TUM: Junge Akademie

Research Reports 2017/II

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Partner of

TUM Universitätsstiftung

Welcome to the *TUM: Junge Akademie*

In this booklet the insights and final results of the 2017/II project groups are presented. Once again, it was exciting to see how our particularly talented students came together to create tangible projects from the quite broad and general motto “Truth and Lies”.

Even though the immediate reactions to the call could have led to more simple proposals – such as, for example, counting and assessing the number and the effects of the numerous and obvious "alternative facts" in the last few years – the students focused on demanding projects, addressing four subliminal and tricky mechanisms: The well-known, but difficult to quantify, aspect of subconscious influencing by search engines, the aspect of the new dimensions of manipulation through personalized advertising, the difficult task of coping with truth in politics, since democratic processes don’t always accept truth or a rigorous integration of scientific findings and, finally, the question of how credibility in communication is influenced by the communicating person.

It is satisfying to see how our students poured the basic problem of finding truth and avoiding lies, of a true description of reality, into their projects. They focused on the key mechanisms that lead to unconscious shifts in perception, affecting us all.

The teams’ insights and experiences were wrapped up in a symposium “Truth 2.0”. After the excellent first symposium in 2018, they further elaborated on this concept with inspiring keynotes and a Cabaret finale, showing the diverse formats for finding truth.

Why are we convinced of our format *TUM: Junge Akademie*? Why do we invest so much time in this format? We do so because we know that our excellent graduates will have the responsibility and the power to identify disruptive processes and to proactively shape development – to understand, analyze and balance conflicts of interests, and to act as moderators and communicators. We thus consider it as particularly important to encourage our students to discuss difficult issues that require a transdisciplinary approach – ranging from psychology, over communication theory, politics, economics, information technology to data analysis and data reduction. We also want to encourage them to not just talk about these issues, but to move from “talk the talk” to a sound “walk the walk”, to transform discussions into actions for the better, to ask and address questions for which there are no clear answers and that must be illuminated from different angles. We prepare them for future work that is fueled by scientific analysis, creativity, commitment, and good communication. Nothing should be taken for granted, and established paradigms have to be questioned. Common simplifying statements like “as we all know” should be no-goes.

My sincere thanks to all the supervisors, tutors, and former members involved in the projects. Their generosity of time, expertise, and friendly advice has been of enormous value to the project groups. Many thanks also to the TUM Board of Management for supporting the format, to the Managing Director Peter Finger and to Maria Hannecker and her team for their invaluable and highly professional guidance, and to the members of the Taskforces and the Board of Members for their creativity, devotion, and enthusiasm.

Enjoy reading this booklet and exploring the projects! Enjoy truth!

Yours,

Gerhard Müller
Senior Vice President Academic and Student Affairs

Dear friends of TUM,

At TUM, promoting talent is a core aspect of our agenda – and the *TUM: Junge Akademie* offers young people of all scientific disciplines an opportunity to address current social issues alongside their courses of study.

For the projects presented in this Research Report, the scholarship recipients of the year 2017/II selected four up-to-date and relevant topics – following the motto "Wahrheit und Lüge" *("Truth and Lies")* – which were then addressed over the course of the past 20 months: policy advice by students, perception of personalities based on the truthfulness of their statements, clustering of users of Google Search, and the question how young people handle social media advertising.

So as to address these questions, the students left the familiarity of their specialist discipline in order to expand their personal horizons. Based on this kind of experience, the *TUM: Junge Akademie* – under the leadership of our Senior Vice President for Academic and Student Affairs, Prof. Dr.-Ing. Gerhard Müller – prepares them to take over responsibility and to make factual decisions. These skills are fundamental to being successful in the fields of business or science.

At TUM, we are convinced that this format is effective. We are especially proud that there are already five professors among the alumni of the *TUM: Junge Akademie*. Around 80% of the participants decided to take first steps into the world of science by working on a doctoral thesis after completing their studies – mostly at TUM, but also at other renowned universities in Germany and abroad.

After more than ten years of existence, we are proud of the scholarship program *TUM: Junge Akademie*, of the students involved, of their supporters from among the TUM professors, and of the many creative and motivating formats that have so far been developed. Further, the TUM: Junge Akademie also represents TUM at the Streetlife Festival (with the "StreetScience" format), motivates more than 1,500 people from the TUM network to take part in the annual TUM Campus Run in Garching, and sparks enthusiasm for research and teaching in the scope of the twenty-month scholarships. Thereby, we can show what is important to us: to inspire our students to be curious and to become intelligent, responsible people who are capable of making their own decisions!

As President of TUM, I would like to congratulate everyone involved for their achievements. I hope that the *TUM: Junge Akademie*, which is unique in Germany, will set an example for similar endeavors elsewhere.

Yours sincerely,

Wolfgang A. Herrmann
President

„The truth is rarely pure
and never simple.“

Oscar Wilde

Directory

Directory

List of Supervisors

Prof. Dr.-Ing. Martin **Buss**
SciCom
Electrical and Computer Engineering

It has been a great inspiration to discuss this project with a team so motivated to achieve so ambitious goals; job well done.

Dominik **Frank**
CredibiliTUM
Forschungsinstitut für Musiktheater Thurnau
Universität Bayreuth

Congratulations to the students and many thanks that I was given the opportunity to accompany this exciting project, which also provided new impulses to my own research.

Dr. Alexander **Lang**
SchaschLeak
Chemistry / Mechanical Engineering

And again it was lots of fun working with a team of highly motivated students on an interdisciplinary topic. SchaschLeak, my 3rd term as a supervisor, amazed with interesting approaches.

Prof. Dr. (em.) Klaus **Mainzer**
SciCom
Munich Center for Technology in Society

TUM:JA is filling a key gap in the transdiciplinary education of next generation students: in cooperation with stakeholders in society, ideas are developed, conceptualised and realised.

Dr. Hannes **Petermeier**
ClusterMe
TUM School of Life Sciences

TUM:JA let you experience communicating between disciplines, applying different methods and getting an overview, too. It's simply practical interdisciplinarity.

Dr. Florian **Röhrbein**
SciCom
Informatics

As a supervisor, I promote a higher degree of permeability between university research and industrial development, especially in the field of artificial intelligence.

Prof. Dr. (em.) Erich **Sackmann**
CredibiliTUM
Physics

I am impressed by the impact of TUM:JA on the most brilliant students. By letting them chose the research projects they learn to overcome difficulties through team cohesion.

Prof. Dr. (em.) Jürgen **Scheurle**
ClusterMe
Mathematics

I enjoy very much to be a mentor of the TUM:JA. Helping students to create, shape, implement, and finally evaluate their project ideas is a wonderful task.

