

Scrollytelling – An Analysis of Visual Storytelling in Online Journalism

Doris Seyser

Information Technology and Information Management
University of Applied Sciences Burgenland
Eisenstadt, Austria
doris_seyser@gmx.at

Michael Zeiller

Information Technology and Information Management
University of Applied Sciences Burgenland
Eisenstadt, Austria
michael.zeiller@fh-burgenland.at

Abstract—Scrollytelling – the long-form of articles used in journalism – uses long, narrative types of text (e.g., report, feature) to tell complex stories. Scrollytelling articles published online often use multimedia content, especially information graphics which is a powerful tool to communicate complex information. This study investigates which types of infographics are used for visualizing complex data in long-form journalism published online. The analysis focusses on the utilization of infographics in scrollytelling and how infographics are integrated in long-form articles.

Keywords—scrollytelling; storytelling; infographics; information visualization; online journalism; online newspaper

I. INTRODUCTION

Long articles telling detailed stories with large amounts of content are frequently used in journalism – typically called long-form journalism. Journalism is steadily changing and especially online journalism leads to new types of – digital – storytelling. Especially online media provide new ways of presenting such complex issues using multimedia content. The digital long-form – often called *scrollytelling* – allows journalists to use different forms of expression by taking advantage of the multimedia character of electronic publications [1]. Besides images, audio and video content, spoken text, and animated graphics the digital long-form may heavily use information visualization to enhance the narrative text. The *New York Times* is a pioneer in using information visualization in the long-form since many years. In 2012 the *New York Times* published a multimedia report called “Snow Fall” setting the standard for this new type of visual storytelling in online media [2]. Other trend-setting publications like “The Russia Left Behind” any many more followed [3]. For example, in Europe the long-form is frequently used by *Zeit Online* or *Süddeutsche Zeitung*.

Scrollytelling articles – especially when using multimedia content and infographics – are much more costly to produce compared to a conventional feature or a short video. Thus, scrollytelling will be seldom used for up-to-date reporting, but for detailed, in-depth stories on complex issues, e.g., in projects on investigative journalism or data-driven journalism [4]. Since data-driven journalism explains new insights and clarifies facts while telling complex stories on the basis of large amounts of retrieved data, the long-form is an appropriate way of presentation [5].

Information visualization describes the use of visual representations of abstract data to amplify cognition [6] [7]. The visual representation of information enables users to effectively and efficiently perceive, recognize and interpret information. Especially information graphics (short: infographics), that combine graphics, image and text, are an efficient means to communicate complex data, information, or knowledge – and therefore they are a perfect way for visual storytelling in digital long-form journalism [8] [9]. Long-form articles use a combination of multimedia components. Different kinds of visual representations will always be combined with text [10]. The choice of media, its composition and the narrative structure are crucial for the success and acceptance of a long-form story in online journalism.

In this study we analyze how and which infographics are used to visualize complex information in scrollytelling in online media. We focus on the integration of visualization in the narrative structures of scrollytelling articles. The study investigates which opportunities visual storytelling can provide for editorial purposes in online media.

II. VISUAL STORYTELLING IN JOURNALISM

A. Visual Storytelling

Storytelling is the activity of telling or writing stories. Storytelling in the context of journalism refers to narrative forms of journalism. It creates nonfiction including in-depth information based on accurate research, typically in long-form. The most important elements (building blocks) in storytelling are a central character, a conflict, a meaningful motive, a viral approach, and – most important – an emotional narration [10].

Visual storytelling tells stories using visual representations [10]. An alternative term for this kind of storytelling is *visual narrative*. Photos, videos, infographics, and other visual elements are used to tell thrilling stories based on emotion [11] [12]. Visual storytelling differs in content and format from other types of communication that use only neutral information and fact-based knowledge [10] [13]. Visual storytelling can be applied offline and online, but online storytelling will use much more types of visual representations. Visualization, e.g., infographics, have a positive influence on the cognitive processing of information. However, multimodal presentations may also have negative effects due to overtaxing [14].

