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1 Introduction

Currently, the total population of the world is 8.1 billion and more than half of it, 4.76 billion people, are active social media users (Meltwater & We Are Social , 2023). In addition to the increase in the number of people on social media and the time spent there, the way we use social media are also changing. As indicated in the previous report (Meltwater & We Are Social , 2023), social media is a news source for 34.2% of users all around the world.

Although disinformation and popular misperceptions have a long history in the political process, misinformation on social media has prompted significant concern in recent years (Flynn et al. 2017; Lazer et al. 2018). While digital technologies lower the costs of access to information, they dramatically raise the transaction costs of being correctly informed, exposing large segments of society to unprecedented difficulties in assessing the accuracy of contradictory information (Maati et al. 2023).

In social media, where you can reach millions of people with a single click, the speed of news spread is incomparably higher than in the past. The fact that platforms also allow not only to consume but also to produce content leaves people helpless against manipulative and fake news, misinformation and disinformation.

Three main elements of digital technology influence the nature of information and how individuals consume it: (1) an abundance of conflicting information; (2) a decline in consumer ability to judge its truth; and (3) AI-assisted algorithmic targeting of users with personalized content (Maati et al. 2023).

To sum up, the rise of the internet and social media has made accessing information much easier but lowered its reliability and accuracy. This is one of the big problems of today, where we can see unfortunate results with real world examples. Media Manipulation and Disinformation Online Report offer insight into why the media are vulnerable to manipulation by radical groups emerging from various internet subcultures in 2016, with case studies such as "The White Student Union, Trump and the Star of David Image, Hillary's Health, Pizzagate" (Marwick & Lewis, 2017).

As long as people do not have the competencies to cope with digital information, it is predicted that there will be polarization and radicalization in society, and even violence, and democracy will be negatively affected.

2 Research Methodology

This section outlines our approach to the challenge and steps followed to create the solution. Our main approach is based on the principles of design thinking, a problem-solving approach that prioritizes user-centered design and iterative development. Design thinking fosters empathy, creativity, and rationality to address complex challenges effectively ("What Is Design Thinking?", 2016). This methodology involves a series of iterative steps, including problem definition, empathizing with the target audience, generating ideas, prototyping, testing, and refining solutions ("What Is Design Thinking?", 2016). The five main stages of this approach are Empathize, Define, Ideate, Prototype, and Test.
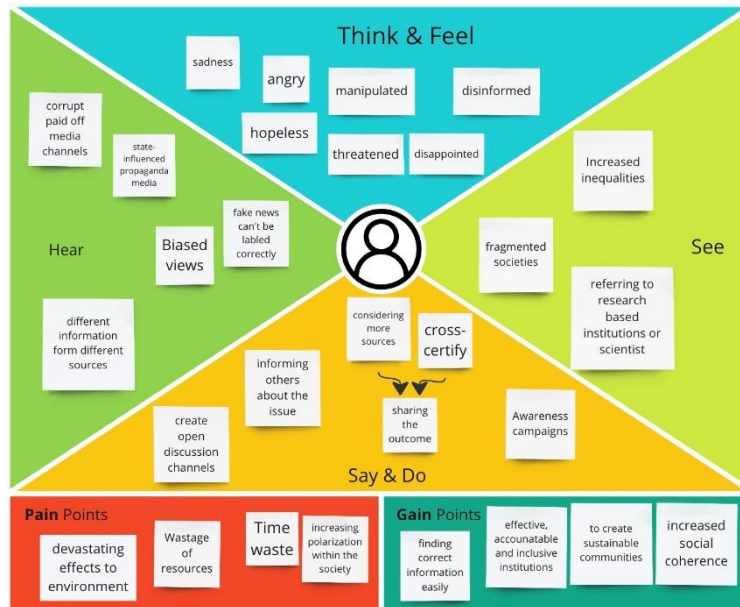
2.1 Define