Prof. Dr. rer. soc. Elisabeth **Wacker**
CredibiliTUM
Sport and Health Sciences

Pioneering spirit was in demand, teamwork becomes a source of strength and it's fun - what more could you want?

Dr. Manuel **Wiesche**
SchaschLeak
Informatics

I really enjoy working with these curious and hardworking students at TUM:JA and appreciate the chance to support them in their projects.

List of Tutors

Thomas **Bickel Haase**
ClusterMe
TUM School of Life Sciences

Working with ClusterMe was great. It was fantastic to see the members grow together as a team and watch them commit to a common goal, making an amazing tool.

Nikolaus **Pöchhacker**
CredibiliTUM
Munich Center for Technology in Society

TUM:JA provides the students and tutors with the unique opportunity to learn that great projects are made from failures and how to grow with your challenges.

Xenia **Priebe**
SciCom
Mechanical Engineering

For me, being a tutor meant to find the right balance between guiding my project team and providing the students with sufficient freedom.

Leonard **Przybilla**
SchaschLeak
TUM School of Management/Informatics

TUM:JA provides a unique environment to get to know and gain experience in scientific project work. Teams really have the opportunity to work on their own terms.

Christopher **Schlenk**
SchaschLeak
Mechanical Engineering

It was an interesting and inspiring experience to accompany Team Schaschleak on their way through their project. You managed it thanks to your motivation and your team spirit.

Alexander **Biederer**
SciCom
Informatics

TUM:JA offers space for engagement in socially relevant areas, and thus supports personal growth and further flourishing of young, prosperous talents.

Vanessa **Buchweitz**
SchaschLeak
TUM School of Life Sciences

As a member of the TUM:JA I became aware of how the work in an interdisciplinary group can lead to new perspectives about projects.

Beate **Lang**
CredibiliTUM
Physics

Being a tutor was an interesting shift of perspective: Looking from outside at how a team works, after making the same experiences in my own project work.

Dr. Matthias **Lehner**
SciCom
TUM School of Education

As a tutor, I support the scholarship holders of TUM:JA to develop their project ideas. Therefore I share my experience with our motivated students.

Evi **Schmid**
SchaschLeak
TUM School of Life Sciences

As tutors, we are advisory and motivational supporters of the group. We want every participant to experience such a valuable time during the scholarship as we did.

Michael **Vetter**
ClusterMe
TUM School of Management

Having followed the evolvement of a team and the shaping of ideas in more detail over the course of a year is a rewarding experience for tutors as well.

List of Scholarship holders 2017/II

Anna-Lena **Fackler**
ClusterMe
Civil, Geo and Environmental Engineering

The opportunity to meet a great variety of students and work together interdisciplinary was a good and enriching experience for me.

Gabriele **Fruth**
SchaschLeak
TUM School of Management

During my time at TUM:JA, I gained many insights into team and project work. I am really grateful for all the people I met and the experiences we could share.

Bertram **Fuchs**
SchaschLeak
Munich School of Engineering

It is great to work together with interdisciplinary students. Discussing the challenges of our world is simply inspiring.

Christos **Gazanis**
SchaschLeak
Mathematics

“I am not proud, but I am happy; and happiness blinds, I think, more than pride.” Alexandre Dumas

Marina **Able**
ClusterMe
TUM School of Life Sciences

I appreciate the time I had at TUM:JA, the things I learnt and the good friends I made in that time. I want to thank the people who made this possible.

Julian **Albers**
ClusterMe
TUM School of Medicine

At TUM:JA I had the pleasure to work together with interesting students from different fields and backgrounds on our project ClusterMe!

Veronika **Bauer**
SchaschLeak
TUM School of Governance

TUM:JA gave me the opportunity the think outside the box and to gain new experiences like organizing a symposium.

Rishith **Ellath Meethal**
ClusterMe
Civil, Geo and Environmental Engineering

Workshops, seminars, socially relevant projects, cultural exchange, panel discussions and a multidisciplinary team – that is TUM:JA.

Barbara **Gleißl**
SciCom
Munich School of Engineering

I loved being part of a culturally diverse and interdisciplinary team full of people who were always enthusiastic and supportive of each other.

Frederik **Heetmeyer**
SchaschLeak
Munich School of Engineering

I will carry along enriching memories from this program: Working in multidisciplinary teams, having the freedom for experiments and learning new skills.

List of Scholarship holders 2017/II

Daniel **Körner**
SchaschLeak
Mechanical Engineering

Those 1.5 years were a wonderful possibility to develop skills in diverse areas. The work with my team was always a pleasure and we shared great experiences!

Luisa-Maria **Kraus**
CredibiliTUM
Sport and Health Sciences

I experienced the positive effect of interdisciplinarity on cooperation and work results. A functioning and diverse team is the key to a successfull project.

Frank **Latsch**
SchaschLeak
TUM School of Medicine

In our team, we were able to be creative and try out unusual ideas. I'm grateful to get to know outstanding people and opportunities through the Academy.

Sebastian **Leicher**
SciCom
Munich School of Engineering

The interdisciplinary, intercultural and inspirational project journey with my great team SciCom was an enriching experience, and I am very thankful for it!

Daniel **Hernández**
ClusterMe
Architecture

The past twenty months working with a great team helped me to develop my skills in multiple aspects and drives me to look beyond my horizons.

Thomas **Just**
SchaschLeak
Chemistry

TUM:JA was a great opportunity to open myself up to different ideas from outside my own field of studies.

Kyra **Kleine**
ClusterMe
Architecture + Mechanical Engineering

Through the TUM:JA I have learned how important the communication and cooperation between the different disciplines is.

Tilman **Knopp**
ClusterMe
Mechanical Engineering

Thank you TUM:JA for giving me new insights in interesting topics and the opportunity to meet awesome people!

Hayden **Liu Weng**
CredibiliTUM
Civil, Geo and Environmental Engineering

With the TUM:JA I had the chance to work with a very diverse team on an engaging and challenging topic, all while sharpening my German language skills!

Mohammad Y. **Mahfouz**
ClusterMe
Electrical and Computer Engineering

Being part of TUM:JA helped me to develop my teamwork skills. Working in an interdisciplinary team added a lot to the team ideas and development.

List of Scholarship holders 2017/II

Michael **Reichert**
SchaschLeak
Physics

Facing challenging tasks together in an interdisciplinary team with ambitious students prompted me to think out of the box and helped me to grow personally.

Jakob **Scheffels**
SchaschLeak
Munich School of Engineering

During the work with an interdisziplinary team I have learned the advantages and the challenges of a group project and met a lot of amazing people.

Carolin **Schimmer**
CredibiliTUM
Sport and Health Sciences

In contrast to a culture of no mistakes, TUM:JA offers challenging and inspiring tasks with room for failure, self-responsibility and creativity, which allowed me to grow.