The narrative structure of (visual) storytelling can be linear, nonlinear, and the combination linear-nonlinear (course of action) [15]. Linear structures enable the user to move (forward or backward) through a predetermined linear sequence [16]. The linear type is based on a step-by-step course defined by the author (i.e., author-driven [17]). A nonlinear structure does not provide a prescribed ordering and requires a high degree of interactivity by the user – its narrative being reader-driven [17]. 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 options to select on his own [17].

B. Scrollytelling and Infographics

The long journalistic format – typically called *long-form* – is gaining increasing interest. Several publishing houses put much effort in creating scrollytelling articles, including special publication formats. Some studies define the long-form on the number of words, but typically it stands for non-fictional, narrative journalism based on detailed research [1]. A major feature of scrollytelling is its multimedia character. However, in multimedia storytelling the multimedia elements are independent components of the story that contribute additional aspects and information to the whole story [1].

Some authors – like in [1] – distinguish between three types of long-form: scrollytelling, web documentation, and selective multimedia story. All of them are characterized by the application of internet-specific features: selectivity, interactivity, linking, multimedia, and participation [1].

The term scrollytelling is a combination of “storytelling” and “scrolling”. These articles are typically complex feature-type stories using a lot of images and multimedia. Due to the large number of individual components the user can decide for the depth of the story by himself [1].

Scrollytelling articles typically start with a full-screen photograph or video. By scrolling – usually vertically, seldom horizontally – the user moves forward to the next element. Scrollytelling articles are often text-centric, i.e., text is the leading component, but nevertheless an integrated component amongst others. The text is the backbone of the article. In multimedia storytelling the multimedia elements typically appear on the side of the text or full-width between the text blocks. Image-centric articles have a similar structure, but the sequence of elements is determined by images/photos and videos. Other types use full-screen images in the background and text, audio elements and infographics are placed on top [1].

The narrative structure of scrollytelling articles is linear or elastic. An elastic narrative allows to follow a predetermined order. However, on specific points the story branches off. These branches allow to get deeper into the story – see Figure 1. Some articles are deconstructed into chapters, each of them following an elastic structure. This results in a high selectivity since individual aspects of the story can be explored in different order, using direct entry points. The elastic structure allows users to get back to the main thread of the story. However, if there are too many branches users might get lost (emotionally or content-related) and do not find the way back to the core story [1].

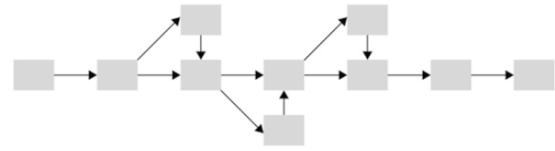


Fig. 1. Elastic narrative structure [1].

Since scrollytelling articles typically include a lot of images and multimedia elements and they are used to tell complex stories, infographics can often be found in these articles. They are a very well qualified method to add information in an efficient way [15] [18] [19].

III. A STUDY ON INFOGRAPHICS IN SCROLLYTELLING

This study focusses on the utilization of information visualization – in particular on interactive and non-interactive infographics – in multimedia scrollytelling articles that have been published in online newspapers. The main issue of our research is to analyze how infographics are used to visualize complex data in scrollytelling in online media and which types of infographics are being used. Additionally, we investigate how infographics are integrated in the narrative structures of scrollytelling articles. The suitability of specific topics for visual storytelling in online news is analyzed as well.

When starting to work on a multimedia long-form article the editorial staff has to figure out which content shall be represented by written or spoken text, image or video, or by static or interactive infographics and how these elements can be composed to a thrilling story. Different narrative structures (e.g., linear, elastic, parallel, threads, branches, concentric, using chapters) will support the composition [1]. Therefore we will investigate whether the combination of specific modes will support or obstruct the perception of the story [14]. Processes of reception and coherence can be supported by the application of the Gestalt laws, e.g., closure, proximity, and similarity [14]. Since interactive infographics attract attention, but have to be carefully applied, we will cover this issue as well.