The first step in the design thinking process involved clearly defining the problem that served as the foundation for the study. To understand the challenge and problem better, we employed the research conducted by our challenge collaborator Dr. Ahmed Maati as our theoretical starting point. In his forthcoming paper, he explains how digitization facilitates attitudes and behavior that threatens democracy. He argues how digital technologies affect the nature of information and influence the ways in which citizens consume them are based on the abundance of contradictory information, decreasing ability of citizens to assess the truthfulness of information and AI assisted algorithmic targeting of users with personalized content (Maati et al., forthcoming). This destabilization of citizens' information environment affects democratic sovereignty, i.e., the citizens' free will (Maati et al., forthcoming; Maati, 2023). This affects the information environment of society as whole and jeopardizes social cohesion. Social cohesion stems from shared commonalities between citizens. In cohesive societies, differences are cross-cutting, promoting peace, inclusion, and stability (Maati, 2023). In contrast, polarized or fragmented societies have reinforcing differences, leading to disagreements on fundamental and various other issues. Hence, inclusive, and peaceful societies require a stable information environment in which citizens differ in opinion,

interest, and interpretation of information but share a common foundation of how to evaluate and engage with information as well as a common understanding of the basic elements that distinguish reality from fraud (Maati, 2023). Several recent incidents also emphasize the need for a stable information environment for democracy to thrive: the US capitol riots violence and the protests around the corona regulations in Germany (Maati et al., forthcoming). Therefore, the problem statement with which we approached the challenge is *"There is a need to create a common understanding in societies to distinguish reality from fraud to promote peace and inclusion, especially as citizens are flooded with information from different easily accessible but unreliable sources that jeopardize social cohesion".*

We also discussed about the desired impact of the challenge along with our collaborator at this stage: (1) increased awareness of the multitude of risks of the destabilized information environment using an interdisciplinary approach and (2) to utilize the awareness to motivate technological innovations without leaving political waste behind.

2.2 Empathize

To gain a deep understanding of the potential users or stakeholders involved, an empathetic approach was employed. For this our team used an empathy map as can be seen in Figure 1. The empathize phase allowed us a comprehensive understanding of the target group's motivations, desires, and pain points related to the challenge ("What Is Design Thinking?" 2016). During the design thinking team workshop conducted on 11th April 2023, we answered a series of questions as citizens and came up with the following Miro frame. This helped us in understanding the citizens' perspective on how they perceive and deal with a destabilized information environment. As we are a team of five internationals, we shared our varied and different perspectives in the discussion.

Figure 1 The FactFinder's empathy map

We decided high schoolers in their last year of school completion which involve age groups (15 to 20 years old) as our target audience. As a generation born in a technologically advanced world, teenagers of today are the most radically affected by digitization. They rely heavily on online platforms and social media for information (Pérez-Escoda et al., 2021). In a destabilized information environment, they are more susceptible to encountering misinformation, rumors, and conspiracy theories. This distorts their understanding of important issues, creates confusion, and leads to misguided beliefs. Additionally, the abundance of online information makes it challenging for teenagers to discern credible sources. This hinders their ability to make informed decisions and develop a comprehensive understanding of various topics.

As teenagers are in their identity formation stage, they are often easily influenced by polarizing or extremist views, potentially leading to the adoption of extreme ideologies, intolerance, and a lack of critical thinking skills in a destabilized information environment (Pérez-Escoda et al., 2021). The proliferation of false or misleading information can have emotional and psychological consequences for teenagers. They may experience anxiety, stress, or fear due to the misinformation or information overload they encounter, particularly on sensitive or controversial topics. This can negatively impact their mental well-being, social relationships, and overall sense of security. Furthermore, this can

discourage teenagers from engaging in civic and democratic processes. Misinformation and disinformation can erode trust in institutions and the democratic system, leading to apathy, disengagement, or even the spread of false information themselves. This can hinder their active participation in community affairs and the development of critical citizenship skills.