Philipp **Scholl**
SchaschLeak
Mathematics

Besides the interesting work in a completely unkown field with the guidance of experienced mentors, the best of TUM:JA was being part of a very motivated team.

Sebastian **Mair**
ClusterMe
Informatics

The last twenty months were an extremely enriching time, where I learned a lot and met many interesting people from other fields.

Alina **Minth**
SchaschLeak
Sport and Health Sciences

Working in an interdisciplinary team is a valuable experience, a good possibility to meet new people and through the project a great opportunity to improve skills.

Janna **Nikonov**
ClusterMe
TUM School of Medicine

TUM:JA was a unique chance to get in touch with students from all faculties and to work on something that was very different from my everyday life in university.

Himanshu **Panandikar**
SciCom
Electrical and Computer Engineering

TUM:JA gave me the chance to not only work on a socially relevant project but also to learn more about Germany and have fun with my wonderful teammates.

Sabrina **Schwarzmeier**
SciCom
TUM School of Education

I appreciated working together in an interdisciplinary team. During the 20 months, I learned a lot, not only about scientific work but also about myself.

Lea Sophie **Seier**
ClusterMe
TUM School of Medicine

TUM:JA showed me the advantages of working in an interdisciplinary team, combing different strategies of solving problems and listening to other ways of thinking.

List of Scholarship holders 2017/II

Maryam **Tatari**
SciCom
Munich Center for Technology in Society

Working with teammates from different perspectives is like wearing a pair of glasses that has helped me to see and understand issues better.

Victoria **Treßel**
SciCom
TUM School of Management

To me, TUM:JA is about understanding and glancing through the lenses of disciplines and nationalities different than one's own.

Julian **Trummer**
ClusterMe
Architecture

TUM:JA enabled me to step out of my study routine and gave me the tools and self-esteem to build my individual academic career path.

Patricia Sophia **Wild**
SchaschLeak
TUM School of Governance

It was an enriching experience to develop an interdisciplinary project with a great team of interesting people. TUM:JA helped me grow personally.

Sebastian **Siegel**
SciCom
Civil, Geo and Environmental Engineering

Being part of TUM:JA was an amazing journey for which I would like to thank all my team members and people involved.

Lea Luka **Sikau**
CredibiliTUM
University for Music and Performing Art Munich

In the 1,5 years in which I had the honour of being a part of TUM:JA, I have learned many essential lessons not only for work in accademia, but for life in general.

Nicola **Stadler**
ClusterMe
Architecture

In addition to the project work itself, it was above all the numerous encounters and friendships that will hopefully accompany me for a long time to come.

Patrick **Strobl**
SciCom
Physics

Interdisciplinarity and teamwork that's what the TUM:JA is all about. During the project time we combined our different expertise and made the most out of it!

Milena **Wörsching**
CredibiliTUM
TUM School of Education

Working within the academy, but always outside the box.

Projects 2017/II

Our Projects – with an impact on society!

One more cohort of our scholarship program is closing and it is time to say thanks to all of you for your inspiration, creativity and openness to accept the challenge joining a really unconventional and unique program at European universities. What makes TUM: Junge Akademie so special?

Students of all fields of study come together in teams and develop a research project what acts transdisciplinary from academia on society. One of the learning goals of the Academy's project work is to take group members out of their individual comfort zones, and this is facilitated through an interdisciplinary approach. The scholarship holders identify a topic of interest and observe the role it plays in society. In a second step, a research question based on the observations is developed and a hypothesis is formulated.

To verify the hypothesis, the students work together in a creative and explorative way to develop a methodology which, after testing, can help the team to plan an innovative project.

Supervisors and tutors do their very best to guide, prompt and challenge the teams to help them on their way to a successful outcome. After an intensive self-reflection process and several peer feedback sessions, after twenty month the outcome of the project is discussed and evaluated at the final symposium of each academic year. It is no surprise that the final results of the projects often differ greatly from what was anticipated in the initial project ideas – intellectual agility and flexibility are key qualities to be acquired during the learning process that TUM: Junge Akademie offers its members.

This year, three of the four teams, do not want to end their activities after the official scholarship program conclusion but give a continuation to their work. We are looking forward to giving them all the support they need to make the plans a success.

You can gain greater insights into this process by reading the complete reports from the project groups of Year 2017/II and 2019 in this publication – and, rest assured, you will find them full of fascinating surprises.

Peter Finger

Project Report **ClusterMe!**

Team
Marina Able
Julian Albers
Rishith Ellath Meethal
Anna-Lena Fackler
Daniel Hernández
Kyra Kleine
Tilman Knopp
Mohammad Youssef Mahfouz
Sebastian Mair
Janna Nikonov
Lea Sophie Seier
Nicola Stadler
Julian Trummer

Tutor
Thomas Bickel Haase
Michael Vetter

Supervisors
Dr. Hannes Petermeier
Prof. Dr. (em.) Jürgen Scheurle

Preface ClusterMe by Jürgen Scheurle

Modern media provide an excellent opportunity to gather information about almost everything. In this regard the internet (world wide web) has become one of the most popular media. In fact, nowadays it is common to use some search engine on the internet to find out what to do next, where to go, what to buy or rent, what to consume, etc.. Even knowledge traditionally to be found in some encyclopedia or in books is available on the internet.

However, several search engines are run by advertising companies such as Google, which make a huge profit by collecting and storing personal data including search preferences. Using these data, they present personalized search results as well as commercials selected and ranked by means of sophisticated algorithms. So, often the information provided on the internet is actually biased in one way or another and can strongly depend on collected personal characteristics (or rather on characteristics related to the individual internet access device used).

Obviously, this has certain advantages for the users, but there is the drawback of possibly not becoming informed objectively and comprehensively. This is a crucial issue. Therefore, the project team ClusterMe of the academic year 2017/II of the „TUM: Junge Akademie“ has developed an online-tool in order to examine to what extent Google search results are personalized and to raise people's awareness concerning that issue. Everybody is invited to support and to take part in this initiative by visting the website www.cluster-me.com.

The ClusterMe online-tool allows to compare the Google search results received by different people (by means of different internet access devices, respectively). In particular, in the case of certain prescribed search items, it automatically determines and visualizes clusters formed by participants who receive similar (in some well- defined quantitative sense) search results. So, participants can find out to which cluster they belong. Also, they are provided with the search results of all the other clusters. These clusters are supposed to reflect Google's clustering based on personal user profiles. Last but not least, participants are informed about possibilities of how to get unbiased search results on the internet.