A. Research Method

Since scrollytelling articles are a complex composition of content elements of different types we have chosen a qualitative research method based on content analysis of several articles [20]. Content analysis is an empirical method to describe content-related and formal aspects of the test material in a systematic, intersubjective and comprehensible way [21] [22].

The test material for this study are information visualizations in scrollytelling articles that have been published in online newspapers in German-speaking countries (i.e., Germany, Austria, Switzerland) [23]. The scrollytelling articles have been published between April 1, 2016 and July 31, 2017.

Six media have been selected where the scrollytelling articles (context unit) and the corresponding infographics (analysis unit) have been published. All online media had to be national key media with strong online offerings of broad reach. The following media have been chosen: *Spiegel Online*, *Welt Online*, *Berliner Morgenpost* (all from Germany), *Der*

Standard, *Die Presse* (both from Austria), *NZZ Neue Zürcher Zeitung* (Switzerland) [23].

The context unit of the qualitative content analysis is the scrollytelling article. We selected one article from each of the six online media listed above based on indicators of journalistic quality like topicality, proximity, thorough and original research, as well as exclusiveness and investigation. Since the main focus is on the application of infographics for scrollytelling all articles had to contain innovative information visualization combined with outstanding storytelling (strong characters, clear motive, dramaturgy). Additionally, specific awards had been considered as well (e.g., *Grimme Online Award*, *Data Journalism Award*). Table I lists the chosen scrollytelling articles (all titles in German) [23]. Figure 2 shows the starting screens of the analyzed scrollytelling articles.

TABLE I. SCROLLYTELLING ARTICLES

ID	Media	Title	Publishing Date	Ref.
1	Spiegel Online	Was heißt schon arm?	5.2016	[24]
2	Welt Online	ÜberWasser	18.4.2016-22.3.2017	[25]
3	Berliner Morgenpost	So tickt Berlin an deiner Linie	17.7.2017	[26]
4	Der Standard	Trude Pritzi: Verstorben 1968, Weltmeisterin 2001	23.5.2017	[27]
5	Die Presse	200 Jahre Fahrrad: Hass- und Kultobjekt	6.4.2017	[28]
6	NZZ	Piste hinab, Karriereleiter hoch	6.2.2017	[29]

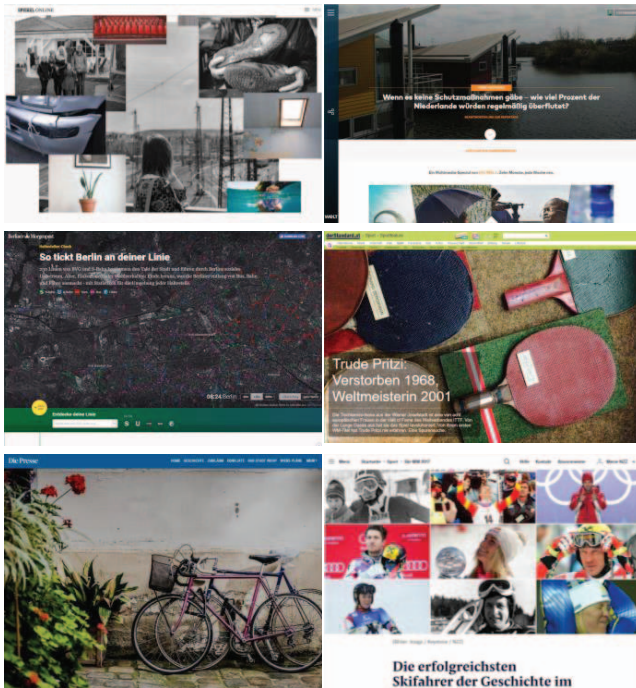


Fig. 2. Starting screens of the selected scrollytelling articles.

The analysis unit of the content analysis is each infographic in a context unit (i.e., scrollytelling article), as well as the topic that embeds the visualization.

