



Project Report **Exhibition Fish**

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Preface by the Supervisors

Prof. Dr. Peter Gritzmam and Prof. Maurice Lausberg

Exhibition Fish: Short Address

When walking in the snow our traces are clearly visible. Our impact on our social environment might not always be as clear but we still have some sense of control. The numerous threads of our digital activities, however, form an impenetrable netting, cryptic to us, but denuded to those who monitor, collect, and interconnect our digital activities. Modern algorithms are unbelievably advanced, and often powerful enough to know us, i.e., predict our future behavior, better than our parents and even we ourselves do. (Welcome to the notorious philosophical discussion of the free will!) Of course, it is easy to believe that this is all to our own good. After all, don't we profit from numerous (relevant and not so relevant) services offered to us free of charge. But should we really suppress the vague

sense of a lurking harm of potential abuse of our most private data. No! This is the answer given by the project team: Make emotionally tangible what it means to digitally expose yourself!

When you google yourself most of the displayed information will not disturb you at all since it comes from legitimate websites. More frightening – since beyond our own knowledge let alone control – are the myriads of traces that we leave by using the internet, social media or other tools of mass instruction.

This is indeed a big issue. When you search for data privacy, google shows 7.900.000.000 entries. Of course, by asking for that

subject you left yet another trace in the web. Your search engine knows you, and big brothers are watching you!

In any case, awareness is desperately needed. The project which the TUM:JA team explains in more detail below addresses the apparent discrepancy between the explicitly acted out willingness to share private data and the often only subliminal concern about the mid- and long-term consequences this may have. This privacy paradox is approached from different directions, empirically, followed by a scientific analysis addressing the audience intellectually, but also by means of art. This is in the best tradition of art as a means of fostering and changing consciousness on a powerful emotional level.

The project was quite a challenge, and even more so under the regime of the pandemic, but the team succeeded. Of course, there were ups and downs, whenever the ambitious concept faced different aspects of reality. But the team was full of ideas, kept up a good spirit and turned the project into a sustainable activity which is, as we all hope and believe, eye-opening and mind-blowing for a broad audience. ■

Interview with our artists

In the context of the umbrella topic “Arts and Technology,” our team “Exhibition Fish” chose to focus on data privacy and, more specifically, the concept of the “Privacy Paradox.” The Privacy Paradox describes the phenomenon that, although many people have the desire to keep their (online) data private, information is nonetheless often liberally shared. This data exchange can take place for example in the context of social media, or by consenting to cookies to access certain websites. Our team was interested in exploring the (perhaps unconscious) motivations, attitudes and emotions that cause people to act in this paradoxical way. Due to the highly personal nature of this topic, we also aimed to find a less scientific and more emotional and creative way to communicate our findings. This led to the development of the HUMAN ALGORITHM.

In the dialogue project HUMAN ALGORITHM, our team developed a musical composition and an accompanying short film in close collaboration with the two participating artists Kilian Sladek (singer/composer) and Laila Bierling (photographer/video artist). Based on our research on the Privacy Paradox among students in Munich, this project aims to draw new attention to the challenges of online behavior in an innovative, personal and emotional way. More specifically, the HUMAN ALGORITHM explores the transaction that occurs when we give away our online data in return for a certain benefit, such as access to a website, and the opportunities and dangers that come with this transaction. The main aspect that the HUMAN ALGORITHM focuses on is the “invisibility” of such processes, meaning that users are often unaware which data they are giving away online, and how this data may be used. The musical composition and short film aim to make viewers more aware of these “invisible” processes, by following a protagonist and her interactions with an artificial intelligence throughout her everyday life.

Here, together with Kilian Sladek and Laila Bierling, the scholarship holders reflect on the joint project and their learnings.

First of all, maybe a short introduction: What do you do in your artistic work and what was the special focus of this project?

Laila: I'm a photographer and videographer from Munich and I take photos in the fashion and beauty sector. In terms of videography, I'm more in the musical field and now, with HUMAN ALGORITHM, also experimentally in the short film/music combination business. So all in all, I am a photo and video artist with strong connections to music.

Kilian: My name is Kilian Sladek and I studied jazz vocals and am just finishing a master's degree in music management. At the moment I'm working on three band projects: my band, my quartet, then Lauraine, a synth-pop band, where Laila also works with me, and then I'm currently setting up a project together with my girlfriend, which is more in the performative area, called “Amuse”. With the composition commission for this project, I've also gone in a more experimental direction musically.

Thank you! Then let's take a closer look at our collaboration, which is something really special for both of us as researchers and you as artists. How did this process work? How did research results become music and a short film?

Kilian: At the beginning, everyone told me very, very precisely and in detail what he or she had found out throughout the scientific work. We did this through very intensive and long workshop sessions. I can remember up to four hours of uninterrupted workshop sessions with you, where everyone was able to contribute with their own topic and their own point of view. Then there was a month or two where we didn't have so much contact, where I could ponder a bit about it and create a story out of the content you gave me. I wrote a lot of post-its and really threw a pile of post-its on the floor and collected everything again, transferred it all into the computer and then put it into meaningful contexts. Important questions were then: Which questions are big? What can I combine and what reappears where and how? That is also the reason why so many meta-levels opened up in this very short time of the composition. It's exciting how much information there is in the end.

Laila: New ideas also kept coming up about the film, we also had many new ideas again during the day of shooting in addition to what we already had. It all came together very organically, with the pictures and the people involved. And yes, it's incredibly nice to see how much everyone enjoys the ideas and has fun implementing ideas and getting involved.

Can either of you give an example of a detail that is now in the film and music that is directly connected to our workshops and Kilian's Post-Its?