The project team ClusterMe did a great job. Being a group of thirteen students from various faculties at the Technical University of Munich, it is not easy to agree upon a topic for a collaborative scientific project and to coordinate the cooperation of the team members in an efficient and goal-oriented way. The team ClusterMe successfully managed to achieve all that and to obtain interesting results during the project period of about eighteen months. Being a mathematician, I especially appreciate, that the team decided to choose a number of quantitative rather than just empirical methods to analyse differences between Google search results. As a mentor of the team, I helped the members of the team to stay motivated and focused over the whole project period, and I offered ongoing academic advice.

Of course, the impact of the ClusterMe initiative depends on the size of the sample of participants. Unfortunately, due to time constraints, only a relatively small group of students participated so far. Hence, the results obtained up to now are not very likely to be representative for general users of Google's search engine. Having more participants could make quite a difference. So, the project is worth to be continued and to be further developed. In any case, general internet users will benefit a lot from participating. ■

How old is Helene Fischer, where can I find the next best pizzeria and why can we drink water while doing a handstand? The answer to such questions is usually the same: Google.

cluster.me

RAISING AWARENESS OF CLUSTERING BY SEARCH ENGINES

No matter which question is on our mind, we simply pull out our mobile phones or start the laptop in front of us, open the internet browser and "google" it. Within seconds, we get a series of search results proposed. But the websites we end up on, are usually already at the top of the list. And that is no coincidence. The team behind the website called “ClusterMe” has therefore set itself the task of shedding more light on the search giant Google. Their aim is to find out whether and to what extent the suggestions of the search engine depend on our personal characteristics. Through their online tool, they want to enable Internet Users to compare the results of google queries with other users.

Let's assume that two friends google the same keyword, for example “vegan”, both using their private mobile phone. Against expectations, the two friends do not get the same results suggested. Imagine friend A, who has been vegan convinced for years and who has used Google before to find new vegan recipes. His friend, on the other hand, has a taste for meat and he has let Google know that in the past. The hypothesis is, that looking at friend A's first Google suggestions, they might include tips for vegan restaurants or organic supermarkets in his area, completed by new vegan recipes. Among the list of search results for friend B you might find a Wikipedia article about veganism and articles that demonstrate and weigh up the pros and cons of a vegan diet. To put it somewhat exaggeratedly, the theory is, that the search giant Google, knows exactly what the two friends are interested in and on which page they are most likely to click on.

But how does Google know? How would the friends end up with such different, but somehow accurate results? One thing must be clear when using the services of the search giant: Google is an advertising group. They use the search terms that its users enter in the search form to present personalized advertising to each one of them. The company collects and stores data, including users’ search history and account information. This way the company might know exactly what our two friends’ likes and dislikes are and what their attitude is towards a certain topic. The theory is that one will most likely get search results that resemble rather preferences and less likely conflictive points of view. So you could say, one googles in a filter bubble. In other words, one would be trapped in a cluster. It is precisely these clusters, that the online tool “ClusterMe” wants to prove and make visible for Internet users.

But doesn’t life become a bit easier, because the search engine already shows a pre-selection of search results tailored to ones needs? Yes, partly. After all, getting information that is relevant to oneself makes life much faster and less complicated. For example, looking for the weather forecast, it is helpful to get results that are related to the current location or hometown. The situation is different, however, with controversy topics. Think about, for example, the recent European elections. A user is looking for information to help him make the right choice. Suddenly it becomes quite dangerous, if he should only get a certain selection of party homepages suggested. The voter could make his decision without having to deal with the views of other parties.

For this reason, ClusterMe was invented. The online tool examines the personalization through Google. It tries to verify and visualize the clusters, into which searchers are put. It further questions, whether the different clusters are also connected to the personal background of each user, such as sex, age or special diet. The ClusterMe website has been online since the beginning of May and is freely available at www.cluster-me.com. After the user has filled out a short questionnaire and installed a plug-in on their device, the tool is ready to operate. In the background the search query for different keywords, such as “vegan” or "HIV", runs automatically. In the following step, the results of the user as well as those of other participants are illustrated as simple dots. The distance between these dots reflects the difference between the results the users are proposed to by Google. Similar search results will therefore gather and be defined as a cluster. The user has the possibility to compare the results of different participants and study an analysis of the resulting clusters.

But now that one knows about these potential clusters, the question arises, how to avoid them and how to bypass Google’s personalization to get a broader selection of search results. There are multiple answers to these questions. First of all, deleting one’s search history and setting the device to private browsing mode, can help. It is also useful to be logged out of the Google Account while searching. However, it remains unclear to what extent this effectively reduces personalization. Alternatively, other search engines, like DuckDuckGo or Startpage, can be considered. These two search engines have set themselves the task of setting new standards for data protection when searching the Internet. They explicitly advertise that they do not store or pass on any information about their users.

Consequently, the question comes up, how Google manages to be the indomitable No. 1. among search engines, despite its sometimes dubious handling of data protection guidelines. According to statistics from Statcounter market researchers, Google handles almost 93 percent of all search queries globally. In addition, competitors such as Yahoo (1.9%) or DuckDuckGo (0.37%) do not reveal any serious challenger. How does Google manage to displace all competitors or at least keep them at distance? Anyone looking for answers to these questions must first study the history of the company. Unlike its competitor Yahoo, Google did not need any human intervention to search the web early on and relied exclusively on an algorithm. Further, the Google founders were convinced that it was not important in the search engine business to produce content themselves – it is sufficient to organize the content of others as well as nobody else does. While others overslept further development, Google is still working on improving its algorithm every day. And as we know, this pays off for the billion-dollar group.

In the end, the web is a uniquely huge and versatile information and communication space, that has shaped and changed our lives in many ways. But it is also a place to be enjoyed carefully. It is the ultimate goal of ClusterMe to raise peoples’ awareness towards the personalization effect by Google and to provide a stimulus to question one’s current behaviour on the Internet. It is important to be aware of such threats when entering the web through the one door with the big G even tough it is so familiar and comfortable. Other approaches can open up new perspectives that are worth a try. ■

ClusterMe

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1. Abstract

Web search engines strongly influence the information users get by filtering the search results and even the order in which they are displayed. Google Search is the main search engine provider globally. While the search results are mainly adapted to the localization of the search, the device used and the timing of the search, it is unclear to what extent search results are additionally personalized according to the user's profile. Although this could lead to better search results, some critics fear it could provoke imbalanced information for some search queries. Receiving information that is likely to be weighted in a particular direction can become a problem when it comes to sensitive topics like politics.

The question is, how this bias – if it exists – could be detected and if possible also be measured. To assess this, the ClusterMe team developed the online tool www.cluster-me.com in order to assess to what extent Google search results are personalized. In addition, the differences in search results should be visualized. Furthermore, the tool gives users the possibility to individually assess how strong their own search results differ from those other users get displayed and to find out which information other users receive that they do not.