B. Categories for Content Analysis

A qualitative content analysis applies categories to examine the context units [22]. In this study the categories have been set up both in an inductive way (e.g., topic, media-typical quality) and a deductive way (e.g., journalistic quality, multimodality, interactivity, visual storytelling, importance of visualization). The following tables II to V present selected categories [23].

TABLE II. CATEGORY MULTIMODALITY

Type	Specification	Variation and Combination
photograph	photo gallery / slide show	with/without audio
	digital photo	in various combinations
text	typography	
graphics	static infographic	
	interactive infographic	in combination with audio and text
	illustration	
video	video	in combination with audio and text

TABLE III. CATEGORY INTERACTIVITY

Type	Specification	Problem / Question
interactivity	yes/no	Are interactive elements available?
intensity	intensity of perception	
navigation	narrative form	linear, nonlinear, linear-nonlinear alternative types of navigation
	selectivity	Are navigation elements available? depth of information, usability

TABLE IV. CATEGORY VISUAL STORYTELLING

Analyzed Aspect	Problem / Question
hero	Has the hero a strong character?
conflict	Are conflicts in form/design and/or content/story shown?
meaningful motive	Is a clear message perceptible?
dramaturgy	Which stylistic means is used?

TABLE V. CATEGORY IMPORTANCE OF VISUALIZATION

Analyzed Aspect	Problem / Question
purpose of visualization	decorative, informative, trigger of emotion, provocative, enlightening
presentation and presence	multimedia; size and frequency; text rich article or article heavily relying on image/infographics

IV. RESULTS

The results section presents a number of key findings for the most important categories of the content analysis: topic, journalistic quality, multimodality, interactivity, media-typical quality, and visual storytelling [23].

A. Topic

The analysis of the topics of the scrollytelling articles reveals a focus on five distinct themes. Three articles (#1, #3, #5) discuss issues on *politics and society*. Additionally, they cover issues on *economy and finance*. This is due to the fact that the long-form allows to cover a story in various aspects. For example, in article #1 on poverty the different applications of information visualization cover social policy as well as finance (changes in income) and science (determination of poverty – an interactive online check for the risk of poverty). Another popular topic is *history* (article #2, #4, #5). For example, historical aspects are discussed in article #2 on water, that also includes the topics *natural disaster* and *technology*. Additionally, *quality of life* and *(living) environment* are discussed in three articles.

B. Journalistic quality

Transparency, solid research, and relevance are important criteria of journalistic quality. Since scrollytelling articles represent a complex narrative made up of several aspects that tells a story more comprehensively, these criteria can be fulfilled more likely. Table VI shows the fulfillment of these criteria (marked X; (X) represents a partial or doubtful fulfillment).

TABLE VI. JOURNALISTIC QUALITY IN SCROLLYTELLING

Type	Specification	Media					
		#1	#2	#3	#4	#5	#6
topicality	relevant	X	X	X			
	new, up-to-date incidents						
	current reference	X				X	X
proximity	spatial-geographic	X	(X)	X	X	X	X
	political-economic	X		X		X	
	cultural	X	(X)	X	X	X	X
research	thorough	X		X	X		X
	original	X		X	X	X	X
transparency	information sources	X		X	(X)		X
	process of research and data analysis						X

C. Multimodality

The sample contains scrollytelling articles that combine at least two different multimedia elements (plus text). In the text-centric articles the element photo is most frequently used – as single photos (40) or in slide shows (8). Only two of these 48 elements also include infographics. There is one article that uses a different setup. In article #6 text is the leading content element, but the text and images/infographics cover almost the same area.

The infographics are interactive line charts (7), complemented by a small number (4) of portrait photos. Although a good slide show is costly to produce, we can find it in four articles. There are nine photo galleries – one of them is based on an interactive cartographic map (#4) – see figure 3.



Fig. 3. Interactive cartographic map in article #4.

