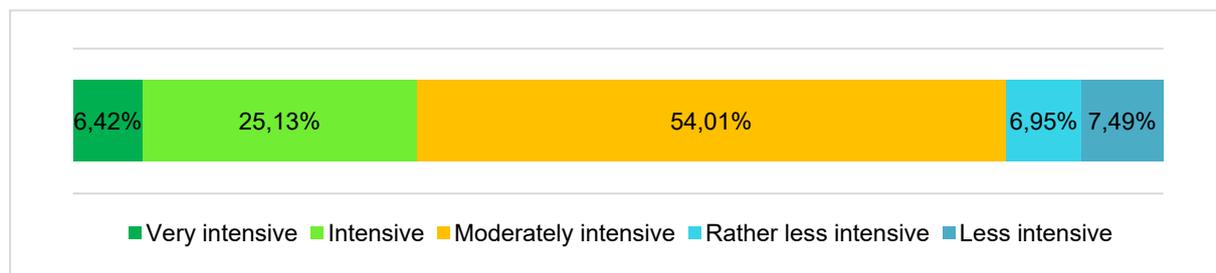


Figure 2: Intensity of using the facilities of interaction (Source: Zwinger 2016b)

Linear, nonlinear and linear-nonlinear infographics provide different mechanisms to control the graphics. Typically used control elements like start/stop button, menu items or filters have been investigated. The respondents of the survey could rate on a five-point Likert scale (scale from “very frequently” to “never”) how frequently they apply these control elements (Table 2).

n=187	Very frequently	Frequently	Occasionally	Seldom	Never
Start, Stop button	11,23 % / 21	25,67 % / 48	35,83 % / 67	22,46 % / 42	4,81 % / 9
Forward, Backward button	10,70 % / 20	29,95 % / 56	39,57 % / 74	18,18 % / 34	1,60 % / 3
Navigation bar (menu)	26,20 % / 49	46,52 % / 87	19,25 % / 36	6,42 % / 12	1,60 % / 3
Filter	20,86 % / 39	36,36 % / 68	26,74 % / 50	13,37 % / 25	2,67 % / 5
Timeline slider	9,09 % / 17	25,13 % / 47	37,97 % / 71	21,93 % / 41	5,88 % / 11
Input box	3,21 % / 6	18,18 % / 34	35,29 % / 66	32,09 % / 60	11,23 % / 21

Table 2: Frequency of use of control tools (Source: Zwinger 2016b)

The respondents (N=187) have been asked whether those control elements can be recognized easily and are marked sufficiently. Only 2.67 % of the respondents (5 persons) consider the control tools as “very well recognizable”. 33.16 % (62 persons) consider them as “good recognizable” and the majority of 37.97 % (71 respondents) consider the control tools as “moderately recognizable”. 20.32 % respondents (38 persons) have not been satisfied with the visibility of the control tools and assessed them as being “poorly recognizable”. One respondent (0.53 %) did not find the control tools at all and answered “not recognizable” (10 persons, i.e., 5.35 %, did not specify) (Fig. 3). Obviously there is need for action to support especially casual users in taking advantage of the interactivity offerings.

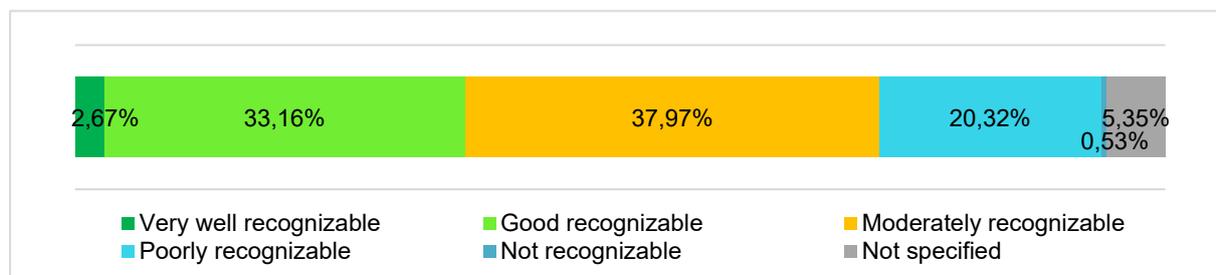


Figure 3: Perceptibility of control tools (Source: Zwinger 2016b)