The analysis of the data collected demonstrates that search results users received differ both in respect to the links displayed and the order in which they are ranked. Furthermore, for some search queries groups with similar search results that differ from other users can be seen and can thus be interpreted as clusters. However, those different clusters can primarily be attributed to different geographical backgrounds and therefore language preferences of the users.

2. Background

2.1 Google's position on personalized search results

When people are interested in a particular topic they often choose to use the internet as a source of information. As shown in Figure 1, the internet is the second important source of information for Germans apart from asking family, friends or acquaintances and used more often than television or newspapers.[1] For internet searches Google Search is the search engine used by more than 92% worldwide, and in Germany the number is even higher than that.[2,3] Therefore, Google strongly influences the information people get if they are looking for something on the internet, and the results Google selects to display are of great importance.

To obtain search results for a specific search query Google carries out three things: it sweeps the web to find websites, it indexes the sites found by crawling and it ranks the indexed sites for a specific search query.[4] The underlying algorithms of how the scanning, indexing and ranking of the sites is carried out is a corporate secret that makes the web service so useful and valuable.

In 2005 Google announced that the results displayed to users on the search engine result page (SERP) would from there on not be universally identical for a particular search item, but rather personalized to the Google user.[5] By tailoring the ranking of the results to the user's last searches they want to prioritize information Google assumes is more relevant to the user. In 2009 personalized search was expanded to searches that were conducted while users were not signed into their Google accounts.[6]

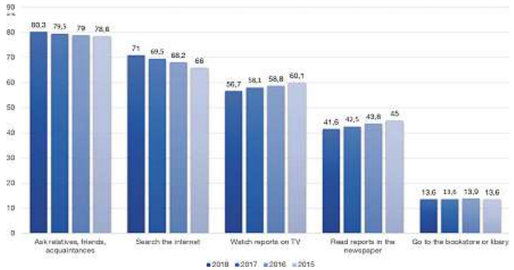

Figure 1: Information sources most used by the population in Germany in 2018 (extract)

In 2011 Google defined personalization as "[…] a special kind of context; it's the context of you. For example, what are you interested in, who do you care about, and what do you search for regularly?"[7]

While being very optimistic about the advantages of personalized search, Google was aware of potentially one-sided information if the results were completely tailored to the user's interest and preferences.

"The science of search is not advanced enough yet to provide a purely personal experience. We aren't confident enough, for example, to say that you're interested in the New York Times and not the Wall Street Journal. However, even if our systems improved so much that we could return only a single source, and it would be the source you like the most, we'd still want to provide a variety of sources and opinions. Our users value diverse viewpoints and serendipitous discovery in search results."[8]

1 Statista 2019.
2 Statcounter 2019b.
3 Statcounter 2019a.
4 Google 2019.
5 Google 2005.
6 Google 2009.
7 Google 2011.
8 Google 2011.

However, Google's optimism towards personalization seems to have faded over the years. In 2018 Pandu Nayak – the Vice President of Search – told CNBC that "Right now, there is very little search personalization and what exists is focused on a user's location or immediate context from a prior search."[9] They decided against extensive personalization as "Google has found that it seldom actually improves results."[10] Further he argues, that "a query a user comes with usually has so much context that the opportunity for personalization is just very limited."[11]

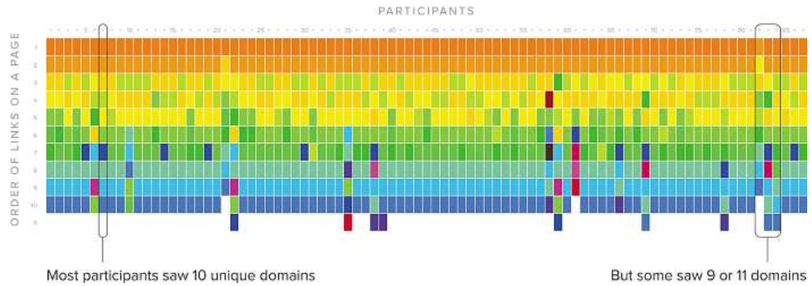

Figure 2: Google filter bubble domain variation – Partial results of the DuckDuckGo study

2.2 Opposing points of view from the public

In 2011 the publicist and internet activist Eli Pariser claimed in a much-noticed TED talk, "Beware online Filter Bubbles", and in his book, The filter bubble – what the internet is hiding from you, that personalization on the internet is not only ubiquitous but also harmful as it creates filter bubbles. In his talk he defined filter bubbles as "[…] kind of your own personal, unique universe of information that you live in online."[12] He claimed such filter bubbles exist on social media platforms such as Facebook, search engines such as Google Search and also everywhere else on the internet where recommender systems are in use that tailor the information displayed to the individual user and optimize the probability that the user clicks on the results. According to Pariser such filter bubble effects are worrisome as they do not display a well-balanced selection of information, but rather a biased one that is skewed towards the information individual users are are most probably interested in.[13] Or as Pariser describes it: "Instead of a balanced information diet, you get surrounded by information junk food".[14]

On the other hand, he criticized the fact that the selection process that forms such filter bubbles is not transparent and users are not informed about information that is not displayed to them.[15] "The thing is: you don't decide what gets in and you don't actually see what gets edited out."[16] Pariser's claims were heavily supported by Google rivals, such as the search engine providers DuckDuckGo.com and Startpage.com.[17,18,19]

In 2018 DuckDuckGo published the non-peer-reviewed study "Measuring the 'Filter Bubble': How Google is influencing what you click". In this study the search results of 87 users for the terms "gun control," "immigration," and "vaccination" – three highly debated political topics – were compared. Temporal influences on search results (information relevant to a topic changes over time) were controlled for by asking the participants to run the searches at the same time. Local differences in search results that could be attributed to local relevance of a search query were examined by checking the results for local relatedness. The result of their study is shown in Figure 2. The study was heavily debated and while some were convinced, that the data presented pointed towards a highly relevant problem others criticized the low number of participants and the methodology of the study.[20,21]

87 people searched Google for „gun control" at the same time from across the U.S., logged out and in private browsing mode. They saw 19 domains ordered in 31 ways.

Google strongly disagreed with the interpretation of the results and attributed the differences in search results to the user's "location, language settings, platform and the dynamic nature of search."[22] In 2017 researchers of the organization AlgorithmWatch conducted a large study to assess the variability of search results users saw during the German Bundestagswahl (German parliamentary elections) when searching for the names of big German parties or famous politicians. In their analysis they did not see strong differences when they controlled for time and location of the search.[23] However, it is unclear how much one can extrapolate these results to other search queries.

