Exploring interactive features in auto-generated articles through article visualization

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Abstract

News articles generated by artificial intelligence rather than human reporters are referred to as automated journalism. This thesis explores how to create a trustworthy representation of news articles that mainly are generated by algorithmic decisions. The hypothesis of this thesis takes the background (characteristics of the underlying system design) and the foreground (millennials news consumption behaviour) contexts into consideration in order to provide an optimal approach for trustworthy representation of auto-generated articles. A theory about algorithmic transparency in the news media has been investigated to reveal information about the systems selection processes. The principles of glanceability and the heuristic principles are applied to proposed design solutions (interactive features). The outcomes show that newsreaders are positive towards a system that is trying to encourage them to fact-check the articles. Additionally, the outcomes also contributed to the understanding of how newsreaders can consume auto-generated news.

**Keywords:** Interaction Design, Automated Journalism, Algorithmic Transparency, Auto-Generated Article, News Consumption
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1 Introduction

The world of journalism is constantly changing due to new technological advances (Pavlik, 2000). For nearly 80 years, people have turned to the TV for their primary consumption of digital news (Richardson, 2018), but that is rapidly changing. In recent years online news has become the primary source of information for people aged 18-49 in the United States (Pew Research Center, 2016), and it’s not uncommon to consume through multiple media, rather than a single media selection (Yuan, 2011). Moreover, the majority of online consumption happens through smartphones that change our accessibility to news (Ofcom, 2016) and affect the business model for news companies, i.e. how to reach out to newsreaders (Fletcher, 2016). Therefore, with new technology, the production and consumption patterns of news are most likely subjected to change, and further impacts the nature of news content and “the nature of the relationships between and among news organizations, journalists and their audience” (Pavlik, 2000).

Referred to as automated journalism, algorithmic journalism and robot journalism, news articles are generated by computer programs instead of human reporters (Dörr, 2016). Through artificial intelligence (AI) systems, this software is capable of producing news content with incredible speed, at a low cost and text practically indistinguishable from human-written text (Clerwall, 2014). Various news companies see opportunities to utilize these algorithmic systems, but the software is used differently depending on how data is provided and how involved human reporters are in the production process of news articles (Graefe, 2016). However, there are AI systems that can gather, select, organize, narrate and publish news content independently, a process that is usually well-thought-out in editorial rooms. These AI systems focus on quantitative evaluation of content and not primarily on qualitative inspection of news content, i.e. the selection of content in a comprised article can be rather random. The system domain, however, has the prerequisite for the integration of different interactive features (functions that allow newsreaders to attain additional information), through the characteristics of the underlying system design (section 2.3). Furthermore, considering that newsreaders weigh credibility in either their choice of news provider or their own competence to validate them (section 4.1.3) it can be imperative for them to understand the systems selection processes in order to form any sense of credibility towards these articles.

1.1 Purpose

In collaboration with Semsomi, this thesis’s primary aim is through means of interaction design methods and principles, explore article visualization in the field of automated journalism. By seeking to understand both the foreground context (newsreaders news behaviour) and the background context (the
characteristics of the underlying system design) I intend to explore how the algorithmic selection processes can become more transparent and understood by users. That is why a theory on the transparency of the underlying selection processes and understanding the newsreaders' behaviour will be relevant to examine this question. Beyond contributing to the relevance of interaction design in the future of news consumption of auto-generated article, this thesis will also discuss the importance of involving newsreaders in the design process, when exploring how the algorithmic selection process can become transparent. The nature of this study is speculative, i.e. revealing information about the selection process through the article interface might not be a method of interest for future news companies, and in the future, other more adaptable solutions might be discovered.

1.2 Target group
The target group are people whose primary consumption is digital news. This thesis will, therefore, focus on millennials' news consumption because studies have shown that this generation receives news from several digital sources across both social media and reportorial media (Associated Press, 2015). Millennials have a tendency to adapt and adjust to new technology faster than other generations (Nominet, 2017). Thus, investigating this young user group will be relevant to further understand how auto-generated articles can be visualized and how additional information about the selection process can be acquired.

1.3 Delimitations
The proposed design solutions and completed empirical research have been within the scope of understanding how to design for automatically generated articles for the algorithmic system on the news site Monok.com. However, there are several different linguistic systems with different processes that may require alternate solutions. Therefore, these design proposals and summarized user personas (section 5.1) should not be considered adaptable to all artificial intelligence linguistic software. There might be AI systems that have other algorithmic functions that can be better managed with transparency and that would address how to reveal more about additional information on the system's selection process as well.

Another limitation of the scope of this project within these systems of natural language generators (NLG) was that many identified interaction opportunities presented themselves, but this dissertation only investigates transparency of algorithmic selection processes. Furthermore, the design context was also limited to interactive features that could be implemented directly in the interface of news articles.
1.4 Ethical concerns

This thesis follows the ethical standards as formulated in the Codex rules and guidelines for research in Humanities and Social sciences (Vetenskapsrådet, 2017). The participants were orally informed about the research project before participating. In connection to interviews, all interviewees were asked to sign a consent form, informing them about their rights in this project. In relation to workshops, all participants were orally informed about all exercises. All participation was voluntary, and withdrawal of participation was possible at all times. All research was conducted independently and impartially. Finally, a Non-Disclosure Agreement was signed with Semsomi. This agreement gave them rights to non-disclose information that they viewed as company data.

1.5 Research question

How can interaction design methods be used to design interactive features that enable newsreaders to understand information about system selection processes in auto-generated articles?
2 Background

This chapter presents background information and relevant theories to develop an understanding of the project’s design context. The included topics are automated journalism, the partnership with Semsomi and their product Monok.com, characteristics of the underlying system design, transparency of algorithmic processes, heuristics principles, the concept of glanceability, millennials news consumption habits and related work.

2.1 Automated journalism

Automated journalism is a concept that still is in its infancy, with a primary function of producing news articles on a large scale. Several studies have already been conducted in relation to automated journalism and its possible impact on the journalistic profession (Van Dalen, 2012; Pavlik, 2013), but there are fewer studies about its technological potential for newsreaders. From the outset, the intention behind these algorithmic systems was to generate articles that felt superfluous to write repeatedly, for example, these systems mainly summed up sports results, provided weather forecasts and reported results on financial quarters (Van Dalen, 2012). However, in recent years AI technology has been developed to become smarter, more robust and credible (Ericsson, 2019). Ericsson, a telecoms company, predicts that software development will play an increasing role in journalism and media. However, rather than replacing journalists, these systems will be employed as tools in an increasingly complex and international media landscape.

Currently, when producing an article, the algorithmic system goes through a similar work process to that of a journalist. Graefe (2016) explains that the system’s first step is collecting data, this can either come from pre-defined sources, e.g. a journalist providing data, or data-mining where the system search for patterns, connections and trends to identify interesting events. The system either does that or follows predetermined rules, for example, runs per team in a baseball game determines the winner. After identifying a story, the system prioritizes insights, i.e. what is newsworthiness and what is not. For example, the algorithm is programmed to value results higher than injuries in sports games. Lastly, the system generates a narrative before publishing the story. Notably, this production process changes depending on how it is used in combination with journalists, i.e. whether someone reviews the content before it gets published. The design phase further down in this work will experiment with a system that operates solely on algorithmic decisions, i.e. there is no journalist that is feeding it directly with data or reviews the content before being published. Instead, it procures that data indirectly through the news articles it is observing and when enough information is gathered a comprised article is published (see Figure 1).
2.2 Partnership with Semsomi

Semsomi is a software agency based in Stockholm specializing in software development, modelling and product development. The company consist of a team of senior developers, computer scientists, data scientists and UI/UX designers working on various software services and products. Their technical focus is on AI and Natural Language Generation. Their primary product Monok.com is a website with an AI service that creates news articles. This service is currently being used as a journalistic tool, a business's analytical tool and a news source for newsreaders (Semsomi, 2019). However, this thesis mainly focuses on newsreaders and their consumption habits and therefore research around their preferences in the domain of automated journalism will be included (section 2.5). The next section will describe the system's functionality and purpose on Monok.com.

2.2.1 Monok.com

Monok.com, a news site focusing on user experience and community analysis is described by Semsomi as an innovative way of connecting readers to global and local news. The AI system operating on Monok.com is fully autonomous running continuously, observing and obtaining elements from news articles in 40 languages from 10000 different news sources. The system transforms a collection of news articles into one comprised article through a filtering process, i.e. the algorithm summarises articles stories and produces its own text and adds an image relevant to the new summarise text (news article). Additionally, this system also complements the article with relevant social media commentaries such as tweets, subreddits and Instagram posts before being published onto the news feed on Monok.com (see figure 2). By going through this process, the algorithm mimics most journalistic tasks, from collecting data to publishing a story. Moreover, this system is operating with little to none human inference, but the AI system it still is in need of data. This means that the process of gathering metadata (interviewing experts,
literature research and reporter agenda) is still in the hands of journalists (Semsomi, 2019).