Kilian: An important point for me was ultimately this blatant reduction of our unbelievably big topic of the data privacy paradox to the topic of algorithms and how such an algorithm is constructed via an input, a transformation process and an output. The music underlines on many levels that every little input, if you know exactly what the output should be, can be relevant for the system. That's why personal sounds also play an important role, which are not always professionally sung or perfectly intoned. For example, not every note that the singer featured in the HUMAN ALGORITHM sings is perfect – but instead of autotuning her voice, I left her sounds as they were. This underlines that every type of input, even if it isn't perfect or ideal, can be used in an algorithm to generate an output. This is the same way that all of our online data is used for some purpose, regardless of the type and where that data comes from. The important message is: Everything is relevant. Every sound, every clacking in the coffee machine is somehow transposed. Every door opening can somehow be musically transferred into the digital world as well.

Laila: There is also a very significant element in the film, which further underlines that all data is relevant: The smart home camera concept, that you see the actress from the perspective of the coffee machine, from her mobile phone, from her laptop, through CCTV cameras – so she is just being watched everywhere. Stylistically, I also made sure that you notice when you feel closer to her, by making you feel somehow visually closer to her. And when you no longer look at her with eyes which are trying to understand her but rather with eyes which are trying to analyze her, these are completely different camera angles, for example with the surveillance cameras.

We are all very excited to see the final work. The workshops were always really cool and the exciting thing was that we also found out completely new levels of the project through them. Thank you for this small foretaste of this unique work of art, the HUMAN ALGORITHM. But we also want to try to go a step further and reflect on this form of project in general. You, Kilian, are also a kind of a coach for us, so you actually helped us in these workshops to find ways to communicate research results in a way that has personal relevance. So, what kind of team are we together? What role did you artists play?

Kilian: I went in with the attitude that I was not going in to explain anything to you or to contribute my point of view, but rather to absorb your insights first. Because it's an absolutely luxurious situation to join a team that has already dealt with the topic very intensively and has illuminated this topic very extensively for me and Laila. Throughout the whole project, it was very important to me to reflect on your insights with you again and again. It's not just about composing music, but it was important to me to convey a lot of the information that you want to convey. I created a symbiosis between your findings and the music and you made this really easy.

Laila: It's extremely valuable that we can exchange our perspectives from different fields and ways of thinking. Research and technology are very logical processes and my creative work is partly the complete opposite. I think it's the most beautiful thing when you can exchange ideas and simply broaden your horizons. This works very well with the project because we all learn from each other!

I couldn't agree more on the value of our exchanges! Thank you, Laila and Kilian, for taking the time today to give us insights into the HUMAN ALGORITHM project! We look forward to our big online premiere of the HUMAN ALGORITHM in September!

For more information about the artists, see:
kiliansladek.com
lailabierling.com ■

Exhibition Fish

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Abstract

Big Data has brought important technological advances in several fields such as medicine, engineering or natural sciences. Together with these advantages, data comes with numerous risks and challenges that affect society in a wide range of aspects, and which raise several concerns on the part of digital users regarding their private data. In this report, we explore the concept of the Privacy Paradox, which describes the contradiction between data privacy concerns and the actual private behaviors of users. In particular, we want to explore to what extent the Privacy Paradox is present among students in Munich, as well as understand some of the factors that could explain this phenomenon. We performed a quantitative analysis in the form of a questionnaire to determine if the Privacy Paradox is indeed present in our target group and if providing a prior bias towards the topic affected the result of the questionnaire. Additionally, we performed a qualitative analysis in the form of interviews, to determine how and if the contextualization of privacy affects behavior towards data disclosure. We found from the quantitative questionnaire that the Privacy Paradox is indeed present among students in Munich and that the prior bias does not have an effect on actual privacy behavior. Additionally, from the qualitative interview, we observed the dependence of the context on the notion of privacy as well as the presence of a coerced participation on the data-requiring platforms. These results give some insights into possible approaches or solutions to the Privacy Paradox.

Introduction

Big data offers great opportunities. Whether it is machine-learning improving cancer detection or recommender algorithms providing us with a never-ending stream of tailored content, data enables us to achieve amazing things. However, it also comes at a cost. From individual risks such as identity theft to large-scale misuse of personal data influencing political elections, sharing data has the potential to do harm. And while most people are aware of and concerned about this, many of us continue to share personal data deliberately. Researchers have called this phenomenon the *Privacy Paradox*, the dichotomy of information privacy attitudes and actual information privacy behavior (Gerber et al. 2018: 2). Luckily, we might be able to overcome this paradox eventually as science

offers various explanations as to what causes this paradox. The most widely accepted one is called the *Privacy Calculus*. It assumes that users trade benefits they might earn by sharing their data off against potential costs.

However, much privacy calculus-based research primarily focuses on the nature and effect of benefits rather than risks (cf. Gerber et al. 2018). Even though the model assumes that users weigh benefits against risks, the notion of risk often lacks thorough consideration compared to benefits. This bias might make sense, considering that risks are commonly less well understood and negative consequences are often delayed or do not materialize at all, while benefits are experienced frequently and immediately by most users (Gerber et al. 2018: 38). However, if we put that assumption into context with Marwick's and Boyd's (2014) research, it loses its merit. In their paper on *networked privacy* in social media, they demonstrate how privacy behavior is often highly context-dependent. This suggests that understanding the context within which a user makes data privacy relevant decisions is an important determinant for their actual behavior. Therefore, if benefits are a familiar occurrence while negative outcomes are not, we might expect that situations in which users consider data privacy are more easily contextualized in terms of benefits than risks. Following this hypothesis, we argue that if we want to explain the privacy paradox, people not being able to successfully contextualize risks when disclosing data might be just as important to consider as people not taking benefits into account when reflecting on their data privacy concerns.

Starting from this hypothesis, we argue that more research is needed on how users contextualize privacy-relevant situations online and how this process affects their behavior vis-à-vis their privacy concerns. If we can determine how users contextualize these situations, we might better understand not only their behavior but also what factors influence their capacity to contextualize data privacy and, by extension, how we might enable users to reconcile their privacy concerns and their actual data disclosure behavior. In doing so, people could be empowered to make choices that are more informed and a critical discourse around data usage and data privacy could be promoted.