2.3 Project objective of ClusterMe

So far there is no strong and unambiguous proof that personalization of search results happens to such an extent that it leads to the formation of filter bubbles. However, if personalization of search results and the subsequent formation of filter bubbles was indeed as strong as suggested by Pariser and others, this could have a massive impact on decision-making of search engine users in general and political decision-making in particular. This is due to the fact, that users trust the relevance-ranking of search engines and that users are strongly influenced by the information that is displayed to them.[24,25]

Also, the question of how often personalization of Google search results occurs, how big the differences between users are and the resulting consequences on the balance of information users receive is not fully answered. Therefore, the project ClusterMe strives to further elucidate this question. Its goal is to raise awareness of the fact that search results are not static but rather dynamic collections of links, whose ranking is influenced by several different factors. Most of all, it aims to give users the opportunity to compare their search results to those others have gotten and to decide for themselves, whether they receive the well-balanced collection of information they want to see.

Figure 3: Web presence of www.cluster-me.com

3. Goals and methods

3.1 ClusterMe web application

The aim of ClusterMe is to assess the personalization effect of Google through a programmed web application. To increase the awareness of clustering this effect will be displayed as a visualization of the previously explained clusters.

As mentioned before, it is especially young people who get their information from Google searches. In fact, 87% of the adolescents and younger adults in Germany use this search engine several times a week.[26] The links in Google search results are thus the

9 D'Onfro 2018.
10 D'Onfro 2018.
11 D'Onfro 2018.
12 Pariser 2011.
13 Pariser 2011.
14 Pariser 2011.
15 Pariser 2011.
16 Pariser 2011.
17 DuckDuckGo 2013.
18 Startpage 2019a.
19 Startpage 2019b.
20 DuckDuckGo 2018.
21 Tiku 2018.
22 Google 2018.
23 Spiegel Online 2018.
24 Pan et al. 2007.
25 Epstein and Robertson 2015.
26 Luther 2017.

main source of knowledge for the decision-making process of the younger generation in Germany. Due to this fact, the project focuses on the target group of students of the Technical University of Munich (TUM).

The web tool had been published at the beginning of May in 2019. The web application could easily be reached via the internet site www.cluster-me.com. (Figure 3). Besides the data collection through participation and the display of clusters to its users, the website also pursues the goal of educating its users. It contains explanations on the topic as well as simple tips to avoid filter bubbles. To motivate students to visit the website and use the online-tool, ClusterMe accompanied the launch of the website with a kick-off event at the TUM main campus. At this event, a substantial part (60 student) of all website users up to now was recruited. A total of about 130 students took part in the project and thus contributed to sufficiently big data pool for subsequent evaluation within the first three weeks.

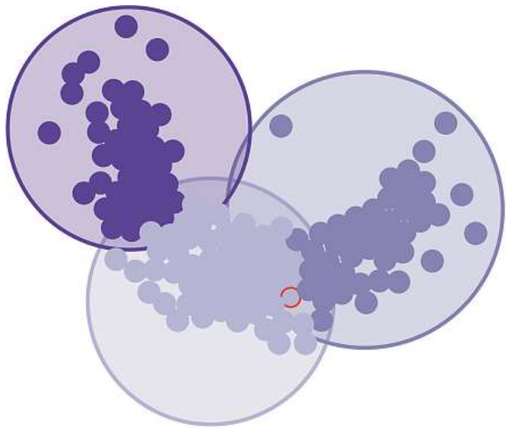

Figure 4: Visualization of the clusters for the search word “Fridays for Future”

The users represented a diverse group in terms of nationality. They came from 25 different countries. German users represented 65% of the participants and the rest of the users are come from China, Turkey, Italy, Egypt, Colombia, Israel, Taiwan, Bosnia, Czech Republic, Macedonia, Luxembourg, Ukraine, Mexico, Peru, Pakistan, Switzerland, Iran, Venezuela, India, Austria, Romania, Laos, Afghanistan and Brazil. The average age of the tool’s users was around 26 years. Moreover, most of the users are university students. Also the male to female ratio was skewed, as 70% of the participants were males. Therefore, the sample of users that ClusterMe was able to reach does not represent a broad part of German society. However, it can be viewed as a representative sample of students at the TUM main campus.

3.2 Visualization of Google clusters

For “making clusters visible to everyone” the ClusterMe team developed a clustering tool as a web application. This web application assesses which user gets which results for a certain search query and visualizes the similarity and differences between the users. As seen in Figure 4, in this simulation each user is represented by a single point. Points that are located closely to each other indicate similar search results, while points further away from each other differ in more results. If several users are allocated closely next to each other, they are highlighted as bubbles. Each bubble represents a user-cluster in Google with highly similar results.

The visualization used on the website gave users an impression on how strong the results between users differed. Furthermore, users could click on individual points to see the result page of the respective other user.

Nevertheless, the ClusterMe team concluded that this 2D form of visualization was not well suited for a thorough further analysis of the data. Therefore, the decision was made to not use this format for the final data analysis and rather introduce other forms of analysis that are closely describe in the paragraph 4. Evaluation of the Data.

Hereafter, the steps of the development process of the clustering tool are listed. In addition to the technical development of the tool, the use of the tool in the form of an experiment with 127 participants was also part of the development process:

- Proof for existing clusters in Google searches
- Decision on a method to visualize clustering
- Development of a clustering tool
- Small scale testing of the clustering tool
- Refinements following testing and bug fixing
- Selection of interesting/controversial topics for which clustering is visualized as well as relatively neutral words as counter-control
- Preparation of a large scale experiment with approximately 60 participants (TUM students)
- Evaluation of the testing results

3.3 Technical elaboration of the web-tool ClusterMe

3.3.1 Survey and collection of data

With the help of a short questionnaire before using the tool, information about the participant was collected. This was used to estimate how representative the group of users was. Afterwards, the website searches 20 keywords using Google search in the background. Among these search words one can find words on current topics such as “Impfen ja oder nein?” (vaccination yes or no?), “Fridays for Future” or “EU-Wahl” (European elections), but also less discussed words such as “Geburtstag” (birthday) and “TUM” were introduced as counter control. The URLs of the first ten results of each Google search were then stored in a list of a database. Thereby it was possible to collect the necessary data without the user typing every single search query. This database forms the basis for determining and visualizing the results of our analysis as seen before.

3.3.2 Algorithms

The differences in the URL lists of all users form the basis of the clustering bubbles. To determine the differences between them the Levenshtein Distance is used.

- Definition of Levenshtein Distance:
  Minimum number of Paste, Delete, and Replace operations to turn one list of items into another.[27]

To enhance the influence of inserting but also deleting items in contrast to just reordering them, corresponding contributions to the distance for these operations were multiplied with 2.