Since this system is observing social media networks as well implies considerations when designing for this system, i.e. this system is using many sources and making several decisions on what to include and to exclude. These decisions are normally being considered carefully in editorial rooms but now gets regulated by an AI system. It can, therefore, be important to understand more about the selection process of this system in order to provide newsreaders with more context about the news articles and systems choices. It might, therefore, be interesting to investigate how users can understand what, how and to what degree article elements have been involved to generate a news article on Monok.com. For example, we could ask if this selection process is neutral towards sources or if it’s prioritizing? Another question could be: to what degree can this selection process be communicated? But, before investigating these questions further, it can be vital to understand if the system can incorporate interactive features that can help users to entail additional information that doesn’t necessarily bring about an article’s main story. Therefore, the section below will outline the characteristics of the underlying system design in order to understand what can be achievable through interaction design.

2.3 Characteristics of the underlying system design

A central and shared component in automated journalism is the algorithmic linguistic system, i.e. the natural language generator (NLG). To research the technological potential of NLG it is imperative to consider where the system operates, i.e. the internet (Dörr, 2016). This domain has the prerequisite for the integration of different media (multimediality), and article texts can embed hyperlinks which function both as linking and distribution of existing content (additivity) which allows for interaction (interactivity). By affording
interactivity, technological features through an NLG system are possible, both through text and media customization.

Studies have indicated that NLG systems can produce news articles and automatically deliver them practically indistinguishable from a human reporter’s article (Clerwall, 2014; van der Kaa, Krahmer, & Krahmer, 2014). Therefore, retaining algorithmic systems in journalism indicates both production speed and article relevance. For example, after an earthquake in California, LA Times had already produced an article about the earthquake three minutes after it had stopped (“Robot Writes La Times Earthquake Breaking News Article,” 2014).

Observing these two examples four crucial aspects can be procured of online news: Publication speed, data quality (qualitative), data relevance and data availability. If these requirements are fulfilled, these linguistic systems are capable of producing a large number of texts at any time, variety in texts, and if not interfered with, be objective in its reporting. Hence, the systems qualities on Monok.com as mentioned in section (2.2.1) indicates potential for interactive and customizable article elements. However, as previously mentioned (chapter 1) in order to communicate information about the selection process a theory about algorithmic transparency in news media is presented in the section below.

2.4 Transparency

Transparency is a subject that is widely debated in news media, particularly with new technology. Both a disdain towards and a steady decline in trust have been detected over the last decades in news media in The United States (Gronke & Cook, 2007; Turcotte et al., 2015). With the increased use of automated journalism in news media, how will this technology further impact the notion of “news media trust”?

Applying interaction design methods and principles to explore opportunities in algorithmic transparency in the news media can contribute to understanding how interactive components in auto-generated news articles can be visualised and help newsreaders filter through what they read and ensure that they receive credible news stories. Nicholas Diakopoulos & Michael Koliska (2016) conducted a study where they explored how to make the algorithmic processes more transparent in automated journalism. They discussed how the system can communicate more about itself to the newsreaders. Their findings identified four layers in which information can be disclosed about a system’s selection process.

- **Data**: If it’s affiliated or independent sources and how they were chosen, collected and sampled.
- **Model**: Disclosing editorial decisions influencing the modelling and how those choices are applied in code.
• **Interference:** How the system classifies, predicts and recommends content for users.

• **Interface:** User-focused, asks how the system can portray itself or its decisions to the user and that it needs to take either a tangible or visual form in order to be presented to the user.

Furthermore, Diakopoulos and Koliska’s study embraces designers to investigate, through interface & interaction design, how to balance information about the system's selection process and communicate it without overloading or diminishing the user experience. Several experts in their study also expressed positive attitudes towards exploring options through these design fields. Thus, applying interaction design methods and principles can be a way of exploring how to enable users to reveal and/or understand additional information about the system selection process.

### 2.4.1 Heuristic principles

In order to make an AI system more transparent and possibly communicate more additional information that does not directly bring about an article's main story, it is important to analyse how users get access to and read the presented information, that is, it should begin with understanding the user's needs (Devos, 2019). This means that the design of how to access the information and how to visualise access to information should be evaluated by the user's needs and experiences of these automatically generated articles. Jakob Nielsen (1994) outlined a set of evaluation principles for interaction design to help designers understand their users’ experiences. On the UX Collective, a web forum for user experience designers, Jordan Devos (2019) further evaluates Nielsen's principles and argues that they are still universally relevant even when a large portion of the media landscape has moved from the computer to the smartphone screen. Devos states these principles as such, “Heuristic principles for usability evaluations help identify where a UI design is falling short of delivering a user-friendly experience”. These principles will be together with a few stated design guidelines in section (5.2) applied, to some extent, to evaluate the usability in the proposed design solutions. However, the section below will discuss how theory on peripheral displays and glanceability can aid to explore how one can design and communicate additional information on the selection processes of AI software in the news media.

### 2.4.2 Glanceable

According to the Oxford dictionaries (2019), a glanceable display is, “denoting or relating to information, especially as displayed on an electronic screen, that can be read or understood very quickly and easily.” Hence, when trying to design peripheral displays with additional information about sources (see chapter 6) the information might greatly benefit from glanceability. This approach could possibly help to establish a symbolism
between the presentation and information of sources, e.g. design an interactive feature that when used can highlight colours around article elements, and if the colours would represent different news articles and their political affiliation, the newsreaders could quickly understand how much information has been taken from either a liberal or a conservative source. If this is achieved the user can focus on the main task, in this case reading the article’s main story without being disturbed or overwhelmed by additional information (Matthews, 2006).

However, to further understand how interactive functions inside articles can be designed, communicated and interacted with, it can be vital to involve intended users in the design process (Abras, Maloney-Krichmar & Preece, 2005). In order for newsreaders to understand where the information comes from and how it is generated, designers need to create an interface that ties in with their existing news consumption habits to make all the associated data readily accessible to the users. Next section will, therefore, outline millennials consumption behaviour.

2.5 Millennials consumption behaviour

This thesis particularly focuses on millennials consumption behaviour because they primarily consume digital news and particularly through social networks (Associated Press, 2015). This group of young adults consume news through a range of devices and across numerous social networks, such as Facebook, Reddit, Twitter and Youtube and other more traditional forms of news media platforms, such as BBC, Aftonbladet, SVT, etc. This form of media consumption, however, raises concern regarding the validity of news. The participatory culture model seen over social networks where users create and share content with each other opposes the traditional media model where there is usually one sender and many recipients (Fuchs, 2015). Therefore, consuming news sporadically over social media can endanger the true facts of stories for different purposes, e.g. political agendas or company interest. Furthermore, millennials are extremely frequent consumers of these social network news, 69% check the news at least once a day and 40% do it several times.

There are different pathways, methods and motives involved in their news consumption. The Associated Press (2015) define three different pathways that millennials use: A curated pathway (searching for a selected and organized source), a social pathway (bumped into on social networks) and a reportorial pathway (choose a source with reporters). The use of these pathways is topic dependent; different topics prompt different pathways. However, they can be used in symbiosis, e.g. using the social pathway to bump into an article about a political poll and then choose a reportorial pathway to learn more about its validity. They use different methods to further investigate a subject or event, but most often they turn to search engines (e.g. Google). This theory of pathways could represent a form of
transparency for users today, it forms their unique personalized route through news and the search engines works as the main road. To further one’s understanding about events or subject in news articles, this approach resonates well with findings and summarised extrovert users in section (5.1)

Thus, this young demography uses a conglomerate of methods and devices in order to stay well-informed, but what considerations are being taken to validate their news? Can interactive features intended to communicate additional information about the systems selection process align with their energy to engage, or will they only neglect these functions? According to a Dutch study made by Kormelink and Meijer (2014), newsreaders desire to control but in limited portions. They summarise user’s definition of control “to be able to consult all content whenever and wherever they want it and to be able to choose anything without having to choose anything”, see section (4.1.5). This statement indicates a balance in the presentation of information, versus, time to acquire it. Therefore, it is of interest to understand to what degree millennials want to control/understand more about different article elements. Furthermore, how glanceability and heuristics principles can aid to evaluate design solutions to fit millennials news reading preferences.

2.6 Related work

Social networks are going to great length implementing tools and formats that are appealing and easy for anyone to use. Producing news isn’t an exclusive journalistic right anymore, anyone can produce news on social networks that looks intuitive and credible. However, social media platform companies have tried to apply tools to filter out non-credible news.

A project developed by Facebook back in 2017 looked at the possibility to give context to articles posted on their social platform (Smith, 2018). They designed a feature intended to inform users on the origin of the article’s publisher and their relation to other articles. The design was grounded on research that investigated people’s news habits and motives. They primarily explored how to present information on social networks and more narrowly in the users feed. They developed an information button that included background information, related articles and third-party information on the publisher.

This does, however, differentiate from this thesis investigation on how to convey additional information on its selection process. But the design decisions may be interesting for our purposes as well in that they prevent users to leave the site in a single click. Instead, they provide information at a glance in users’ feed after the first tap on the button. Although this decision might be connected to the social media market concept of connectivity (Van Dijck, 2013) their data might have indicated that users aren’t interested in being sent to external pages, this might confuse their understanding of an article’s story. This work does influence how the design can take shape in this
work as well in that the button is glanceable, easy to use and retains the user on the same site.