Hence, it is crucial to address these challenges by equipping teenagers with information literacy skills. By promoting critical thinking, information and media literacy, we can empower them to navigate the complexities of the information landscape, make informed decisions, and become responsible consumers and creators of information.

2.3 Ideate

The ideation phase is aimed at generating a wide range of creative ideas and potential solutions ("What Is Design Thinking?",2016).

After numerous brainstorming sessions about our challenge, we decided to develop an e-learning program on information literacy targeted towards high schoolers. It is our understanding that an e-learning program on information literacy alone may not completely solve the issue of a destabilized environment and its impact on democratic societies, however it can still significantly contribute to addressing the problem. Although there are several e-learning courses on information literacy on different educational platforms such as Coursera, LinkedIn, Udemy, and in other university level educational institutions, none are targeted towards the high schoolers and are often with a fee. This gives our e-learning program the unique opportunity to reach a wider audience and to create maximum awareness of the problem by disseminating the program via schools, making it free and mandatory for students by including it in the curriculum.

From a societal point of view, an e-learning program on information literacy could play an important role in fostering active civic engagement and democratic participation among teenagers, our future citizens. In an era where misinformation can spread rapidly and impact public opinion, teenagers need to be equipped with the skills to engage responsibly in public discourse. They must learn to distinguish reliable information from propaganda, identify biased narratives, understand opposing views and critically analyze sources. It can help them develop a discerning approach towards digital content, understand the importance of fact-checking, and recognize potential biases. By promoting

critical thinking, media literacy, and responsible information consumption, an e-learning program can empower teenagers to make informed decisions, benefit their mental health and make them more resilient to misinformation.

Additionally, these information literacy skills are valuable for academic success and future career prospects. This e-learning program on information literacy equips them with the necessary tools to conduct effective research, distinguish reliable information for academic projects, and develop a foundation for lifelong learning. These skills are transferable to various professional domains, enabling teenagers to thrive in an information-driven society. Based on all these considerations, we defined our vision as *"to shape and educate an information-literate generation"*.

In the next section, the prototype and the syllabus developed for the e-learning course on information literacy for high schoolers are shown.

3   Our Product

3.1   The website and its features

To equip students with the necessary skills to critically analyze and navigate the media landscape, we are introducing an e-learning website designed to provide a comprehensive course on media literacy. The visualization of Figure 2 shows what have been designed. It offers a user-friendly interface and intuitive navigation, ensuring an engaging and seamless learning experience for students. The color scheme and visual elements are carefully chosen to create a visually appealing and engaging environment promoting effective learning.

The course is designed to accommodate different learning styles and preferences. Students can progress through the material at their own pace, allowing for personalized learning experiences. This flexibility enables students to manage their time effectively and engage with the content at a comfortable speed.

The e-learning platform incorporates regular assessments to evaluate students' understanding and progress. Immediate feedback is provided, allowing learners to track their performance and identify areas for improvement. This feedback mechanism promotes active learning and helps students reinforce their understanding of media literacy concepts.
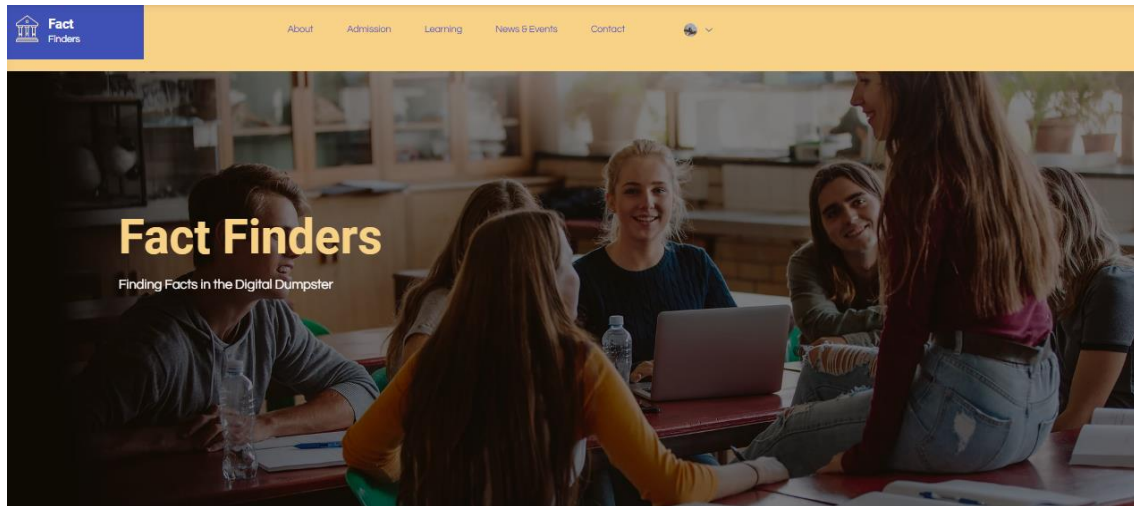
Our Product