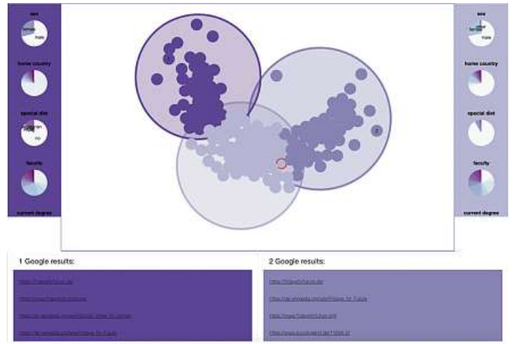

Figure 5: Visualization of a comparison between two clusters and between the results of two users for the search word “Fridays for Future”

- Definitions of clusters
  Mapping each user to points on a two-dimensional plane, so that the distance between two points (users) is approximately proportional to the calculated Levenshtein distance between these two users. This was done using a force simulation, where mutual forces are iteratively applied to the points, and each force is based on the Levenshtein Distance. A two-dimensional representation has been used, as it can be directly displayed to the users as described in Figure 4. For running the force-simulation the Javascript-library d3.js was applied.[28]

As cluster algorithm an iterated k-means algorithm was used, where k is incremented by 1 in each step starting from k=2 until the error loss from k to k+1 relatively to the error in k decreases by less than 10%. For executing the k-means algorithm for a specific value of k the Javascript-library ml-kmeans was applied.[29]

27 Centrum für Informations- und Sprachverarbeitung.

28 GitHub.
29 GitHub.

3.3.3 Display of clusters
In the front-end page of the web application a user can inspect the clusters and results of the users for each keyword as follows. By selecting a specific search-keyword, an overview of the users and clusters is displayed: a user is represented by a small point, where the position of that point is the one calculated by the force simulation mentioned above. That means, the further the points – symbolizing users – are apart, the greater the difference in their results. The computed clusters are then shown by a big circle around all points of those users, that are in this cluster. When the user clicks on a point (user), the results (i.e. the first ten URLs) are shown. Clicking on a cluster shows the user statistics for that cluster, which means the aggregated data that had been collected about the users by the questionnaire at the registration using pie diagrams (i.e. age, sex, diet).

4. Outcome and discussion

4.1 Data analysis

After three weeks of data acquisition the data was analyzed using Matlab. Two main factors influencing search results are the time of the search and the location of the user when doing the search. On the first day after launching the tool online a kick-off event at the TUM main campus was organized, where students were recruited to use the tool directly on-site. Therefore, the focus of the analysis is on the data obtained on this first day to minimize effects due to different timing or location of the search.

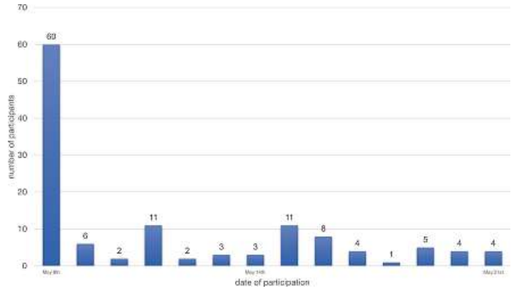

Figure 6: Temporal distribution of the usage of the online tool ClusterMe

Further, the analysis was limited to the first five search results, as users are most likely to click on one of those (Figure 7) and changes in the search results at positions further down the site would presumably not have such a relevant impact on the user.[30]

This analysis was conducted by the Search Engine Optimization (SEO) tool provider Sistrix. The evaluation of more than 120.000.000 clicks on Google search result pages demonstrates that search results ranked on top of the result page are much more likely to be clicked on than search results displayed further down.

4.2 Results

4.2.1 Homogeneous groups of results
As an initial analysis, the aim was to assess, whether there are groups of people who get exactly the same search results. For this analysis the order of the results was neglected and only examined whether they were displayed within the first five ranks.

Number and relative size of user groups that get the same search displayed on the ranks 1-5. The order in which the search results were displayed was neglected.

30 Beus 2015.

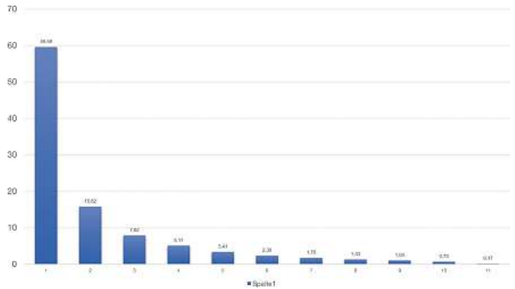

Figure 7: Probability of users clicking on links displayed by Google at different ranking positions

Three main patterns became apparent when taking a look at Figure 8. Although no hard cut-off could be determined, some search queries could be broadly attributed to one of the three patterns while others were placed between them.

(1) For some search queries a large number of users got the same search results, while other users formed several small homogeneous groups. This is the case for search queries such as EU-Wahl, Fridays for Future, Master, HIV or Pizzeria. Especially notable is the result for the search query Atomausstieg as all 60 users received exactly the same search results and form a homogeneous group.

(2) For other search queries several bigger groups with different sizes appeared. This could be observed for Industrie 4.0, Praktikum, Wachstum or Obergrenze.

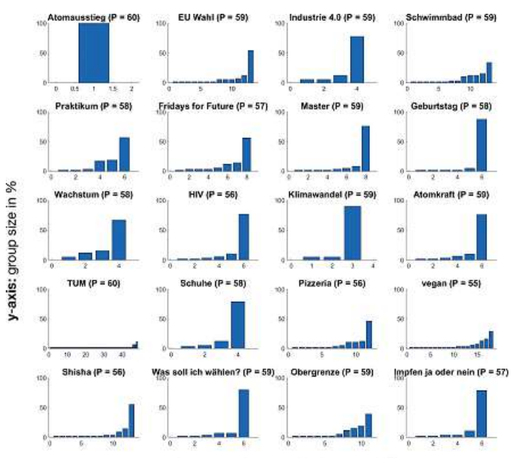

Figure 8: Uniform groups of users with exactly the same search results.

(3) For the search query TUM almost every user got individual results.

Upon closer inspection the discovery was made, that for TUM, the search result page included a search bar that enabled the user to search directly on the TUM website. This search function itself had an URL that was unique to almost every user. This explains why no bigger homogenous groups could be observed for this keyword and why this search query also displayed a unique pattern in the subsequent analyses.