2.7 Summary
Automated journalism is a system advanced enough to produce texts for topics like politics, technology, crimes, etc. These systems have become smarter, more robust and reliable. Specific systems encompass technical components that afford a method of combining previously produced news stories from different sources and summarise these into one article for newsreaders. Semsomi have developed a variant of this system and they are interested in improving visualisation of these auto-generated articles. Through understanding how interaction design can be applied in the domain of news consumption in the future, this project can identify how methods and principles can further empower newsreaders. A designer needs to consider how data is presented and communicated, in order for users to find it relevant. Therefore, it will not be enough to purely understand millennials consumption habits for this project’s design context, but also to understand how their habits are susceptible to design features intended to disclose additional information on an algorithmic system selection process. Thus, empirical research will include exploring newsreaders behaviour parallel to their thoughts on auto-generated articles. The primary aim of the research is to frame personas that can facilitate design guidelines for an explorative design phase encompassing an understanding of both newsreaders preferences and the technological potential of the AI system on Monok.com.
3 Methods

Chapter three will explain all the methods that were used and why they were used for this thesis. How methods were conducted, and insights were gained are addressed in the design process (chapter 4).

3.1 Double diamond

This thesis design process followed the double diamond model (see figure 3) as presented by the British Design Council (2007). This design model is divided into four different phases, discover, define, develop and deliver with each phase altering between a convergent stage and a divergent stage. The first phase of this model encourages designers to find an initial idea, design opening or problem (see section 2.7), based on an understanding of end-users, in which the final design will be intended for. This is followed by the second phase which is a divergent phase, here the procured insights are condensed and formulated into design challenges. These challenges are then evaluated and filtered depending on the scope of the design project, into a few prototypes where they get created, iterated and tested. The final and last divergent phase includes improvements, iterations, final testing and final results.

![Figure 3: The double diamond model as presented by the British Design Council (2007).](image)

3.2 Literature studies

Literature studies have been conducted to understand theoretical and technical perspectives in automated journalism and consumers consumption behaviour. Since the field of automated journalism is still in its infancy, reviews of previous research have been conducted mainly on digital articles. Meanwhile, books and other official websites have also been used to inform
on topics such as social media, and millennials’ consumption behaviour. Outlined theories from relevant areas will be discussed in connection to this thesis design phase and its findings (Muratovski, 2016). Furthermore, an area of opportunity for interaction design was identified in a paper on algorithmic transparency (Diakopoulos & Koliska, 2016), experts from this study expressed positivity towards interactive solutions, further clarification can be found in section (2.4). Moreover, literature studies were also conducted during the research phase in order to complement field studies findings.

3.3 User-centred design

User-centred design is a process in which the user’s involvement influence and shapes the project’s design. There aren’t necessarily any particular moments where a user should be included, but it is important that they are. Their involvement can range from first user interviews to last user tests. There are three levels of users, the primary users who will use the service frequently, the secondary users who will occasionally use it and the tertiary user who will be affected by the use of the product. Throughout this process all three user groups have been involved, ranging from primary users’ involvement in user testing to tertiary users such as editorial manager in the empirical research about the future perspectives on automated journalism (Abras, Maloney-Krichmar & Preece, 2005). This design principle is important for this project because how the users would like to understand the system is crucial to addressing the hypothesis for this project. Therefore, it is important to understand what information they want to understand, why they want to understand the information and how they would acquire it.

3.4 Field studies

This section will describe how different interaction design methods have been used throughout the empirical research. First, it explains what the particular method is aimed to do and secondly, how it’s been structured to extract insights for this particular project.

3.4.1 Semi-structured interviews

An interview is a method used to gather qualitative data and get a better understanding of the user, moreover, according to Muratovski (2016), semi-structured interviews are a hybrid format of structured and unstructured interviews. This method affords both open-ended and close-ended questions. The primary goal of an interview is to gather information on a particular subject. For example, this thesis design context found newsreaders behaviour, the systems selection process and journalistic expert opinion on two latter subjects as relevant perspectives to pursue. Semi-structured interviews should also be planned ahead of time in order to be prepared and extract correct information (Cooper et al., 2014). It can also be beneficial to
have users in the same environment where the product will be used. However, since this thesis design context is dominantly in a digital environment it can also work to have the interviewee in an environment of their choosing making them comfortable. All interviews were decided to be conducted through a semi-structured format because they often unfold into a conversational manner (Longhurst, 2003), considering that I was a novice in both the fields of artificial intelligence and journalism it seemed most suitable to use this approach with experts. This method generated opportunities for questions that weren't considered in advance.

3.4.2 Focus group

Focus groups are structured and moderated group discussions used to reveal a target audience’s preferences, recalled experiences and priorities. Ideally, the environment should be a place where participants can feel comfortable enough to reveal thoughts and ideas, the purpose is to reach a state where users discuss their core experience on issues and assumptions. Focus groups can come early in the design process to unravel users’ experiences but they can also come at later stages to discuss products and services (Goodman et al., 2012). This thesis conducted a focus group in the later stages of empirical research before the ideation phase. The intended value of this focus group is to understand what article elements and article structure they prefer. By understanding more about newsreaders preferences from existing news-sites and to hear their thoughts about Monok.com articles will help to evaluate two things: First, what existing articles do good with critical features in their articles. Secondly, understand how Monok.com current article interface is visually experienced and how potentially new features can be implemented. Lastly, conducting this exercise that facilitates discussion well, will also provide somewhat of a consensus on article elements millennials value higher and therefore can limit the design scope.

3.4.3 Personas

Szerovay (2017) explains that insights from the field studies can be categorised and used to create personas which are represented as an individual. However, Cooper et al. (2014) explain further, when one is creating a persona it is important to not include all user’s needs, trying to design for every possible user and their interest will just overload concepts with too many features, enabling the risk for confusion. Instead, a persona should concretize a large group of users into a few goals that will be reflected in the design. Hence, a persona should be formatted as an individual and be based on user research. In regard to this project, the purpose of this method is to concretize a few features that can be pursuable instead of overloading users with too many features. The auto-generated articles on Monok.com have the capacity to implement many features and article elements and that is why this method can limit the design scope and features. This method will also be used to frame design guidelines for a design opportunity.
3.4.4 Brainstorming

The main purpose of brainstorming is to generate many ideas in a short period (Arvola, 2014). The ideas shouldn't be restricted by what might be achievable, but rather ideas should be encouraged to be challenging and irrational. The first step in this process is to write and identify reasonable challenges, issues or questions. It is important that the challenge isn't too broad or narrow; too broad and it might be hard to ideate, and if it’s too narrow it might be limiting to creativity. The first step of a typical session is to write down a challenge in the case of this thesis that is “how might we” question. Participants write down ideas to solve it and usually a session like this can take 10 minutes. Furthermore, Arvola argues that it is preferable to do several smaller sessions than one big. This method will be useful to this thesis in that when a design opportunity has been identified a brainstorming session can help to understand how that opportunity can be explored. Since this thesis will limit the design scope down to few features understanding how to implement one of these features can benefit by brainstorming ideas around. This thesis had two sessions, one for navigation and one for visualisation of additional information, see section (5.5).

3.4.5 Prototyping

Prototyping is a method aimed to manifest design ideas into prototypes that allow users to interact with it and explore its usability. A prototype can be anything from a paper-based prototype to a complex software solution, as long as the prototype is simulating the scenario of use it can be viewed as advantageous. Beneficial results of using prototypes as a tool to facilitate discussions about current and future use with stakeholders. It helps to distinguish between the users' thoughts and ideas and the designer's intended ones. By involving the user in this process will help to evaluate how design can meet the users’ requirements of use. This is especially important for this project since it is seeking to understand how sources can be understood through other means of visualization without disrupting the user from reading the main story (Sharp, Peerce & Rogers, 2015). So, this method focuses both on the visual composition of elements and the feeling of switching between modes of view.

3.4.5.1 Low-fi prototyping

Low-fi prototyping is a useful method when a designer needs to produce simple, fast and inexpensive prototypes. The method should not be time-consuming, and it does not have to look like a finished product. The purpose of this method is to encourage users to easily criticize a prototype. Although low-fi prototypes can be a combination of sketches and images, it can sometimes be daunting for some designers to sketch because of limited skill but it is important to note out that sketching is not about drawings but about the design (Sharp, Peerce & Rogers, 2015). It is simply easier to change the design of a low-fi prototype than hi-fi prototype, i.e. a user can add
components when they see that it wasn't time-consuming for the designer to make them in the first place (Snyder, 2003). This was a useful method to deploy when making fast iterations during the design phase.

3.4.5.2 Hi-fi prototyping

A hi-fi prototype can look like the final product and often offers more features than a low-value prototype. For example, a sketched news article would be considered a lo-fi prototype while one designed in Adobe xd can be seen as hi-fi. Hi-fi prototypes are often tested on the intended use screen in this case that would be a smartphone. They are easier to navigate due to more advanced features, but they are also more difficult for users to criticize (Sharp, Peerce & Rogers, 2015). It was important to prototype hi-fi prototypes to try multiple access points and understand the actual design space of smartphone screens (see section 6.5).

3.4.5.3 Usability testing

Usability testing is a research tool that uses people who are representative of the intended user group, as they are often seen as experts on the product. Usability tests can range from a large group of people who try a product/service to an individual user, it depends entirely on the scope and purpose of a prototype. The purpose of usability testing is to inform the design and eliminate frustrations and or problems the users experience. By doing usability tests, an interaction designer can learn what the users think is important in the prototype, how the user wants to acquire this information, how the user feels at the same time as they do the task and whether they think the service/product is efficient to use (Rubin & Chisnell, 2008). Moreover, since this study focuses on the visualization of articles that contain an interface, it is necessary to understand how the general layout, placement of controls and navigation feels (Saffer, 2009). Due to the fact that there was a lot of information about the prototype that needed to be evaluated visually and navigationally, it happened that participants and moderators discussed the users’ thoughts and actions. Usability testing is very important for this thesis in order to understand the relationship between users’ news reading settings and how information can be designed and communicated to suit them.
4 Research phase

The first part of the design process outlines interviews, observations and a focus group. This includes how each method was carried out, and how insights were obtained and summarized before proceeding to the next activity.