Background

Data in the 21st century has become ubiquitous for most of the world's population. This is because through ever improving technology we can easily gather, store, analyze and interlink massive amounts of data (Crawford et al. 2014). Paired with advances in algorithmic processing and machine learning, we can use these data in order to optimize scientific research, traffic, weather forecasting, health care, manufacturing, advertising, and the entertainment industry to name only a few examples. Because of big data, we are spoiled with only the most relevant content and advertising while unwanted products ads are a relic of the past – or so the well-crafted narrative we hear day in and day out goes.

In fact, there are caveats as well. The application of big data analysis also includes distortion, errors, bias, and misinterpretation, which can be harmful to individuals and reinforce structural inequalities, e.g., when making use of technologies such as predictive policing. In turn, personal marketing and advertising “[...] requires identification, tracking, and predictive analytics [which] should be considered a new and important modality of surveillance” (Bodle 2017: 138). This form of surveillance among other things can lead to online discrimination, coercion, political polarization, the erosion of personal autonomy, and the loss of political freedom (ibid.). A well-known example for such consequences is what Eli Pariser (2011) calls *The Filter Bubble*, which prevents people from being exposed to competing political, social, economic, or other views. This is problematic in that [a]ccess to a wide range of news and views can encourage an active and informed citizenry and provide the preconditions for a vibrant public dialog and debate that is robust, wide open, and uninhibited. (Bodle 2017: 146)

Conversely, the absence of such open dialog is likely to impair the proper workings of our democratic system.

Given these issues, being cautious with our personal data seems paramount and, indeed, people are concerned about what data they share online, how their data is being used, and data privacy in general. Unfortunately, these concerns are often not supported by corresponding actions. People frequently engage in privacy-compromising behavior although they show interest in their data pri-

privacy and generally exhibit a positive attitude towards privacy protection (Barth & de Jong 2017). Researchers call this phenomenon the *Privacy Paradox*, a discrepancy between people's information privacy attitude and their actual information privacy behavior. Even though existing privacy concerns should in theory lead to restrictive provision of information, people often share information in exchange for personalized services or retail value (ibid.). This tendency to trade benefits off against potential costs of data disclosure has been investigated by various scholars. Culnan and Armstrong (1999) point out that often for people the perceived benefits [of data disclosure] outweigh the perceived risks, which eventually leads to the neglecting of privacy concerns that often results in the disclosure of information in exchange for social or economic benefit. (Barth & de Jong 2017: 1044)

Among the different explanations for the privacy paradox, this *Privacy Calculus Theory* is the most prominent one (e.g. Gerber et al. 2018).

However, the assumption that people are making a conscious effort to weigh benefits against risk every time they disclose information online is questionable. Barth and de Jong (2017) point out that individuals often experience perceived or actual cognitive limitations regarding privacy concerns, leading to an unwillingness to use all the necessary information to make informed decisions on issues affecting their privacy. Consequently, people often fall back to subpar solutions because rational decision-making is possible only within the limits of cognitive abilities and available time (ibid.). Simon (1982) describes this phenomenon in his *Theory of Bounded Rationality*. In accordance with this theory, Barth and de Jong (2017) point out that the cognitive processes that are necessary to assess the risks of sharing information online are rather difficult to aggregate and process and, therefore, often seem too costly. Consequently, people tend to rely on simple heuristics rather than accurate information.

Based on this line of argumentation, we argue that investigating which factors influence people's cognitive capabilities in such privacy-relevant settings is crucial if we want to understand how the privacy paradox could be resolved. To this end, Marwick's and Boyd's (2014) research on *networked privacy* in social media might offer valuable insights. In their paper, the authors demonstrate how

privacy behavior is often highly context dependent. This suggests that people's ability to understand the context within which they make privacy-relevant decisions is an important determinant for successful risk assessment. However, the way we contextualize risks can be influenced or impaired by different factors that, in turn, affect the cognitive abilities we rely upon in order to properly carry out such assessments.

Goals and Methods

Taking the existing literature as outlined above into account, we argue that investigating how people's ability to contextualize privacy-relevant situations might offer insights into what factors contribute to the occurrence of behavior in line with the privacy paradox. Consequently, our research questions go as follows:

1. To what extent do students that are aware about the topic of the questionnaire regarding the privacy paradox differ from the ones who are not aware of it in self-reporting actions taken to protect their digital data?

H1: We hypothesize that the experimental group will self-report themselves as more protective with their data in online environments. Since they will be advised on the topic before answering the questionnaire, it is probable that their perceptions of what is socially desirable will play a role.

2. To what extent can the privacy paradox be observed in both groups?

H1: We hypothesize that it will be possible to observe the privacy paradox only in the control group.

3. To what extent do the participants of both groups differ in the amount of optional demographic data given?

H1: We hypothesize there will be no statistical difference between the groups in this regard, since previous research (Oomen & Leenes, 2008) showed that in general, a higher privacy risk perception does not lead to the adoption of stronger or more protection strategies.

4. How do Munich-based students contextualize data privacy when disclosing data online and how does this contextualization affect their risk assessment and subsequent data disclosure behavior?

In order to investigate the first three research questions, we used a quantitative approach. During a period of two months, 87 students from Munich universities answered the Online Privacy Survey (William & Nurse, 2016). The students were randomly divided into two groups. The control group consisted of 36 participants (63.9% male, $M_{age}=22.50$, $SD_{age}=3.33$) and most of them were studying a bachelor's degree (55.6%) while the experimental group was formed by 51 students (25.5% male, $M_{age}=22.75$, $SD_{age}=3.36$) and most of them were studying a master's degree (41.2%).