Most of the text-centric scrollytelling articles contain photo galleries and at least one interactive infographic. Video is frequently used, too. However, the videos in the scrollytelling articles seldom include information visualization.

Table VII presents the application of data representations on a micro level. The conventional digital photo is most frequently used (40 times) in the scrollytelling articles – without considering articles #3 and #6. In article #3 the high number of infographics (250 interactive infographics) is due to the fact that each line of public transport is visually represented by an individual infographic – including statistics for each stop [26].

TABLE VII. MULTIMODALITY

Type	Specification	Media					
		#1	#2	#3	#4	#5	#6
photograph	photo gallery / slide show	3	-	-	1	3	1
	digital photo	4	8	-	10+1	13	4
text	typography	-	-	-	-	-	-
graphics	static infographic	-	1	-	-	2+1	-
	interactive infographic	2	-	250	1	1+4+1	7
	illustration	-	-	-	-	4	-
	animation	1	2	1	-	-	-
video	video	3	1	-	3	2	-

The number of interactive infographics varies strongly. Some pattern can be identified: Those articles with high-quality (and thus costly) infographics do not use videos and only few photos. Most infographics are based on line charts. The others use a Sankey diagram, a timeline, a pie chart, and a bar chart.

Static infographics are used much less in the analyzed scrollytelling articles: cartographic map (3 times) and table (1), photo (1), statistics chart (4). Animations are used four times. They usually have a simple linear structure. The only interactive element is the Play-button. Article #3 includes an animation that

allows the user to choose between different views and different time scales. This animation has an infinite duration and is based on a nonlinear narrative structure.

The scrollytelling articles contain an average of 2.5 different representations (photo, graphic, video). Without considering article #3 and its 250 individual infographics the average number of visualizations is five (minimum: three, maximum: nine).

D. Interactivity

Interactive elements can be found in all six scrollytelling articles. The complexity of scrollytelling articles can be identified by its level of selectivity and the narrative structure. The linear narrative structure can be found in three articles (#1, #2, #4), while two articles use the elastic type of narrative structure (#5, #6) [1] – see also table VIII.

TABLE VIII. NARRATIVE STRUCTURE

Type	Media					
	#1	#2	#3	#4	#5	#6
linear structure	X	X		X		
elastic structure					X	X
chapters					X	
alternative structure			X			

The course of action of the interactive infographics is dominated by the linear-nonlinear type (252 of 271 infographics) – see table IX. Only three infographics represent the linear type. However, the dominance of the linear-nonlinear type is caused by the fact that article #3 by the *Berliner Morgenpost* on public transport lines in Berlin is made up of 250 infographics – one for each line. This scrollytelling article is an example of an image-centric approach where interactive infographics are complemented by short text elements. The user starts in a nonlinear way by filtering (selecting a transport line) and continues linear using a Next-button to investigate socio-demographic and psychographic features. A drop-down menu adds a nonlinear navigation as well. The control elements in the nonlinear course of action are mouse-over effects (12 occurrences) and menus (3). A high level of interactivity is provided by filtering or data input, but this could only be identified three times.

TABLE IX. COURSE OF ACTION

Type	Media					
	#1	#2	#3	#4	#5	#6
linear	1	2				
nonlinear	2		1		6	7
linear-nonlinear			250	2		

E. Media-typical Quality

Complex content types like slide shows using interactive timelines (e.g., in #4) and selective infographics (e.g., in #3 and #6) are frequently applied. Like in classic feature articles

selective narrative structures are used. For example, the *Berliner Morgenpost* (#3) uses a selective narrative structure that applies a linear navigation using a Next-button and a nonlinear filtering of elements using a drop-down menu. Thus, the media-typical quality of the infographics in article #3 is high due to the innovative approach and high aesthetic appearance. The line graph is not used for a temporal structure, but for a geographic (spatial) structure (i.e., bus stations).