Only 24.06 % of the participants in the survey (45 persons, N=187) declared that they actively search for interactive infographics in online newspapers. But even those people had difficulties to find interactive infographics. 77.78% of this group of users highly interested in interactive infographics (N=45) is not satisfied with the result when they actively search for infographics in online newspapers. They would endorse (97.78 %) that online newspapers promote interactive infographics, e.g., by dedicated menu items or other kinds of distinction.

The majority of the participants – 75.94 % (142 respondents, N=187) – do not search actively for articles that contain interactive infographics, i.e., they are very casual users of this type of information

visualization. Nevertheless, three-quarters of those casual users (74.65%, 106 persons, N=142) mentioned that they would use infographics more often, if they would be easier to find.

A barrier for casual users that can hinder them using interactive infographics might be due to a lack of experience and IT literacy respectively data literacy. While 25.67 % of the respondents do not need additional computer and IT skills for using interactive infographics, the majority of readers of online newspapers indicated that computer/IT knowledge is necessary – at least a basic knowledge (63.64 %, N=187) (Figure 4).

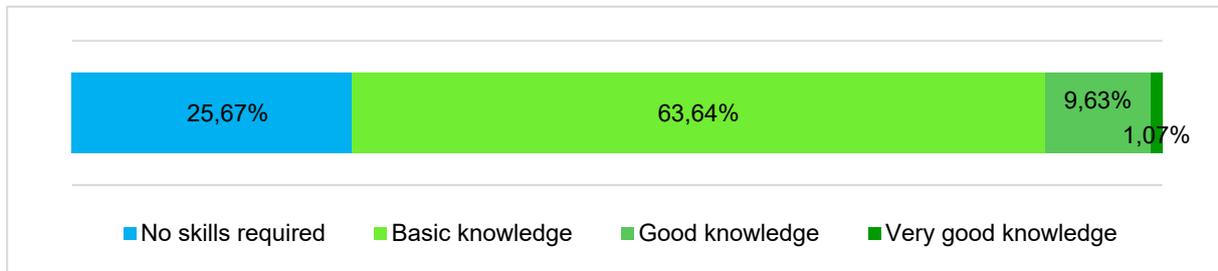


Figure 4: Computer literacy (Source: Zwinger 2016b)

Despite the problems users of interactive infographics in (Austrian) online newspapers might encounter, the majority of the respondents of the survey (73.26 %) would appreciate an increasing offering of infographics (only 1.60 % disapproved, 25.13 % were indifferent to an increase). The respondents would prefer if more interactive infographics would be published concerning science (24.60 %), economics (22.99 %), consumption (10.70 %), crime (9.63 %) and politics (8.56 %) (note: user hold the opinion that 53.48 % of published infographics are currently on politics).

Conclusion

From the point of view of readers of online newspapers we identified potential for improvement concerning the findability and utilization of interactive infographics. Infographics and especially interactive infographics provide an efficient means to communication complex information in online journalism. The survey of readers of online newspapers demonstrates that the offering of interactive infographics is highly accepted among users with all levels user experience. However, users have often difficulties to find infographics in online media. The findability of interactive infographics might be improved by dedicated sections in the online newspapers aggregating infographics (e.g., specific menu items in the main navigation) or by others ways to mark or label interactive infographics. The reason why interactive infographics are often not used by casual users is caused by the fact that they simply cannot be found. Additionally, it is often hard to recognize that infographics offer interactive features with corresponding control tools. Consequently, those control tools are only moderately or seldom used, thus limiting the chance for users to fully explore the infographics. Media should identify controls for interactivity more clearly to allow users to fully utilize the offer of information of the infographics.

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