The Online Privacy Survey was composed of four parts. The first part consisted of required demographics, in which we added a few questions to the original instrument such as information about in which university the participants were enrolled, field of study and nationality. The second part included three optional demographic questions that contained an option "prefer not to say." In these questions, the participants had a choice to avoid revealing more information about themselves. Next, the third part was the opinions section that was formed by three statements regarding privacy: 1) "Privacy is of importance to me"; 2) "Online privacy is of importance to me"; and 3) "I am private with my data". The participants should rate themselves in each of the statements using a 5-point Likert scale (from strongly agree to strongly disagree). Lastly, the actions section contained a scale formed by statements about actions that online users could take to protect themselves in this environment. Participants rated themselves using a 4-point Likert scale (from always to never), so that lower values represent higher protection in online environments. In addition, in this section was included an option "N/A" and "Unsure" in each of the items.

In a study by Williams and Nurse (2016), the action scale had a Cronbach's alpha of .81, a fact we could not observe in our data. The Cronbach's alpha in our scale was initially .42, which is considered far below the standards for a scale's internal consistency. It was calculated using 48 participants (55% of the total) since cases that participants assigned as "Unsure" and "N/A" were ignored to calculate the internal consistency of the scale. Consequently, in order to increase the reliability of the actions scale, we excluded four items that presented item-total correlation lower than .1. Finally, the action scales were composed of seven items and Cronbach's alpha resulted in .64. This difference between internal reliability coefficients between the studies might be because of the smaller sample size in the present study.

Both control and experimental groups answered the same questionnaire. The difference between the groups was in the message that the participants read before answering the questionnaire. In this message, the experimental group had an extra sentence, underlined in the text below, that aimed to make the students from this group aware of the online data privacy topic. The message was:

"As part of a scholarship program, the TUM: Junge Akademie, our research team is interested in understanding basic online habits, such as social media usage, of students in Munich. Your help is crucial for our investigation.

Furthermore, as concerns about online data privacy are becoming more and more prevalent, the questionnaire also investigates the extent to which students take precautions to protect their personal data online."

Firstly, we analyzed the frequencies of the opinions section of both groups. In the next step, analyzing the items of the actions section, we observed that three items did not meet the normal distribution pattern. Thus, non-parametric methods were used to run the analysis that involved this section. The Mann-Whitney test was used to verify if there was a difference in the self-reported protective actions between the groups and the eta-squared (η^2) as the effect size.

Furthermore, we used Spearman's Rank Correlation Coefficient (ρ) to measure the correlations between the actions and the opinions statement "online privacy is of importance to me." The presence of the privacy paradox is determined by the positive correlation between these two variables. Lastly, we used independent T-test samples to verify whether the amount of optional demographic data disclosed was different between the groups.

Following this quantitative investigation, we conducted semi-structured guideline interviews to answer the fourth research question. The selection of suitable interview partners was already determined by our research question and the target population of our survey: Munich based students. Participants were chosen randomly from different faculties at TUM and HMTM. In order to conduct the interviews, we used a semi-structured guideline which is particularly well suited to cover narrow topical areas for research interests while still offering enough freedom to uncover structures of relevance and interpretative patterns of interviewees in an ex-

ploratory way. The interviews were recorded via recording devices and subsequently transcribed. For analysis, we followed a basic approach for qualitative data analysis as proposed by Strauss (1998). Accordingly, the empirical data was translated into concepts and categories through the application of codes. However, we did not develop a whole theory grounded in our empirical material as this would have exceeded the scope of our investigation. Instead, we focused on uncovering smaller concepts and categories that would allow us to answer the different aspects of our research questions without developing one central key category.

In order to do so, we first opened the raw data through open coding in order to identify concepts that would allow us to create first categories (ibid.). Following that, we created sub-categories through axial coding to form preliminary hypotheses regarding our research question which we then verified against our interview data. This part of the analysis was oriented towards Corbin and Strauss' coding paradigm (e.g. Trübinger 2004). In the following pages, we will present and discuss the findings of our quantitative and qualitative research.

Outcomes and Discussion

Quantitative Analysis

We analyzed the frequencies of the opinions section to verify the extent that both groups agreed with the statements and the results showed that groups behaved similarly. Regarding the first statement of this section, "Privacy is of importance to me," most of the students in both control and experimental groups agreed to some extent with it (88.9% and 92.2%, respectively). As with the first statement, results demonstrated that 88.9% and 92.2% of the control and experimental group, respectively, agreed to some degree with the second statement, "Online privacy is of importance to me." The participants that chose *strongly agree* or *agree* in the third statement, "I am private with my data," were similar but lower than in the first two statements. In the control group 63.9% agreed with the statement and in the experimental group 64.7%.

The results from the Mann-Whitney test showed that there was a significant difference in the self-reported actions between the groups. The control group ($Mdn=3.29$, $SD=.47$) self-reported taking fewer actions to protect their online data than the experimental group ($Mdn=3.00$, $SD=.43$), $U(N_{control}=36$,

$N_{experimental}=51)=673.00$, $Z=-2.12$, $p < .05$, as hypothesized, with a small effect size ($\eta^2 = .05$). This fact can be explained by the awareness of the objective of the questionnaire that the experimental group had before answering it, inclining participants to answer according to notions of social desirability. It is important to mention that the difference between the groups was significant, but the effect size was small. A possible explanation for this can be found in the methodology used in the study, since the difference between the groups was only an extra sentence in the beginning of the questionnaire, which might be a weak stimulus to substantially alter the students' actions self-report.

Moreover, we analyzed the correlation between the actions and opinions sections in both groups (Table 1). These results showed that in the experimental group there was a medium correlation between actions and "Online privacy is of importance to me" ($\rho = .47$, $p < .01$). However, the same correlation was not observed in the control group, indicating the presence of the privacy paradox only in the control group. This result was expected because it was dependent on the students' self-reported actions, where the participants of this group reported themselves to be less protective with their online behavior than the experimental group.