4.1 Interviews & observations

In order to grasp the entirety of the design context, interviews have been conducted with three different stakeholders. A system developer was interviewed to understand the background context, i.e. the systems selection process. Millennials were interviewed to understand their news consumption behaviour and motives for reading the news. Sydsvenskans editorial development manager was interviewed to give an expert view about automated journalism and newsreaders habits (see figure 4). A total of six interviews were conducted, five interviews were done face-to-face in a comfortable environment and one was done remotely over Skype. For interview templates (see Appendix). The insights will be reflected and discussed in each interview section (4.1.1, 4.1.2, 4.1.3) and the overall findings will be summarised together with observations in section (4.1.5).

Figure 4: The interview methodology to get a broader understanding of the field.
4.1.1 System developer interview

The first interview was made with one of the Semsomi’s systems developers on the production process auto-generated articles. This interview began with an introduction with the interviewee being informed on the theory surrounding algorithmic transparency, i.e. possibilities for transparency of the systems different layers, see section (2.4). This interview focused immediately on the news production and selection processes. Two interesting insights were gathered from this interview which both complemented and added to the theoretical research. The first insight revealed that Semsomi’s system developers haven’t formalized parameters specifically, but rather these are connected to how the system clusters articles. The second insight is that the AI system on Monok.com doesn’t predict and/or recommend any content based on data drawn from newsreaders preferences. This insight eliminated further research on how to understand the systems prediction and recommendation processes. However, subsequently, it also shifted this thesis focus towards “system neutrality” in its selection process, i.e. if the system is prioritizing specific sources and article elements when producing a news article. Hence, some follow-up questions were asked after the interview on how the system ranks article elements from different articles. For example, one follow-up question examined if four different articles, each containing a video, were clustered to become one article, which video is then prioritized?

Evidently, their system looks for quality and relevance of article elements, quality is purely associated with technical issues and not with who produced it. For example, a video component can be selected based on HD or YouTube quality. Therefore, conclusively this system has no source prioritization. It isn’t biased towards any source, but rather, based on technical parameters operating in a neutral mode and scrapes from what it can detect. Thus, two opportunities within interactive article visualisation were identified for the systems selection process: Either to understand how much the system has extracted from different sources, or, how this could be customized by the reader directly in the article’s User Interface (UI).

These insights prompted the empirical research to move towards the systems foreground context where an editorial development manager and intended users were interviewed. This interview approach focused on both forming a critical reflection and understanding users’ interests (see figure 4).

4.1.2 Editorial manager interview

The interview with the editorial manager was conducted at Sydsvenskans headquarter in Malmö for an hour. The purpose of this interview was to gather information from an expert about technology in journalism and newsreaders consumption habits. This interview started out by asking intended questions, but it quickly unfolded into a conversation where the discussion often traversed the interview questions. The interview began with
a small introduction to this thesis topic and quickly moved to discuss auto-generated articles. Afterwards, it moved to discuss transparency in news reporting and how transparency might be valued when articles aren’t always written by human reporters. The conversation also covered some earlier insights Sydsvenskan had acquired several years back in a study about users’ behaviour. One insight Sydsvenskan gathered in their study revealed that newsreaders tend to say one thing theoretically but practically act a little differently. For example, it showed that despite nine out of ten interviewees claiming that they read and saw the editorial page as important, only two out of ten actually took time to read it when observed in practice at a later stage. This finding inspired this current research to observe users’ habits which will be further explained after user interviews in section (4.1.4).

Another insight gathered from interview revealed that newsreaders often prefer articles that aren’t swamped with too many multimedia features, for example, recordings, videos, images, etc. The interviewee explained that just because there is potential to implement new features into an article doesn’t mean that it should. He emphasised that simplistic design in news often is received well by readers and that presentation also factors in on how newsreaders perceive news articles. Furthermore, another insight or rather a point he expressed was that customized articles might have value, but it depends on the degree of customization. This subject is further discussed in the next section with the user interviews.

The interview with the editorial development manager informed this project’s design process on users’ habits in that it can be useful to observe their habits rather than relying on answers to questions alone. Another insight procured from this interview also revealed that articles often are received better with a fewer set of features rather than incorporating too many. This can be interpreted as newsreaders valuing the articles main story the most and that the focus should be on it, even when you incorporate new features. Lastly, this interview also confirmed some suspicion raised in the Background chapter (chapter 2) on the degree to which a user is motivated to use interactive functions inside articles. The section below will continue to discuss newsreaders habits.

### 4.1.3 User interviews

According to Cooper et al. (2014), it is imperative to understand if there are a different type of users of the product, thus different users were identified in (section 2.5). These differences are based on how they access news either through social networks or media platforms, or how they navigate through the news. Substantially meaning, when they want to know more about a particular story, they filter differently through a news article. Four user interviews were completed, all interviews followed a similar semi-structured template. All interviews began with warm-up questions, it focused on understanding how they access news, how long their sessions were and what
elements that draw their attention towards a particular news story. In the second part, questions focused on general issues, e.g. how they navigate in order to receive more information about a story and how they validate that information. The third part of the interview focused on future scenarios how they feel towards a more interactive environment in articles. Furthermore, the last two interviews also included an observation session. This decision was made because of what the editorial manager expressed about readers contradicts themselves with what they say and do. Therefore, as part of two interviews, observations were made to view whether their verbal answers aligned with their actions, see section (4.1.4).

A peculiar thing which is also reaffirmed in the background research is how all the users used different pathways to access their news. However, although they used different pathways, their shared concern for credible facts was clarified when they all said that they question the origin of facts in articles. This is also applicable to what the editorial manager said about young newsreaders. All interviewees explained that often the article isn’t covering the entire story and that it is missing important pieces of information on earlier events related to the story or about specific people mentioned in the article. Therefore, when they wanted to understand additional information around the story or on the story itself, they turn to a search engine to find out more (transparency of news media). Interestingly enough, one interviewee did turn to the comment section on subreddit to get the community to connect different parts and events of a specific story, which correlates with Rachel Botsman’s (2017) theory about distributed trust. She explains that there is a risk of vulnerability to go from the certain to uncertain, “...to trust new offerings, so that the initial risk of trying something new quickly becomes irrelevant”. So, successfully this interviewee had taken that leap of trust by relying on other readers in a distributed community. But it had however forced him to be more scrutinising in return of this service. This is valuable information because this can be compared to someone putting their trust in AI systems to provide news to them. How can we help people take that leap of trust?

Furthermore, users also expressed that they often have to navigate between websites a lot and they preferred it to be as little steps as possible. The only time they preferred to take more steps was when they explored news feeds. Plus, many of the interviewees expressed concern regarding too much control about what they are exposed to in their news feed, they rather have the opportunity to explore than to make too many personalized decisions. What they fear is that too much personalization will result in a limited view of news and facts and successively make them “news fatties” as described by Kormelink & Meijer (2014). By being exposed to a range of different news topics they are able to form a broader view of society, as one interviewee put it: “What we can read in the news is a reflection of society, it’s who we are.” Thus, they have a fundamental understanding over the issues they face when
reading news, that news should be validated if they come from social media, and that their perspective of the world isn’t necessarily the only perspective in the world.

Another gathered insight was how users constantly go between an active and passive stage when reading the news, connected to what the editorial managers expressed about newsreaders treating the news like a tv with different channels, i.e. they are “zapping” through news articles. When brought up all interviewees concurred but expressed it was more of a routine habit, to ensure up-to-date information on current news events. This form of reading does not provide newsreaders with an in-depth perspective but more superficial because of consumption speed. Regarding credibility all interviewees expressed importance over their choice of news dispatcher, however, their view about which one was credible did differentiate. While some explained that if the news dispatcher was state-owned, they trusted it completely, others said that they trusted their own decisions, creating their own method (see section 2.5), to find out if a story was credible or not.

4.1.4 Observations

Something that several interviewees expressed was their interest in news that provided different perspectives on stories. However, their ambition to pursue proved to be a big difference during the observations. This primary insight gathered here was how their interest in finding several perspectives on news lacked significantly more than expressed. This is of course not a criticism but rather raised questions surrounding why that is. Interviewees were asked afterwards why they didn’t pursue it and apparently it is more about how convenient the information is at hand. If different perspectives are close at hand, they will look at it, but they don’t actively search for it. So, by aligning this with an early interviewee’s answer, “If a function were to present itself, I’d probably try it out”. This means that the interviewees might not want to pursue too much information about a story but rather show interest if something was presented. An insight that supports what Kormelink & Meijer (2014) explained, that newsreaders are unwilling to customize too much themselves, but if presented in a way that requires little to none effort sparks motivation to test it out.