Figure 2 The FactFinders's website

The website features three key buttons on the welcome page, as can be seen in Figure 3 The FactFinder's website welcome page:

- **Course outline**: Clicking this button will land the young aspirants on the course outline page where they can have a quick go through the course.

- **Learning Schedule**: Clicking this button will land them on the learning schedule page of the website for the e-Learning course where they would be able to see the flexibly designed schedule and would be able to adjust their ongoing schedule with the course learning schedule.

- **Apply Now**: Finally comes the Apply Now button where after clicking this, the aspiring students will land at the form-filling page, where they will put all their primary information including their contact info and they will receive a confirmation email of enrolment. All their Data will be protected under International Data Protection Policy.
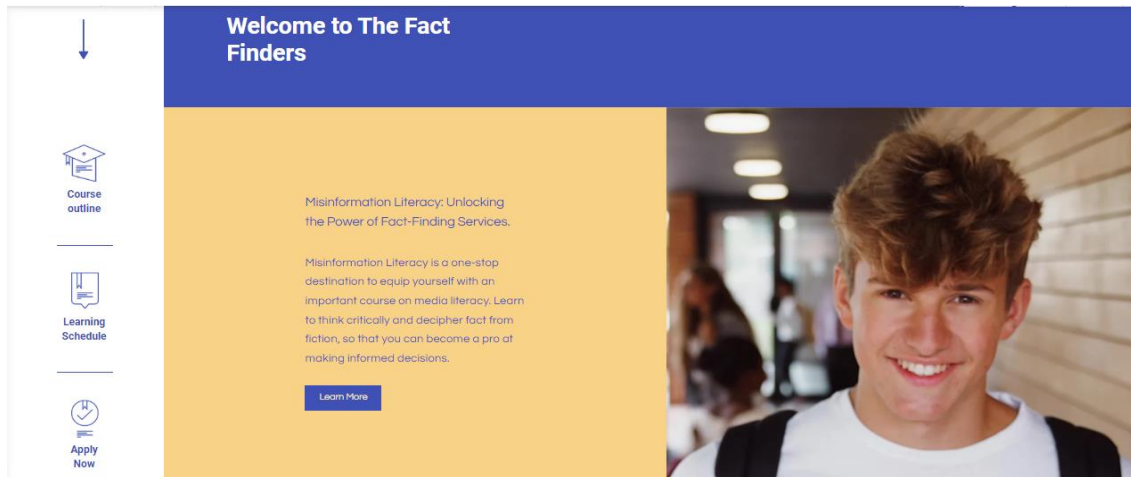
Figure 3 The FactFinder's website welcome page

3.2   The content of the course

The scale of the misinformation problem is significant and pervasive. Misinformation refers to false or inaccurate information that is spread, often unintentionally and sometimes intentionally, through various channels such as social media, websites, news outlets, and word-of-mouth. Addressing the scale of the misinformation problem requires a multi-faceted approach involving misinformation literacy education, fact-checking initiatives, responsible platform policies, and individual critical thinking. The Misinformation Literacy course syllabus consists of different modules that draw a framework from beginning to end about what misinformation is, in which ways we can be faced with misinformation, and how we can deal with it.