Lastly, we used independent T-test samples to verify the extent that both groups differ in the disclosure of optional demographic data. In both control and experimental groups, most participants preferred to reveal all the three optional demographic items (94.4% and 90.2%, respectively) instead of choosing the option "Prefer not to say." Moreover, as we hypothesized, there was no significant difference between the groups regarding the amount of data needlessly revealed by the participants. These results indicate that both groups were not worried about needlessly revealing data. It is important to mention that there are possible reasons that would lead the students to needlessly reveal the optional demographic information asked in the questionnaire. Firstly, the students who participated in the survey may have revealed the data because they believed it is protected since the researchers explained in the text before the questionnaire that the research was attached to a project from a well-known university in Germany. Secondly, the participants may not consider data such as relationship status, employment status, and most-used social media as private data or sensitive data they should protect in the online environment.

Qualitative Analysis

Blurred Privacy Status

Whether people share data or not is not solely determined by its privacy status. The interviewees' experiences and reflections indicate that there is a blurred line and disclosing data depends on the situational context. This can be seen in the following sequence:

Mr. G.: And I think, I'm always very critical about health data, because that's something which shouldn't be of importance to anyone except your health insurance, and not even that completely. So if a doctor, if they want to give you a treatment or something like that, they should know about that, of course. But even the health insurance doesn't need to know everything.

At the same time, today's online ecosystem also imposes its logic onto people in that they evaluate their own behavior against this very logic. Data in this context is not necessarily private in itself but only as long as a person keeps it private. Once shared online, the act of sharing renders data's privacy status ambiguous.

Mr. G.: I think the data that was collected about me like when I'm searching for health-related stuff, like I'm still giving it away, even if I'm not conscious about it, so I think it's hard to really draw that line. And like, everything I do online, I have to be aware that this is data that I'm giving away, so maybe there's not much that is really super private.

This shows that people genuinely do consider the context within which they might share personal data and not only potential benefits and risks. Getting health treatment from a doctor merits sharing personal health information while the benefits of that treatment are rather implicit in this case. However, the mere act of sharing data online might cause people to question whether their information is private or not, not because of its inherent privacy status but the imposition of data handling practices in current online environments.

Use context

The interviewees also consider what their data is being used for when contextualizing situations in which they share data online. The following interview sequence illustrates how assessing the merit of what his data is being used for is an important factor for Mr. U's risk perception.

Mr. U.: What I don't like, and it's also true that just by using the websites, not just by sharing my birthday, people are kind of making money just by knowing my birthday, right, as a representation. This is a little bit I don't know, it's like a bit of a dishonest way to make money.

His considerations go well beyond the fact that websites are using his data to make money from it. He considers these practices not only to be bad or to represent a risk but to be a dishonest way of making money, which is a normative assessment of the situation. This indicates that his assessment of the risks of sharing his personal information is affected by what data is being used for and whether this use context is normatively acceptable. Simultaneously, the interviewees stressed that they do not always know about the ways in which their information is being used and how that might affect them. Mr S.: "[...]n Facebook I have already put in some photos with my friends. Yeah, [...] I have no idea how it can be used." These findings suggest that the ends to which people's data are being used might play an important role in how they contextualize the risks of their data disclosure. This goes beyond clear-cut negative consequences but includes normative evaluations such as whether the data usage is honest or not. At the same time, the interviewees do not always know what their personal information is being used for, making it difficult to assess the merit of such usage and if it poses a risk or not.

Coerced Digital Participation

Another factor influencing the way the interviewees contextualize the risks of sharing personal information is their perception of coerced digital participation. Participating in society means participating in online platforms and the internet in general regardless of whether it puts them at a disadvantage regarding their data privacy or not.

Mr. G.: Let's say I lose my iPhone and I'm not able to access it. I mean, it's very difficult to keep up with what's happening, right? Like how do I get all the content that is there? I'm not going to [...]. But if I really want to be involved in our communication process, I'm just not gonna be part of it. And this obviously is a disadvantage. I think the more you depend on your surroundings and the more you depend on communicating with other people you cannot really choose then I mean yeah, you're kind of screwed when you don't have access to those right[?]

Summary and Future Goals

Considering all the problems and concerns around Big Data, understanding the concept of the *Privacy Paradox* is of high relevance for developing efficient mechanisms and/or regulations for protecting the user's data. For this, we investigated how the behavior towards data privacy of students in Munich is affected by the contextualization of *Data Privacy* and whether the paradox presents itself in this target group. We observed in the quantitative analysis that the paradox is indeed present in the target group. Also, the awareness about the topic, prior to the questionnaire, affected the behavior on the self-reported perception of privacy but not on the actual behavior. The prior bias on the questionnaire was not statistically significant on the amount of information disclosed. Additionally, we obtained from the qualitative analysis two hypotheses on how the participants made the risk assessment of their data disclosure. Mainly, we observed that the context in which the data is given away affects the notion of private data, as well as the importance of the notion of coerced digital participation for the participants. With this, we give a first overview on if and how

the *Privacy Paradox* is present in the students in Munich. Further work, from a theoretical perspective, could be focused on realizing a quantitative analysis on the hypothesis from the qualitative study, along with additional theoretical study regarding the factors that affect the *Privacy Calculus*. From a practical perspective, further work can be developed on designing tools or mechanisms that enable the users to regain ownership of their data. This could be done, for example, by making the data transaction process transparent and informing the users about its risks and implications, not only from a personal security perspective, but also from an ethical and a political one.