4.1.5 Interviews & observations findings

The background context aimed to understand how the algorithmic system worked. Insights revealed that Monok.com does not predict and/or recommend information neither does it prioritize sources and their elements. This has shifted the project’s design context to explore more information about the selection process and/or selected article elements and how that can be communicated to the newsreaders. These insights, however, were also compared to what an editorial manager expressed about new technology in news articles. He expressed that too much information and/or features might distract the reader from the articles main story, so if more
information/features are added it should be carefully considered in relation to users' willingness to use them. Therefore, the foreground context aimed to understand users’ motives, habits and behaviour when reading news and how that would align with new interactive features. Findings of newsreaders behaviour showed that they have different motives and they can be categorised into either being socially motivated, meaning that they enjoy the discussion around a news story, or personally motivated, meaning that they read news for personal growth and understanding of our society. When it came to interactive features, users seemed conflicted if they wanted to interact or customize too much, they like to read the stories fast, however, if the information is intuitive and convenient to use that could be of interest. Therefore, if designing a feature, it needs to align with the user's willingness to explore it. Newsreaders do like to explore as long as they don't lose track of the main story. The section below will explore article elements and article structure in a focus group.

4.2 Focus group

After summarising data from interviews and observations as well as keeping in mind the technological possibilities of the system on Monok.com, a focus group were conducted. Four participants including two earlier interviewees were invited and participated in this activity. Each exercise was performed in groups of two in order to have participants discuss their decisions between themselves. This team arrangement aimed to inspire imagination and motivation to the participants. The teams were given two different articles to work with, one article from svt.se and one auto-generated article from Monok.com. This focus group was structured into three tasks over two different phases. The first task teams had to customise an article using adaptability cards. The second task informed them to build that same article but from their own preferences using content and pillar cards. The third assignment was evaluation and discussion surrounding the first two tasks and this evaluation phase were moderated. The teams were asked to explain their choices for both the moderator and the other team, both what elements they made adaptably and why they made them adaptable. The “why” question here was particularly important in order to establish users’ thoughts for customization and/or interaction of particular article elements. The primary intention was to understand which elements they found most lucrative to adapt or interact with. By seeking to understand what and why they want to interact with certain elements, will help to inform which article elements they’d prefer to explore interactively. Furthermore, since the articles on Monok.com include more external information than articles usually do, a discussion was sparked between the participants about the structure and presentation of information.
4.2.1 Exercise 1

Six adaptability cards for assignment one was used, the official, unofficial, complexity, quantity, length and language. These cards were decided to be involved because they could almost be used on any element inside the article. By allowing participants to place them upon any article element also revealed how often they changed a specific element. The cards were colour coded to help participants differentiate them. The aim of this exercise was to get the teams to write or place these cards on the article (see figure 5 & 6). The reasons for choosing these six cards were that they are applicable to almost all the different article elements. Official and unofficial touches upon sources and credibility of news. Complexity looks towards how well one wants to understand the situation, i.e. a topic about biology, some readers would want the field's terminology, while others might be okay with being able to understand the story. Quantity focuses on allowing newsreaders to decide for themselves what they want to add or remove, this could also show how often they are willing to remove or add an element. Length and language are used to see how often they want to interact with the text and if they are it might be interesting to pursue new interactive features for text. Below is a list of the adaptability cards.

- **Official**: Adapt an article element to have partly or only official sources.
- **Unofficial**: Adapt an article element to have partly or only unofficial sources.
- **Complexity**: Increase or decrease the difficulty of elements, e.g. text level could be changed to fit someone with lesser reading knowledge.
• **Quantity**: Add or subtract elements inside an article.
• **Length**: Extend or shorten article elements, e.g. shorten or extend text length.
• **Language**: Change language on article elements.

### 4.2.2 Exercise 2

![Figure 7 & 8: Builds of articles using pillar and content cards established on user preferences.](image)

The second exercise included teams to take the same article and build their own version using “pillar cards”, these cards were not optional, see the list below for pillar cards. They were also given “content cards”, these cards could range from multimedia to hyperlinks, but these cards were optional. The aim of this exercise was to establish their preferences for external information relevant to an article story (see figure 7 & 8). This exercise led to a few valued insights on information hierarchy. Firstly, both teams indicated a desire for clear facts on the story and all other information was secondary if other information were to be incorporated it should be so either after or around. Below are the pillar cards:

• **Headline**: Headline of an article.
• **Content**: Any form of content, e.g. image, video, text, etc.
• **Sources**: Sources used to produce the article.
• **Time and date**: When an article get published.

### 4.2.3 Exercise 3

The third exercise was a group discussion where participants choices and builds were discussed. The first exercise revealed that participants wanted first and foremost only official sources and that they also wanted to be able to extend or shorten the article text. They also discussed that certain elements
were not of interest depending on the situations. For example, if they were on a bus, watching a video was not attractive, element in that situation and they rather have more text. They also discussed that they didn’t want implicit interactions on the website referring to videos that play without being instructed to do so. When it came to the article on Monok.com they all said that the presentation of the news article made it hard to follow the story. What elements belonged together, and it was also hard to point out where the story began and ended. Moreover, they continued to affirm what was discovered in the interviews, that the most important element in a news article is the main story. However, when it came to the news article on Monok.com they said that it was equally important to understand the sources and what elements were connected to which source. When it came to social media elements participants thought that interacting with such elements in an article was unnecessary since there are other platforms that are doing it better. But they did agree that some social media can be interesting to understand more about the story.

4.2.4 Focus group findings

Findings indicated that article presentation and sources were objectively most relevant and desirable elements to adapt/interact with. Social media were an element that was viewed as unprofessional but could be convenient if one were interested in different opinions and understanding more about the story. Participants wanted the possibility to understand source information and if they wanted more about stories from other media expanding the article or including navigation tools could be interesting. This led to a discussion about digital space and how to work with it in order to provide information without disrupting the main story. Newsreaders do emphasis importance in concrete and concise facts through the clear structure.
5 Ideation phase

Firstly, this section describes how insights gathered from interviews, observations and focus groups were combined in two different personas. Secondly, design guidelines based on these personas and background research on the technical potential of automated journalism are formulated. With these guidelines, some “how might we” (HMW) questions are framed and used for brainstorming sessions to generate design opportunities.

5.1 Personas

First Persona (see Figure 9) focused on extroverted newsreaders who read for social interactions around news stories. These users value discussions about news and often listen to several perspectives to formulate their own opinion on various issues. As one interviewee said, "I prefer when users can help me understand the whole story", meanwhile another interviewee expressed concerns about biased media, "I know big news sites are doing their research and should be valid, but I feel many papers writes with a certain bias". But even if their interests lie in creating their own view of events through a community, they recognize that reportorial media are credible and important for them to validate news stories. Hence, it was not an unexpected comment when these newsreaders expressed frustrations about moving between websites to validate information often, because of having to move from social networks and reportorial media.
The second persona represents introvert newsreaders whose priority is to keep themselves informed about society's concerns for personal growth (see Figure 10). They attain knowledge and update themselves on the latest events. For example, when asked why they read the news, an interviewee expressed themselves as such, "sometimes I read the news to get empathy with other people and what they are going through, reading news means something more than just passive consumption of the latest events". These readers often perceive credibility in relation to their choice of news sources, as an interviewee framed it, "I read SVT because they are governed by the government's rules and laws". It indicates that they do not validate as much as people who read news from social media platforms, but that they put a lot of trust in their news provider.

Both intended user groups value credibility and actively seek it out, and although their paths differ and their main reason for reading news is not the same, these newsreaders can still be considered very aware of why and how they read the news. But it is important to note that there were newsreaders in the empirical research who do not necessarily consume news with this thought-provoking technique but instead read the news to fill the time and update themselves on events. So why were they not summed up in a persona?

In order to understand new technology and ideas, it is important to include how they are spread and why they are spreading as well as understanding how much they are adopted and communicated by different users. Everett Rogers (1962) popularized a theory that tried to explain how, why and at what speed technology and new ideas spread. He defined five different adopters, ranging from the innovators to the laggards. In this spectrum of adopters, there is a group entitled "early adopters" (13.5%), which follows directly after
the "innovators" (2.5%). This cluster of “early adopters” dare to adopt new methods because they are more critical of what they read, due to their ability to adapt and communicate new ideas and technologies. Therefore, the identified newsreaders (introvert and extrovert) will be the users testers during the design phase.

5.2 Design guidelines

According to Mattias Arvola (2014), it is important to understand that when designing a product, one is not only designing a product but also how to use a product and how it feels when using it. Therefore, it is good to develop a vocabulary and criteria that address the use and experience of a product. From the two personas, seven qualities were framed (see Figure 11). To explore these qualities a few criteria should be met, as is shown in this picture. Design concepts should aim to fulfil feelings of credibility, objectivity, easy to navigate, explorative, personal and/or community and storytelling.

![Design guidelines]

Figure 11: Design guidelines aimed to be experienced by users when testing prototypes.

5.3 "How might we?"

Consequently, personal design guidelines and technical insights on Monok.com generation system were taken into consideration, some "how might we" questions were presented to reach a design opportunity.
A. How might we communicate additional information about sources
without having the newsreader lose track of the story?
B. How might we redesign articles layout to incorporate external but
related information to the story without overwhelming the user?
C. How might we facilitate a discussion between readers, about the story
through the articles interface?
D. How might we redesign additional information about mentioned
people, places and/or organisations without having the newsreader
lose track of the story?