Module 1 explains the scale of the misinformation problem and understanding of consequences like hate speech and polarization in societies. Some strategies for coping with information overload will be mentioned also in this module. Misinformation knows no boundaries. With the internet connecting people around the world, misinformation can spread globally in a matter of minutes. Misinformation can significantly impact public opinion and beliefs. False narratives, conspiracy theories, and manipulated content can shape people's perceptions, leading to polarized views, the erosion of trust, and social divisions. Misinformation related to health topics, such as vaccines, treatments, or COVID-19, can have severe consequences. It can undermine public health efforts, lead to harmful behaviors, and even endanger lives. Misinformation can be exploited for political purposes. The misinformation problem can have economic repercussions. False information about companies, products, or financial markets can lead to stock market

fluctuations, damage reputations, and affect business operations. Information overload combined with cognitive biases makes people susceptible to misinformation. Individuals who seek information that confirms their existing beliefs because of bias, can become more receptive to false or misleading content. To engage our teenager audience, we will add end-of-chapter quizzes and gaming elements throughout the training program. On the other hand, we will provide their motivation with a bar where they can follow their progress in the program.

Module 2 questions why people fall for misinformation. Misinformation and disinformation are related but distinct categories of false or misleading information. That's why people will have information about the comparison between misinformation and disinformation categories. Toolkits for addressing misinformation involve a range of strategies and approaches aimed at mitigating the impact of false information. What are these toolkits for addressing misinformation will be covered in this module. For example, promoting critical thinking will encourage critical thinking skills, information verification, and skepticism by this way it can help individuals navigate the complex information landscape. Critical thinking involves questioning sources, verifying information from multiple reputable sources, and considering alternative perspectives. Addressing misinformation requires a multifaceted and collaborative approach involving individuals, media organizations, technology companies, policymakers, and civil society. By combining efforts, it is possible to mitigate the impact of false information and promote a more informed society.

Module 3 will be about fact checking techniques and tools. Fact-checking techniques and tools are essential for verifying the accuracy of information and identifying misinformation. These techniques and tools can be listed as source verification, cross-referencing multiple sources, expert interviews, fact-checking organizations and databases, reverse image search, data analysis and statistical verification, fact-checking plugins and browser extensions, crowdsourcing and user reports, fact-checking apps and websites. For example, Reverse image search technique is used to verify the authenticity of images. By conducting a reverse image search using tools like Google Images or TinEye, fact-checkers can identify if an image has been manipulated, taken out of context, or used in misleading ways. This module aims that people who are taking this course can find an answer where to find credible information and spot bad information. It's important

to note that while these techniques and tools are valuable, fact-checking is an ongoing process, and no single method is foolproof. Fact-checkers use a combination of these techniques and exercise critical thinking skills to assess the accuracy of information and combat misinformation effectively. Within the scope of this module, which techniques and tools are available, how to use these tools and what benefits they will provide are discussed in detail.

Module 4 covers critical points about how to avoid echo chambers and the filter bubble. Because, escaping echo chambers and filter bubbles, which refer to the phenomenon of being surrounded by like-minded opinions and information that reinforce existing beliefs, is crucial for promoting diverse perspectives and combating misinformation. For example, seeking out diverse perspectives represents different viewpoints. That's why, following individuals, publications, and social media accounts that offer diverse perspectives, even if they challenge your existing beliefs. This can help broaden your understanding of complex issues and foster critical thinking. Breaking free from echo chambers and filter bubbles requires proactive effort and a willingness to challenge one's own beliefs. By actively seeking diverse perspectives, critically evaluating information, and engaging in respectful dialogue, individuals can broaden their understanding and contribute to a more informed and inclusive society. In this point, another relevant issue is unconscious bias. What is unconscious bias? And how does it influence our decision making? Unconscious bias refers to biases or prejudices that we hold unconsciously, without being aware of them. These biases are shaped by our experiences, cultural and societal influences, and internalized stereotypes. They can affect our perceptions, attitudes, and decision-making processes, often leading to unintended discriminatory behaviors or unequal treatment.