Acknowledgment

The Exhibition Fish would like to thank the DAC Artemis Studentenförderverein e.V which financially supported our project. Moreover, we would also like to thank our supervisors Prof. Dr. Peter Gritzmann and Prof. Maurice Lausberg as well as our tutors Daniel P. Schwinger and Eva M. Biehl for the support throughout the project. ■

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Self-reflection

At the beginning, we had very little idea how our time as a group in the TUMJA would work out. Our group found each other partially because of a mutual interest in the topic of data privacy, partially at random because the others seemed like nice people to be in a group with. We were happy to see what a diverse group we were, with each member coming from completely different fields of study, several group members coming from different countries and one group member even coming from a university that was not the TUM. We found our tutors and supervisors quickly and naturally, and were excited to embark upon our time in the TUMJA and our topic of data privacy.

As for many groups, we needed some time to figure out what exactly we wanted to focus our project on. After many discussions in and around the field of data privacy, we finally settled on the topic of the Privacy Paradox, a phenomenon that appealed to everyone

in the group, and something we felt that everyone could relate to. The more complicated portion came after we had decided on the topic: we were certain from the beginning that we wanted to incorporate art closely into our project. While this decision was clear, it took many discussions to decide how to best combine arts and sciences within our topic. Guided by the cultural management and social sciences backgrounds present in our group, we tried to be very mindful to include artists into our projects as equals, rather than approaching them with a finished project for them to add to artistically. Although we were uncertain for a long time how (and if) our plans would work out, we are all delighted to have found excellent artistic partners in Kilian Sladek and Laila Bierling. Through several intensive workshops, together we managed to combine our ideas, knowledge and inspiration to produce the “Human Algorithm,” an artistic reflection on the Privacy Paradox and its implications.

Now, at the end of our time as members of the TUMJA, we are very satisfied with what we have accomplished as a group. Although the COVID-19 pandemic meant that almost all of our meetings had to take place online instead of at a Biergarten as would have been our preference, we are happy to have been part of a great group with great people. We are proud to present the results of our group, including of course the “Human Algorithm,” but also a short video documentary about the project process, a virtual exhibit, a website with tips on how to protect your data, and even a brief collaboration with a Bavarian minister, to name a few.

We would like to say a huge thank you to our supervisors Peter Gritzmann and Maurice Lausberg as well as our tutors Daniel Schwinger and Eva Biehl, for being patient with us and helping us so much along the way. Of course, we would also like to thank Kilian Sladek and Laila Bierling for being integral in making the “Hu-

man Alorighm” a reality – this project truly would not have been possible without you. Finally, we would like to thank ProLehre Medien und Didaktik for helping us to create our video documentary, as well as the DAC Artemis Studentenförderverein e.V. for helping us to finance the documentary process. Thank you also to the Bavarian Staatsministerin für Digitales, Judith Gerlach, for taking time out of her busy schedule to support our project as an ambassador.

From
Team Exhibition Fish



Exhibition Fish

INTRODUCTION

Over the last few years, researchers have been studying the discrepancies between people's attitudes and their behavior regarding the data they share in online environments. Although users claim to be concerned about their privacy, they undertake very little to protect their personal data. This phenomenon is called "privacy paradox". Scientists have proposed several theories in order to explain this phenomenon but there are still some unresolved questions. The increase in users' online interaction renders it important to investigate the privacy paradox and offer information to people, allowing them to make informed decisions.

EXPERIMENT

The second component of our research will be an experiment that uses a questionnaire developed in previous literature. We will hand out this questionnaire to students from the TUM. The questionnaire assesses the attitude of participants towards sharing their data and their corresponding data sharing behavior. By examining whether the participants' attitude towards data privacy and their actual behavior matches or not, we will be able to see to what extent the privacy paradox is present among TUM students.



RESEARCH

Based on our literature review, we found out that there is a gap between people's concerns about their online data privacy and their actual behavior regarding online data disclosure. A meta-analysis of over 180 scientific studies investigating this phenomenon suggests that one of the main influencing factors is the perceived benefit that people get out of sharing their data despite their concerns. Subsequently, our research question is:

"Which role do benefits of online services play for TUM students when sharing their data online?"

Guided by this research interest, we are going to (1) conduct an experiment in order to determine to what extent this privacy paradox can be found among TUM students and (2) do at least 6 qualitative semi-structured guideline interviews with TUM students in order to explore this research question. Aspects we will cover in our interviews include what characterizes a benefit of sharing data online and how does context influence these characteristics, to name only two examples.

PROJECT

We're going to use arts as means to render this invisible process of sharing data in order to receive benefits visible again. In doing so, we want to raise awareness and offer scientifically backed insights for the public debate around data privacy. Ideally, we would like to include an actual artist in our project in order to treat arts as an equal component in our work. However, we know that finding and including an artist in our project might be difficult. Subsequently, our alternative solution is to offer the above-mentioned visualization in form of a video, artfully illustrating our research results.

GOAL

The goal of our project is to make people more aware that the privacy paradox exists and that they themselves may be acting this way. We hope that by raising awareness for this issue we will help people to be more conscious of their behavior regarding data privacy, and to be more aware of unconscious processes that may be steering this behavior.

POSTER 1:

Intermediate Evaluation – May 2020

In this poster, we reached the first convergence point in our definition of the topic of the project. We started from the general topic of data privacy, asking how people perceived this concept, until we became interested in the dichotomy between the concern that people have regarding the disclosure of data and their actual private behavior, which led us to define the privacy paradox as our main topic. From this point, there were several challenges that we needed to tackle such as the formulation of the research question. The initial idea was to investigate the role played by the benefits of online services on the privacy behavior of students in Munich. This following the goal of raising people's awareness of the privacy paradox. The most interesting challenge that we found at this point of the project was how to include an artist into the whole project. Ideally, we wanted them to participate throughout the whole process and not only at the end as a communication challenge of our findings. It was not even clear at this stage if we would be able to find any interested artists. However, our focus at that moment was to continue the progress on the research phase. ■

MAY 2020

MEMBERS Renato Coppi, Franz Xavier Gilmeyer, Annakrista Huber, Joshua Sharon Neumann, Paul Andrei Sava, Juan Esteban Suarez
TUTORS Eva M. Biehl, Daniel P. Schaeinger
SUPERVISORS Prof. Dr. Peter Gritzmann, Prof. Dr. Maurice Laubberg



Exhibition Fish

1. RESEARCH QUESTION

There is a gap between people's concerns about their online data privacy and their behavior regarding online data disclosure. A meta-analysis investigating this phenomenon suggested that one of the main influencing factors is the perceived benefit of sharing data. Subsequently, our research question is:

>> Which role do benefits of online services play for students in Munich when sharing their data online?