All of these questions are relevant from a newsreader’s perspective, but they
are not necessarily relevant to the understanding of algorithmic selection
processes. Question A is relevant because it integrates information about
system selection and source management. Question B is semi-relevant
because it tries to structure the choice of information but does not question
selection processes. Question C is not within the scope of background
research because it does not attempt to understand the system’s decisions.
Question D is relevant because it asks about the system’s choices of external
information and tries to understand how the system decided to use them. For
example, a Wikipedia page about an important person can be revealed
through a selection mechanism over the text. But ultimately, question D will
not be explored since the sources were more crucial to the users according to
the results of this study’s empirical research.

Henceforth, the follow-up of how to communicate additional information on
sources will be examined in the design phase. The insight into the
participants’ concerns about managing too much information will be
considered when making design decisions. Exploring sourced data also
resonates well with the intended design guidelines, as the question embodies
an exploratory, navigational, objective, credible and narrative aspect of
reading auto-generated articles. Finally, this question can be tested with
extrovert and introvert newsreaders, as they see sources as an important
element for reading and evaluating credibility in the news.

5.4 Choosing device screen

Before generating design possibilities, this thesis will limit its scope to a
screen-based device. Newsreaders are limited to the operating system they
use and the device’s general functionality, for example, the hover effect is
easier to achieve with a mouse pointer on laptops than the touch on
smartphones. Therefore, it is important to ask which UI screen should be
examined and designed for. According to the US Press Institute (2015),
millennials often use their smartphones as an access point to the news and
they do not spend many minutes in each session. This was further confirmed
by the dissertation’s interview participants who revealed that mobile phones
are their primary choice of unit for news consumption in short sessions.
Therefore, exploring how to access and navigate through additional information in short periods will be the design context for the design phase.

5.5 Brainstorming session

The brainstorm sessions were divided into two sessions, the first session looked at how to present source data and the other looked at how newsreaders can access this source data (see figure 12). The first session produced two different visualizations of the sources, a chart and a spectrum. These visualisations seemed most interesting because of their ability to give an overview of a lot of data (see figure 13) with a quick overview. The second session identified three different functions as potential access points. The three identified access points were sliding, button and force touch, there were other functions, but these three shared a cultural understanding of its use - people already know and accept these forms of interactions. However, these functions will not be determined until you know how the representation of information is perceived. The access to the information is insignificant if the visualization of the information is insufficient. An iterative design method is based on testing these different functions and presentation formats.

![Chart](chart.png)  ![Spectrum](spectrum.png)

*Figure 12: Two different visualizations ideas to quickly inform users on a lot of information. The square boxes in different sizes, represent different sources.*

![Sliding](sliding.png)  ![Button](button.png)  ![Force-touch](force-touch.png)

*Figure 13: Three different access points to the additional information were ideated during the brainstorm session.*
6 Design phase

The following sections will describe three different prototypes with their own source data visualization and various functions. Each iteration will have a usability test with the prototypes and discussed findings.

6.1 Low-fi prototype (chart)

At the first iteration, the prototype was constructed with paper and sketches. As previously mentioned in methods (chapter 3) when prototyping with paper, the user can more easily criticize the prototype because they can see that the prototype has not taken much time to produce (Sharp, Peerce & Rogers, 2015), in addition, one can sketch on the existing prototype. This prototype did not attempt all access points, it only attempted the button as a simulation to obtain the visualization (see figure 16). In order to test these access points, the simulation was done upon the paper prototypes, where participants were asked to either click on the button and the visualization was then unfolded and presented. Regarding the scrolling mechanic on the phone, the table acted as long scroll interface with one paper with a hole in it simulating a smartphone screen and one paper underneath having a long article (see figure 14 & 15).

The chart is divided into two spectrums between liberal to conservative news sites and actually accurate reporting to fabricated reporting (see figure 17). Moreover, it looks at the article's extension (designed as a square) or independent (designed as a circle) to politics. Inside the visualization, the
newsreader can either get a quick overview of the selection process of sources or navigate between the source by clicking on the different circles or boxes. The design is trying to give the user a quick and simple overview of the visualisation because, from earlier interview findings, newsreaders do not have to spend too much time with articles and often want to validate information quickly. This concept can also be viewed as to avoid overloading the user with too much information immediately inside the article by having a separate screen for the additional information.

Figure 16: Button visualization.

Figure 17: The representation of additional information showing a chart of conservative and liberal affiliation as well as how factually correct the articles are.

6.1.1 User test one (chart)

Three participants from the interviews also tested the low-fi prototype with both introverted and extroverted newsreaders. The participants were questioned about their motives and habits for news reading and placed in a persona in accordance with their responses. These tests were performed in a home or work environment. A few questions were asked about how well the
algorithmic system communicated with them about source information and if they ever felt disturbed/separated from the main story when they tried to understand the different sources.

Although good insights were gained from this user test, this method was still not optimal for two reasons. First, the text on data visualization may have benefited from clear digital text rather than handwritten. Secondly, the feelings of access points were not fully experienced on paper. Therefore, in the next iteration, a digital prototype will be designed rather than in paper. Furthermore, the results revealed that the presentation of source data consisted of too much information, the participants felt that there was a lot of information to analyse. They continued to say that it was time-consuming, which resulted in them feeling separated from the article’s main story. Participants felt that the visualization needed to communicate the information quicker as one participant stated: "it is not about understanding every detail of each source but rather getting the underlying fact, if can we trust the article or not". Ideas were derived from these comments on possibly making information more glanceable (Glanceable, 2019). Glanceability, as mentioned in section (2.4.2) the information should not be distracting the user's main task, in this case reading the article’s main story, but rather enhance it. When information was absorbed participants said that the visualisation gave a good overview of the information, one participant said unexpectedly “the article is in the yellow section, therefore, the article could be seen as a fair interpretation of the story” (see figure 17), this observation came as a surprise because the visualization was not designed to communicate that particular information. This led to ideas to possibly communicating a summarised view of different parameters, e.g. political spectrum, fair/unfair reporting or trustworthy/untrustworthy news sites. They also expressed that they weren’t sure how different sources were related to different article elements. Regarding the access point (button), participants said that it wasn’t entirely clear what the illustration was about and that a description can be needed, at least for a beginner.

Subsequently, the next iteration should examine how to visualise information so it is more glanceable and decide which additional information should be communicated. For example, should the visualization communicate the credibility of articles? Or communicate sources that have been used to create specific item elements? Or communicate an overview of different parameters? Or all combined? Moreover, access points must indicate that additional information exists and perhaps what the additional information is about.

6.2 Hi-fi prototype (spectrum)

The second iteration a few digital prototypes were created. These quick digital artefacts with different access points were created in Adobe xd (Adobe, 2019). They were explored together with different political affiliation spectrums,
using colours to indicate unique sources (see figure 18). These digital prototypes contain one political article from Monok.com with elements such as video, image, text, headline, and quotes. These auto-generated articles as mentioned were combined by different sources, in this instance, the article contained six different origin sources. Two articles were affiliated with conservative news sites, two with liberal and two from neutral. In order to access these sources, the newsreader had to slide or tap a menu into the screen. A magnifying glass, a hamburger-menu and a half transparent tab were designed to indicate that there was more information to get (see figure 19). Regarding the visualization of source data, different articles were presented as coloured circles on a political spectrum ranging from conservative to liberal bipartisan. Each circle represented a particular article, e.g. the orange circle (see figure 21) indicates that it is conservative, and it was scraped from Fox News Channel. The functionality of these circles varied from prototype to prototype, for example, one prototype displayed the associated article when clicking on a circle (see figure 22) and another sent the user back to the article with a new indication (coloured squares) around article elements that specific article (see figure 20). Lastly, in order to achieve a more seamless experience, a force-touch mechanism was simulated upon each article element.

Figure 18-20: The left image (figure 18) portrays the spectrum visualization with a Fox news image. The middle image (figure 19) presents the three different access points figures. The right image (figure 20) portrays a coloured square indicating which sources were used to create that element/section.
Figure 21: When a user clicks on the purple circle an article is displayed associated with the circle.

Figure 22: This image portrays how close the orange circle is conservative, meaning that this circle represents an article that has an affiliate with conservative values.

6.2.1 User test two (spectrum)

Seven participants tested these digital prototypes three of whom participated in the previous iteration. This prototype was tested on a smartphone screen which made the feeling of testing it more authentic. Participants were asked to read the article and understand where the information came from, i.e. did they come from a liberal, conservative or neutral source. Additionally, similar questions to that of the first user testing were asked, if they felt that the system was trying to communicate additional information about sources and if they ever felt disrupted from the main story.

Findings showed that the access point, particularly the hamburger menu, was understood quickly by a majority of test subjects. Participants also liked that the entire menu was transparent, so the article was still visible in the background. This resonates with what Jordan Devos (2019) on the forum UX collective discusses about Jakob Nielsen’s principles (see section 2.4.1) - by making the interaction more transparent and intuitive the interface can display more control towards readers, so they know where they are and where they want to go. Regarding the clicking interaction to display different coloured squares around article elements were not obvious to the participants. This interaction often happened by accident when they tried to
slide in the source data visualization. But, when that did happen most participants didn’t understand the different colours because they hadn’t seen the visualization yet, a participant stated that, “maybe a button or some text could be of value inside the visualization to inform participant about this seamless interaction, since it has to be understood in combination with the visualization it feels logical to implement it there”. Another participant concurred and thought that only displaying coloured after a newsreader has seen the visualization. The reason for this might be that they don’t want to feel that they made an error or a mistake and now know how to interpret or go back to the original state. This what Devos refer to an awareness of errors, when a participant has made a misstep, the system should assist the user to recognize, diagnose and recover.