Module 5 consists of the Practice Good Digital Citizenship. People should not only learn something but also teach others and know how they can help others when they see misinformation. By offering accurate information, promoting critical thinking, and fostering open dialogue, people can contribute to countering misinformation and helping others make more informed decisions. When people click to Read More, they will be able to access many educational videos, lecture videos given by experts, images, instructive articles, some recommended readings, and all content on these topics of modules.

4   Future vision

This program stands out with its unique focus on the skills required to navigate the vast amount of information present in our daily lives, encompassing topics such as media, technology, and information literacy. The course combines practical learning opportunities through interactive lessons, real-world case studies, and exercises, which will help students become future FactFinders. Our vision entails the education and cultivation of an information-literate generation, with a specific target audience comprising high school students in their final year of school completion. This selection is motivated by the fact that Generation Z is the first cohort to be born and profoundly influenced by an advanced technological environment and digitization.

At the moment, we are actively engaging with schools and institutions that could serve as initial adopters of our project, while simultaneously providing us with valuable feedback regarding the program's reception. Among the entities approached are several high schools in Bavaria and the Technical University of Munich's information literacy department. To a certain extent, the project possesses the potential to be self-sustainable. However, depending on the specific use case we might need support of researchers and credible individuals to support the program. Consequently, we are actively seeking collaboration with federal and non-federal entities that display interest in supporting and endorsing our project. Furthermore, we acknowledge the substantial impact of social media platforms, such as YouTube, in disseminating fraudulent information to a wide audience. To address this concern, our program has been designed to align with the policies implemented by these platforms to combat misinformation. Through collaborations and incentivization, our aim is to attract students who possess a vested interest in exploring these vital subjects. By collaborating with platforms like YouTube, we aim to offer the participants a free premium membership to attract more high schoolers.

To fulfill the aforementioned objectives, we have devised a comprehensive plan. The FactFinders project will incorporate two distinct revenue streams in its operations. The primary costs associated with the project will be sustained through collaborative partnerships with prominent federal institutions in Germany. To begin with, we will establish a cooperative relationship with the Bundeszentrale für politische Bildung, which will serve as an advertiser and promoter of our e-learning program on their official

website. This partnership will provide us with a valuable platform to reach a wider audience and enhance the visibility of our program. Furthermore, we will actively engage with the Bayerische Staatsministerium für Unterricht und Kultus, as well as the Bundesministerium für Bildung und Forschung, to forge strategic alliances. Given the focus of our program on high school students, these partnerships present a remarkable opportunity and align closely with our objectives. It is worth noting that the current educational system is inadequately equipped to prepare students for the forthcoming challenges, further highlighting the importance of our initiative. In addition to these collaborations, our website will feature selected advertisements from renowned online learning providers such as Duolingo and LinkedIn Learning. This supplementary feature will not only enhance the user experience but also provide additional revenue sources to support the sustainability of our project.

By leveraging these diverse revenue streams and strategic partnerships, our objective is to establish a robust financial foundation for the FactFinders project. Through these efforts, we aspire to advance our mission of effectively addressing the educational needs of high school students, while simultaneously preparing them for the forthcoming challenges.

To conclude, it can be stated that the ambition for this project is to reach as many high school students as possible and empower them with the necessary skills and knowledge. The next steps for the project involve further program development, piloting it in selected schools, refining it based on feedback from students and educators, and subsequently scaling it up to reach a broader audience.

5   Group roles

Group roles

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