2. WHAT HAPPENED SO FAR?

We conducted an experiment with 150 students in Munich to investigate the presence of the Privacy Paradox. This experiment served as a basis for qualitative interview guidelines. We have also contacted artists to include in the development of the DATART Event.

3. WHAT ARE YOUR VERY FIRST RESULTS?

Students were divided into two groups (A and B). Group B was aware of the objective of the questionnaire, group A was not. Group B reported being more protective of their data than group A (Figure 1), although the effect size was small. The privacy paradox was present only in group A (Figure 2). Importantly, there was no difference in the amount of needlessly disclosed data between the groups. Accordingly, although group B reported to be more protective with their data, they did not act this way. This suggests that knowing the study objective changed the self-reported data protection behavior, but not the actual behavior shown in the questionnaire.

Figure 1 Means of students' self-reported actions in online environment

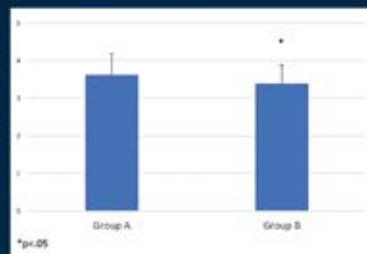
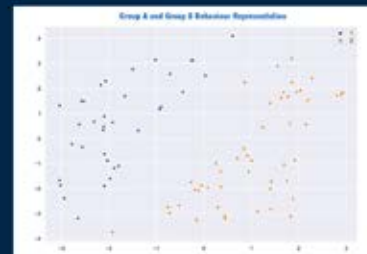


Figure 2 Correlation table between students' opinions about privacy and their self-reported actions

Opinions	Actions	
	Group A	Group B
Privacy is of importance to me.	-.31 (p=.10)	-.30 (p=.09)
Online privacy is of importance to me.	-.24 (p=.16)	-.39 (p=.02)
I am private with my data.	-.32 (p=.054)	-.31 (p=.09)

Figure 3 Two Dimensional representation of the higher dimensional Data, showing the behaviour between group A (Blue) and group B (Orange)

The plot was generated with t-SNE unsupervised learning algorithm, and gives a qualitative representation of the clustered behaviour of both groups.



4. IF APPLICABLE: WHERE AND HOW SHOULD YOU ADAPT YOUR APPROACH? (CRITICAL REASONING)

The DATART Event will be adapted according to the current Covid-19 situation. Should no in-person event be allowed, the event will be an online interactive experience.

OCTOBER 2020

MEMBERS

Renato Alves Coppi, Franz Xaver Gilmeyer, Annalena Huber, Joshua Sharon Neumann, Paul Andrei Sava, Juan Esteban Suarez

TUTORS

Eva M. Bieh, Daniel P. Schwinger

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POSTER 2:

Symposium Class 2019 – October 2020

By October 2020, we were able to expand our knowledge of the Privacy Paradox through comprehensive literature reviews. The central method of our scientific work was an experiment that we conducted with about 150 students from Munich. The results were extremely significant and can be regarded as a scientific foundation for the view that the Privacy Paradox is a phenomenon that we can observe in our immediate environment. In addition to this research work, after the first relaxation of the pandemic legislation, we had new hope for a physical event with art projects around the topic of data privacy. A few weeks after the poster, however, we realized that we had to find other creative solutions to bring our results into dialogue with the arts. ■

Exhibition Fish

WHAT IS OUR RESEARCH ALL ABOUT?

Through our research, we have tried to find out the common perception of data privacy among students at TUM, while focusing on the gap between their concerns and their behavior regarding data disclosure - also known as the Privacy Paradox. In order to investigate this phenomenon, we divided our study in two parts:

■ **QUANTITATIVE** >> consisting of a questionnaire that was sent to students in Munich. Participants were divided into two groups, one group that knew that our questionnaire was about data privacy and the Privacy Paradox, and one group that did not. The questionnaire aimed to answer the following questions:

1. To what extent do the groups differ in self-reported actions taken to protect their digital data?
2. To what extent can the privacy paradox be observed in both groups?
3. To what extent do the participants of both groups differ in the amount of optional demographic data given?

■ **QUALITATIVE** >> consisting of a series of interviews with fellow students, in which we tried to find out in more detail what motivates behaviors like the Privacy Paradox. In particular we touched upon different topics and concepts related to data privacy, such as the transaction of data, privacy calculus, ethical implications of data privacy and the notion of what is private and what is not.

UPDATE: WHAT HAPPENED SO FAR:

1. PROCESS AND MILESTONES

In the first half of our project, we focused on the research part and conducted an in-depth literature review on the discourse on data privacy. Meanwhile, we determined that our research project should focus on the Privacy Paradox. In the summer of 2020, we were able to gather our own data on the relevance of the Privacy Paradox among students in Munich by means of quantitative surveys and qualitative interviews.

Already during our research phase, we had intensive discussions internally and with external experts about how we could integrate arts into our project. Ideally, we wanted to figure out how our research on this highly relevant societal-technological challenge and the arts could work together in the best possible way. The result of these efforts is a series of dialogue projects with conceptual artists, that are curated online on our Hub. The first project started in November 2020 with jazz musician and composer Kilian Sladek and the video artist Laila Bierling. THE HUMAN ALGORITHM was developed in an extensive workshop phase between Kilian Sladek, his ensemble and our team from December 2020 to March 2021 and will celebrate its premiere in September 2021. We are conducting another dialogue project with a cartoonist from Brazil, whose work will be published online in June-July 2021.