Furthermore, when it came to read the visualization participants still felt disconnected between reading the article and reading the visualisation. Participants voiced issues on the colours inside the visualization, they said that they couldn't understand if the colours reflected the political spectrum. When informed that colours were not representing any political spectrum, they asked why so many colours were used and stated that it was annoying going back and forth in order to connect them. Therefore, further work with colours and/or other visual cues is needed in order to make the information more glanceable. The spectrum was more appreciated than the chart. It was less text and they felt that the system was trying to summarise information rather than pushing too much on them, as one participant said, “I feel that the system is trying to encourage me to fact-check more”. This comment can be viewed as the system trying to be more transparent, that it tries to help the user understand its work process.

Regarding their methods for reading, all participants decided to read the article before proceeding to understand where sources came from. This didn’t come as a surprise since most participants read news from providers they trust and therefore aren’t in need of understanding how credible they are. But, in order to encourage them to read news differently, participants were informed beforehand that they could read the article and understand the sources simultaneously if they wanted to, but this did not change their approach. This outcome might’ve been because participants were not used to these articles and that their approach might change over time. Thus, maybe through implementing more articles in the next prototype, it is possible to explore if their behaviour changes with each article they read.

The next iteration will, therefore, continue with a spectrum and a hamburger menu. Further exploration on how to make the user remember the coloured spectrum in relation to the article elements will also be included. Explore through glanceability to prevent participants from having to switch back and forth between article and visualization too often. Explore how to communicate that the source data visualization is interactive and that there are also interactive article elements inside the article’s interface. These
aspects will be important to explore further in order to make this prototype more intuitive and seamless.

6.3 Hi-fi prototype (spectrum, second iteration)

The second iteration with the spectrum visualization and final iteration in the design phase contained a few changes and improvements on the last iteration based on findings. The final prototype consisted of two articles (see figure 23) in order to observe if newsreaders change their reading approach between the first and second article. The colour spectrum got reduced into three colours regardless of the number of sources. The spectrum ranges from blue (liberal) to green (neutral) to red (conservative) and has been designed to fit The United States political landscape. Moreover, each source is placed into a category and given a circle within that area (see figure 24). Instead of clicking on one circle to get one source the newsreader can click on any circle and a list appears with all sources with their respective circle next to them indicating which parameter they belong to (see figure 25), e.g. an article from Fox news is connected with a red circle for their conservative affiliations.

![Figure 23-25: The left image (figure 23) shows the feed on Monok.com with two articles. The middle illustration includes the button that displays a coloured square (figure 24) that displays all coloured squares inside the article, which can be viewed in the right image (figure 25).](image)

Furthermore, the visualisation now obtains two buttons with two different functions - the right button a red one with an “I” in the middle is the information button (see figure 27). This button when clicked displays a text informing the newsreaders that they can interact with article elements to see directly what political values that component might be influenced by (see figure 28). Furthermore, the second button shows all squares in the article if the user wants to quickly observe the entirety of the article’s sources (see figure 29). Lastly, as previously mentioned this iteration will continue with the sliding "hamburger-menu" as its access point.
Figure 27: The blue button with an “A” on it, when clicked, displays all coloured squares in the article. The right button with an “I” is the information button that informs the user that there is a transparent function on each element.

Figure 28: The text information when the “I” button is clicked.

Figure 29: When the “A” button is pushed this is how the article on Monok.com gets displayed with all coloured squares.
6.3.1 User test three (spectrum, second iteration)

Three participants tested the final prototype all whom of which have been participating in earlier iterations. Participants were asked to read the articles in a specific order starting with the top article before proceeding to the article underneath. The reason for that (more than the already stated once in the previous section), was due to the top article not being able to display additional information on the article’s UI (the coloured squares) before the participant had used the red information button explaining for them that they could. The second article, however, did not have that restriction and therefore a participant could from the start click on any article element to display the coloured square, or slide in the visualization and have access to the blue button that displays all coloured squares. Furthermore, test subjects did receive the same questions as the previous iteration regarding communication and disconnection from the articles main story.

Findings presented that the access point was still considered fine but that it could be good to indicate when clicked that it is a swipe motion. This is also something that Jakob Nielsen and Jordan Devos discusses, the importance of immediacy of action feedback, i.e. that the system should confirm the users' action and shortly after reveal the next action. Moreover, observations revealed that most participants did at least once try to click on the menu to bring it back up on the screen, but one participant stated “it might be because of Adobe xd and the smartphone the reason for me clicking on it rather than sliding”, meaning that the technology can be the issue and not the design per se. When it came to the visualisation, participants were satisfied with the number of colours on the spectrum saying that it gives a better overview now, but they still had some issues regarding which sources had been used the most. All participants appreciated the button that informed them about the interaction on the article’s UI. They also were intrigued about the button that shows all coloured squares saying, “I like that this button exists because it now gives me the opportunity to observe the entirety of all categories, I can see how much green or red or blue it is in the article in a second”. Concerning the list of sources participants voiced that it was good for them to receive all sources at once, but it was somewhat distracting for not giving them additional information, one participant said “this step distracts me completely from the main story it isn't giving me information worth taking for a step in the opposite direction from the article”. This can be interpreted as the participant weighing the amount of time it takes versus the reward for doing it.

As regards to observing behavioural change surrounding participants use of sources, findings showed that their approach between the first and second article changed. For example, one participant went directly for the button in the second article to show all squares while another explored the number of sources in each category before returning to the article. This is an interesting insight considering that many participants said that sources are only a thing
they look at in the end if even that. Participants did agree that their behaviour did change, and it was because the system was encouraging them to change after reading the first article. Moreover, it became apparent that the reader got lost from the story, occasionally, when interpreting the additional information. This isn’t an optimal outcome, but it doesn’t mean that it is a bad thing either, that they focus more on fact-checking their news intake. This can lead to further discussion on the need for behavioural change to combat issues with fake news.

6.4 Final results of design phase

Regarding the outcomes of the design phase, findings can be summed up about the introvert and extrovert news reading approaches towards the proposed design solutions. First and foremost, the prototypes were appreciated by users who represent the two personas (5.1), they considered that the software on Monok.com invited them to understand more about the production of articles and sources, which they felt was an indication by the system to do more fact-checking about its articles. Similar to what theoretical and empirical research has shown on newsreaders, they appreciate when the system suggests and assist rather than insisting which is why the proposed solutions were received well.

Although the different readers had a similar approach when reading the news articles their design assessment was different. The extrovert newsreaders focused more on what information the visualization communicated, i.e. they looked directly at parameters and tried to interpret them. The introvert newsreaders were more focused on the representation of information and how that information could be displayed. It is not unreasonable to assume that introvert newsreaders find the main stories more interesting than any additional information, while extrovert newsreaders found value in additional information for discussion purposes.

The future work of this proposed design solution, however, needs to further investigate the visual aspect of how source data should be presented in order to make the information more glanceable. Although iterations in some form attempted to provide an intuitive and convenient design solution, the access points would benefit from additional exploration. The technical limitation (phone dealation with Adobe xd) may have contributed to some of the frustrating comments about the interaction with the access points. In addition, there is still unexplored space about the relationship between an article’s sources and their contribution to specifics of article elements. For example, how much has a particular source influenced the text in the entire comprised news article generated by the software.
7 Discussions

The initial aim of this project was exploring article visualization in automated journalism through experimentation of Semsom’s material (code). However, as the project progressed the focus shifted towards a user-centric approach by seeking to understand newsreaders behaviour and motives. This new focal point had alterations to the project’s design context. The aim of the thesis changed to understand how newsreaders habits are susceptible to interactive features within articles on Monok.com, with an intention to disclose additional information on an algorithmic system selection process. These features aimed to make the selection process more transparent. I hypothesized that taking the background (characteristics of the underlying system design) and the foreground (millennials news preferences) contexts into consideration one could provide an optimal approach for the trustworthy representation of auto-generated articles.

My initial expectations about the system and the millennials were that the software could predict and recommend based on the users’ data and that millennials lacked the discipline to validate their news. However, rather unexpectedly the outcomes revealed that the system operated on a neutral basis, i.e. the choice of sources and article elements was based on technical premises. Thus, when realising that a great number of newsreaders required information to be validated, the focus of this project’s design phase changed to understand users’ requirements to create a sense of trust towards a system such as Monok.com. It was not just visualising an article anymore as it was about understanding how interaction design could facilitate users to continue reading these articles because they evaluate through different means how articles are trustworthy. The target group, far from predictions, had a profound awareness about how and why they read their news and as the project progressed interesting news consumption patterns were discovered in these users. Unlike earlier generations when many trusted the public service tv and national newspapers to provide a "neutral" perspective, and often this perspective was the only one that they could refer to, the millennial generation, however, acknowledges that there are multiple perspectives. This change is perhaps a positive one and a reason why one of the most vital functions the software on Monok.com possesses is the ability to provide a multi-perspective view of news events. But it does indicate a more cautious attitude towards how one does design for these systems.