Article #4 by *Der Standard* applies a selective narrative structure using timeline and slide show. The NZZ (#6) uses an interactive line diagram, but violates the Gestalt law of proximity. Although most visual representations have been chosen properly, only half of them can be considered as innovative applications. Remark: Simple types of infographics like statistics charts (especially pie, line, and bar charts) and simple cartographic infographics (maps) are considered to be less or non-innovative infographics.

The infographics in article #1 make up only a small part of the article, although they seem to be extravagant and costly. In this article, as well as in article #2, #4, and #5, the focus of the visualization is on photos, image galleries, and video interviews.

F. Visual Storytelling

The image-centric articles show visual storytelling with high impact, keeping text short. The visual information is most frequently represented by interactive infographics. Although (interactive) infographics are less emotional than photos and videos, they might use color and pictograms (e.g., warning signs) to add emotion. The emotional impact of information visualization can be increased by empathy (due to the protagonist) or by visual means (e.g., design conflict). The data that is visualized in infographics represents things we need or would like to have, data on our environment or on heroes, on conflicts and values. However, they are only a way to represent reality. In three of the analyzed articles the “heroes” are humans. Their achievements are highlighted (as in #6: famous skiers, #4: world champion in table tennis) or they are strong characters representing a group of people (#1). In article #2 on water the state (i.e., the Netherlands) and active people are put forward. The “hero” in the remaining articles (#3, #5) is a means of transportation – bicycle and public transport line. The conflicts of the heroes are transformed to design conflicts by color contrast or the chosen lines in the graphics. For example, article #1 by *Spiegel* uses a Sankey diagram that illustrates the design conflict by the color flow between income levels.

The visual representations are informative. Using stylistic means (e.g., contrast, dramaturgy) they trigger emotion, provoke or explain something. However, they are never used just as decorative elements. In the analyzed articles the stylistic means contrast and curiosity have been used twice. Color contrast is used in the line charts of article #6 to distinguish between active and non-active skiers or skiers of different nationality. Irritation and surprising change have only been used once.

V. CONCLUSION

The digital long-form provides a great opportunity to present a complex topic with multimedia elements and in-depth narrative. In the majority of the analyzed scrollytelling articles

infographics are used to visualize topics of social policy or high topicality with high level of detail. Most infographics (59 %) contain core content corresponding to the topic of the article. One third of the infographics provide background information. Most of the analyzed infographics include interactive elements.

The visual representations in the scrollytelling articles are mainly used to convey and disseminate information. Additionally they explain facts and trigger emotion. Most infographics are well designed and may serve as first steps into the topic. An assertive visual entry into the story with visualized data – in combination with text – allows the recipients to take an intensive look into the topic. Infographics help recipients to gain a better understanding of space and time. The emotionality of the visualization is reinforced by visual means, e.g., design conflict like contrast or paradox.

In scrollytelling articles the text establishes the structure of the presented content, since it connects the multimedia elements and adds information. In image-centric scrollytelling text is a necessary complement to photo, graphics, and animation. Most stories provide up to seven different modes of multimodality (minimum: three different multimedia elements). All of the analyzed scrollytelling articles start with a full-width background photography or an interactive, animated visualization. While scrolling through a text-centric article the multimedia elements appear either on the left-hand or right-hand side of the screen page or in full-screen mode between the paragraphs. In image-centric articles the sequence is determined by photos, animations and (interactive) infographics. The multimedia elements interweave core and background information with text and support the narrative structure.

In the analyzed scrollytelling articles the infographics integrate current, historic, and personalized data, thus expanding the perspective of the topic in various directions. However, the individual aspects can only be adopted if the visualizations are fully perceived and interactive elements are fully utilized. The Gestalt laws have to be applied to structure the visual elements in a way that they can easily be understood by the recipients.

VI. FUTURE WORK

The presented results are based on the analysis of a small sample of six scrollytelling articles of high quality and high complexity. A continuative study will have to analyze a much larger number of articles. To avoid biased results a widespread selection of scrollytelling articles on various topics, published in different media (online newspapers and online magazines; including non-German speaking media) will have to be tested to cover different style and quality of the implementation.

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