2. Most important results

- In order to increase the sustainability of our project, we decided to change the focus of the "Exhibition Fish HUB" from the topic of data privacy to the collaboration between technology and arts. This resulted in the creation of the "tech&art HUB".
- Our collaboration with Kilian Sladek to create a Jazz piece based on the scientific research and discussions with our group evolved to include a short conceptual video that will be realized by Laila Bierling.



Left:
Jazz musician
Kilian Sladek
Right:
Video artist
Laila Bierling

- We are very pleased that we could win the Bavarian Minister of State for Digital Affairs, Judith Gerlach, as the first member of our ambassador program. There we will bring together representatives from science, society and culture to create a network for dialog projects between science and arts.

NEXT STEPS

- >> Writing the Journalistic Report in the form of an interview with our artists Kilian Sladek & Laila Bierling.
- >> Writing the Scientific Report, showing the results of the qualitative and the quantitative analysis of interviews and the questionnaire.
- >> Further developing the concept of the "tech&art HUB", specifically focusing on the sustainability of the project.
- >> Creating the storyline for our documentary about the collaboration between science&arts.
- >> Launching of the "tech&art HUB"
- >> Designing and launching the advertisement campaign for the "tech&art HUB" and the artistic productions of our collaborators.



3rd experimental
analysis of the
interview

Members:

MEMBERS

Renato Alves Coppi, Franz Xavier Gillemeier, Annalena Huber, Joshua Sharon Neumann, Paul Andrei Silva, Juan Esteban Suarez

TUTORS

Eva M. Biehl, Daniel P. Schaeinger

SUPERVISORS

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MAY 2021

POSTER 3:

Intermediate Evaluation – May 2021

This poster represents the first moment in which our whole project showed some tangible development in the artistic phase of our project. This was the most critical milestone at that moment for the group in the sense that we managed to materialize a collection of abstract ideas, regarding how to integrate our scientific results with the artists, into an exciting jazz-video composition concept realized by Kilian Sladek and Laila Bierling. We had an additional main result regarding the definition of the concept for our website "Exhibition Fish Tech Hub," which was created to guarantee the sustainability of the project, in accordance with the official TUM: Junge Akademie 2020 program. Additionally, we managed to get the Bavarian Minister of State Digital Affairs, Judith Gerlach, for what we planned at the moment to be the ambassador's program of our project. This part of the project was for us probably the most satisfying at that moment, in the sense that we managed to overcome the huge difficulties we had in moving from the abstract initial concept to a tangible one, plus the additional constraints caused by the pandemic on the possible collaboration with the artists. Up to this point, there were still several challenges to overcome, such as finishing the scientific phase of the project and producing a coherent storyline, consistent with artistic cooperation. In addition, we had to formulate a concept for the documentary sub-project which would aim to share our experiences and the process of cooperation with the artists. ■



Exhibition Fish

SUMMARY

We conducted research on the topics of data privacy and the privacy paradox, and, based on our findings, created dialogue projects in close collaboration with artists.

RESEARCH LIFE CYCLE



STUDY PURPOSE

In our study, we explored to what extent the Privacy Paradox is present in students in Munich, and conducted interviews to gain an understanding of the motivations behind user behaviour.

STUDY DESIGN

To answer our research questions, we administered a quantitative questionnaire to see (1) if the privacy paradox was present and (2) if knowledge of our research topic influenced the answers participants gave. We also conducted semi-structured interviews gain a deeper understanding of the factors influencing user behaviour.



Experimental TUM analysis of user behaviour

STUDY OUTCOMES

The Privacy Paradox is present among students in Munich and prior knowledge of the topic does not influence the actual privacy behaviour. Online privacy behaviour is context-dependent. There is a general feeling of societal pressure to participate in platforms that inevitably gather data.

STUDY CLOSURE

Our research and journalistic report will be published in the TUMJA yearbook.

CONCRETE RESULTS / OUTCOME

Our dialogue projects, most importantly the composition and music video HUMAN ALGORITHM, which will be available on our ExFish HUB.



Poster for our dialogue project HUMAN ALGORITHM

IMPACT & SUSTAINABILITY

Through our artistic collaborations, we brought a new emotional and artistic interpretation to the topic of data privacy. To ensure the sustainability of this work, the results are available online.

PROJECT PARTNERS / STAKEHOLDERS

The most important project partners were the artists Kilian Stadler and Lutz Starling, who made the HUMAN ALGORITHM possible.

ACKNOWLEDGEMENTS

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SEPTEMBER 2021

MEMBERS Renato Alves Coppi, Franz Xavier Gillemeier, Annalena Huber, Joshua Sharon Neumann, Paul Andrei Sova, Juan Esteban Suarez

TUTORS Eva M. Biehl, Daniel P. Schainger

SUPERVISORS Prof. Dr. Peter Gritzmann, Prof. Dr. Maurice Lauberg

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POSTER 4:

Symposium Year 2020 – October 2021

At the end of the 20 months of the scholarship, we look back on our time in our team with great gratitude. In the first step, we approached the topic of data privacy and especially the privacy paradox as researchers, looking for insights into how concrete and provable the challenges are that we perceive in our daily lives. The results proved unequivocally that the Privacy Paradox is a phenomenon that is robustly present in our immediate environment at the university. We are particularly proud of the next step, which we took with a lot of work and discussion: We brought our research findings into dialogue with professional artists to find new and personally touching ways to shed new light on this relevant topic. With the opening of our virtual exhibition and the online and live premiere of HUMAN ALGORITHM, we have reached milestones – thanks to the TUM: Junge Akademie – that have greatly enriched us as a team and each of us personally. ■