I explored algorithmic transparency in the news media by applying the principles of glanceability to my design solutions. Through understanding the newsreaders’ consumption behaviour, it was easier to align design decisions based on their preferences. This approach has helped me to unpack my hypothesis. The principles of glanceability, deployed throughout this thesis, were used as guidance. Since this thesis focuses on quantitative source data,
I mainly made use of abstract representation. The use of abstract representations was necessary in order to provide the user with information without overwhelming him/her and thereby avoid disruption from the news article’s main story. In other words, I conveyed information through visual symbols in order to convey information of sources conveyable in a “glance”. I also adhered to the principle of making visuals distinct in order to give them contrast and make them identifiable. I also learned throughout the design phase that visual representations need to match the user's expectations, another important principle of glanceability. This relates to the issues with colour and political affiliations during the second user test. For example, in the third user test red colours were indicating that it was conservative views and blue indicated liberal views. This made it easier for user to connect sources and their political affiliations.

The hypothesis that would provide an optimal approach for a trustworthy representation of auto-generated articles, has also led to identifying several other design opportunities. In order to help future designers to evaluate how they want to proceed in their design work when working with algorithmically produced news articles, the section below will discuss newsreaders different pathways to news and also how we might unpack further information on the systems black box, i.e. the selection process through customization within news articles.

7.1 Future work

As we have seen over the span of this thesis, a lot of young newsreaders have different pathways to news, and this is just another form of trying to achieve transparency of the news stories. It correlates a bit with unpacking and understanding the AI systems selection processes in that they are actively searching for additional information and perspectives. However, throughout this work, I sporadically used the term customization and this term does bring interesting opportunities on how we might unpack the selection process but also can further empower newsreaders with control versus possibilities for search strategies offered by an interface. However, as my findings have shown, newsreaders reluctantly avoid customizing news because they worry about missing out on stories or other aspects of news. Although my proposed design solution might, to some degree, provide a customized news article (clicking on article elements to show coloured squares as shown in chapter six) there is still a lot of research that could be done on how users could customize auto-generated articles. Taking into consideration what was stated in section (2.3) about the technological possibilities the potential is there to explore. The author does, however, believe that work such as this need to involve users, to fully grasp their motivations to actually customize news articles.

Another design opportunity that was framed as an “HMW” question in section (5.3) regarding news articles potential to facilitate discussions is also
another interesting point to explore. The users/newsreaders already curious attitude to debate stories both on existing forums and in real life present possibilities to further investigate how auto-generated articles could facilitate this. An early revelation about millennials various pathways to news (section 2.5) and how their pathways in some way are already trying to achieve transparency of news stories, through social and reportorial media. It was an interesting insight particularly with extrovert newsreaders that sought discussion around the news to understand additional information about the article’s story.

7.2 Reflective critic of interviews

It is not unreasonable to assume that the decision to include a third stakeholder (editorial manager) and listen to his input on the different topics proved to be vital. In particular on obtaining insight about newsreaders habits, by conducting observations. But when consulting an expert in the field of journalism, whether it’s a system developer or an editorial manager, it is important not to be influenced by different agendas. The reason for bringing this up is that AI software does provide ethical concerns that involve a majority of stakeholders within the field of journalism. Everyone has a different agenda and it is important to stay critical and not get blinded by their competence. Therefore, when preparing for an interview with an expert it is vital to make an objective analysis of their answers. I would argue that I aimed to be objective and have a critical attitude towards interviewed experts and their answer but objectively speaking I could have stayed more critical and not as easily persuaded.

Furthermore, this project might’ve gained more from interviewing several other companies that work with some aspect of automated journalism or natural language generators and more than just one editorial manager. When only getting one person’s view on the matter, can skew the information towards their values and beliefs which can be perilous.
8 Conclusions

**Main question:** “How can interaction design methods and principles be used to design interactive features that enable newsreaders to understand information about system selection processes in auto-generated news articles?”.

In order to attend to this research question, the background research has been vital to understanding how the characteristics of the underlying system design in automated journalism might sustain interactive features through article visualization. The literature research has been conducted on the theory of algorithmic transparency in the news media to further understand how and what these systems can communicate to users (section 2.4). The transparency theory by Diakopoulos & Koliska (2014) ended with a conclusion that encourages designers or other scholars to explore interactivity through interface layers to communicate additional information about the systems selection process. In addition, news reading theories were explored for millennials consumption habits, and several findings showed that newsreaders consumption behaviour has various methods and pathways to news (section 2.5). For example, some millennials turn towards social networks, others turn to reportorial media and some to curated media. However, these different pathways often act as an entering point for readers and rather often these different pathways weave into a personalized journey through news events for unique users, for example, see extrovert newsreaders in section (5.1). This approach can be interpreted as the user’s own methods of making news media more transparent.

In order to comprehend what millennials might want to further understand when reading an auto-generated article, interviews, observations and focus groups were conducted. The insights from these field studies revealed that young newsreaders are more aware of their news intake then first predicted. They are afraid of too personalised news, because of the risk to a limited worldview. They consume news rapidly. The aspect that differed most interviews were motives, i.e. whether they preferred to read the news to have discussions around them or read them for their own personal growth. These findings eventually together with a conducted focus group aimed to grasp which article elements they value highly and might want to interact with in articles that are auto-generated by an AI software. Findings indicated that article presentation and sources were objectively most relevant and desirable elements to adapt/interact with. Participants wanted the possibility to understand source information and if they wanted more about stories from other news media, expanding the article or including navigation tools were interesting approaches. Thus, the insights from these field studies resulted in two different personae, the extrovert and introvert newsreaders. With these personae as a focal point, the ideation phase framed design guidelines and “how might we” questions which led to the sub-question below. This question is addressed throughout the design phase.
**Sub-question:** how might we communicate additional information about sources without having the newsreader lose track of the story?

Additional theories were framed to evaluate proposed design solutions and usability testing throughout the design phase (sections 2.4.1 & 2.4.2). These theories focused on how additional information could be accessed and presented to align with the newsreaders’ news habits. The proposed design solutions (chapter 6) offered an alternative tool to understand additional information about the sources comprised of an auto-generated article. In this case, it was news sites political affiliation. Results indicated that both newsreaders found the extra information as valuable to form a sense of trust towards these articles. Newsreaders behaviour changed from not giving attentions towards sources, to paying attention to the sources as well as additional information about those sources. It was because the AI system was encouraging them to fact-check its news after reading the first article, as one participant said, “I feel that the system is trying to encourage me to fact-check more”. Moreover, it became apparent that the reader got lost from the story, occasionally, when interpreting the additional information. This can lead to further discussion on the need for behavioural change from people’s lack of effort to understand algorithmic decisions to be more curious. The principles of glanceability have improved how source data can be visualised to convey additional information about them without too much disruption to the story, allowing the user to have a seamless experience. However, these principles might be better implemented in conjunction with heuristic principles. I suggest that future work could benefit from investigating the synergy between these two sets of principles when exploring how we might convey additional information about selection processes. Further exploration into algorithmic transparency in the news media can play an integral role in the future of how we design and consume auto-generated news articles.
9 References


System Developers

General issues:

- When and how does the system obtain information from sources and when is a story ready to publish?

- Does anyone decide what sources the system look at and what mediums it can incorporate?

- Are the sources taken from both public and private domains?

- How does the robot categorise sources, rank, popularity, traffic, time?

- How does your NLG system work with different sources?

- In relation to NLG how does other technical premises work with relevant multimedia?

- Can the system recommend, classify and predict news for users?

- Looking at the "blackbox", i.e. the toolset, can this part of the system be customised? Examples of toolsets could be: Personal Stories, news articles based on statistics, source diversity, etc.

- What parameters is possible to customise and interact with?
Editorial Manager

Warmup:
- What is your specialisation in journalism are you?
- What is your primary work duties?
- Within the field of journalism, how informed are you on new technology?

General issues:
- What are your view on automated journalism and auto-generated news articles and what do you think transparency will be utilised?
- Do you think customisation in news articles will be relevant for the future? If yes, why?

Deep focus:
- Do you think millennials news habits, their interests and needs aligns with auto-generated articles and the potential for customisation? If yes, why? If no, why not?
- In connection with the previous question, do you think that the methods of journalistic work can help this young target group understand what it means to have such a responsibility and dialogue with systems?

Future:
- Här har jag 20-30 kort, varje kort representerar ett formbart element, dvs. något användaren skulle kunna påverka, jag kommer att ha en "workshop" med min användargrupp där de själva får prioritera och para ihop element. Vad ser du för möjligheter och vilka konsekvenser kan de ha?
Newsreaders

Warmup:
- What's your primary use of technology, phone, tablet, laptop?
- When do you check the news? How often? For how long?
- Why do you read the news?
- What is it that draws you attention to the news, self-curiosity, friends/family, social media, sources or notifications?
- Which sources do your receive your news from? (social media, news sites, etc.) Follow up question: Why do you turn to these news sources?

General issues:
- Take me through the process of one of your reading sessions. Where do you begin?
- What do you do when you want to find out more about a story/subject?
- Do you feel that articles can contain too much information?
- In what way is it too much? (text, pictures, sources, different / too many components, reporter/company agendas, adds?)

Observations questions:
- Which component in the articles communicates the story best? Why this component?
- Which components in the article would you not want to lose? Why not this component?
- Would you want to change or control components in an article?
- Would you want to more options inside the articles?