4.2.2 Differences between homogeneous groups
The comparison of homogeneous groups of users already indicates that there were subsets of users that received unique results, but it was unclear how much those groups differed from one another. To address this question the number of different URLs occurring by

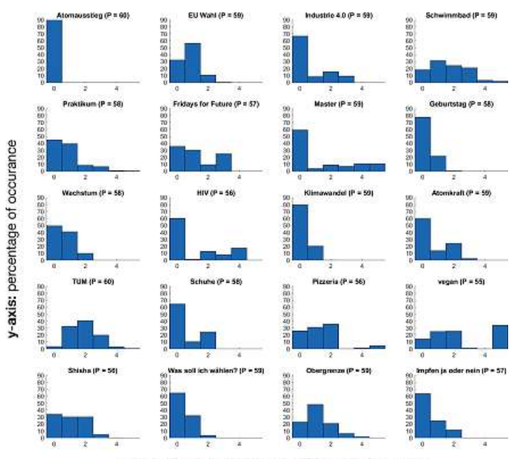

Figure 9: How many times did search results differ in a specific number of URLs?

comparing the results of all users against each other. Subsequently it was counted how many times a certain number of different URLs occurred (Figure 9). Number of different URLs among the results of all users compared against each was calculated and the number of times a certain difference occurred was counted. The order in which the search results were displayed was neglected.

It is reasoned, that if the search results for a specific query that users received could be grouped in homogeneous groups that differed from one another we should observe a high number of cases where search results differed by 0 URLs and additionally a high number of cases where the URLs differed by a specific value. Such a V-shaped distribution could be interpreted as “search-result clustering.”

On the other hand, if the results were more heterogeneous between users and no clear clusters formed but everyone differed from everyone else to a certain degree instead, more cases where the number of different URLs was above 1 should be observed, but no clear peak should be visible. Interestingly the V-shaped pattern emerged for several search queries: Industrie 4.0, Fridays for Future, Master, HIV, Atomkraft, Schuhe and vegan. This could be interpreted as a hint towards the existence of clusters of search results that are in themselves homogeneous, but differed from each other.

However, to assess whether clustering of search results actually exists, a visualization of the differences between every user and every other user in a distance heatmap as shown in Figure 10.

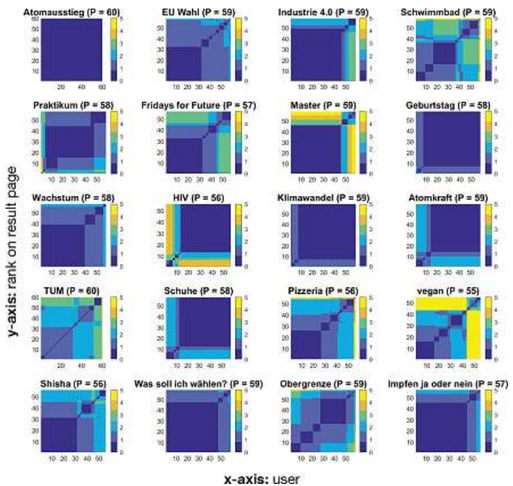

Figure 10: Distance heatmap visualizing the differences between the results of every user compared to every other user.

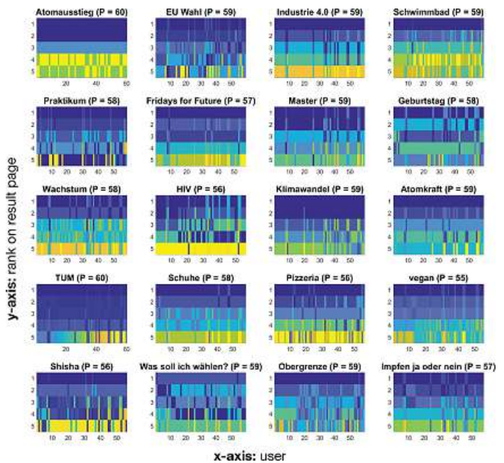

Figure 11: Distance heatmap considering the ranking of search results

The number of different URLs that users get displayed within their first 5 search results are compared. The number of URL mismatches (ranging from 0 to 5) is visualized by color (dark blue to yellow). The order in which the search results were displayed was neglected.

This distance heatmap demonstrates at the same time the formation of homogenous groups (dark blue squares) and enables the assessment of how strong those groups differ from one another (colour of the overlap with other groups). Asymmetries in the heatmap arise if the search results of one of the users contains the same link several times.

It becomes apparent that some search queries lead to “Search Result Clusters” that in themselves are homogeneous, but differ to some extent compared to other “Search Result Clusters.” The difference between big clusters is mainly small (1 different URL) and big differences are almost exclusively observed between small clusters and the other users, which speaks against the formation of big “search result clusters” and rather indicates that these users were outliers. However, for the search queries vegan, Master, Atomkraft, Industrie 4.0 and Schuhe differences of two URLs out of the first five URLs could be observed between reasonably sized clusters.

4.2.3 Consideration of the ranking of the search results

In the previous analysis the order in which the search results were displayed was neglected. However, given that the probability a user clicks on a search result link is largely dependent on the rank of the search result, which means how high on the website the result is displayed (Figure 7) it could have an impact on the information users receive.[31] Previous research demonstrates that this effect is not only a result of Google’s ability to rank the most relevant links on top of the result page. Instead participants trusted the ranking to represent relevance and even clicked on the top search results after the ranking was modified and links less relevant to the query were placed on top.[32] This emphasizes that it is not only relevant which results are displayed to a user, but also in which order they are ranked. Differences in ranking between users could therefore have a strong impact on the information they get after searching for a specific topic.

31 Beus 2015.
32 Pan et al. 2007.

To assess this question, we compared the ranking of search results users received after searching for the different queries as seen in Figure 11.

Tile plot visualizing the ranking of the search results that were displayed to different users when they searched for the indicated search query. Each color represents one URL. Similarity of individual colors does not represent similarity of individual URLs.

The visualization of the individual rankings emphasizes that the results users get displayed not only differ in the URLs displayed (as indicated in Figure 8,9,10) but also strongly vary with respect to the order in which they are displayed (Figure 11). While the first ranked result is rather similar in most cases, variation of ranking increases strongly in the lower ranks. The appearance of unique results that only one individual or a homogenous group gets displayed within the first 5 results is primarily restricted to the fourth and fifth rank.

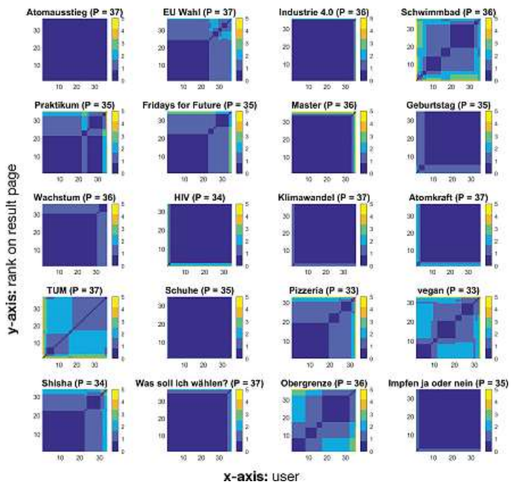

Figure 12: Distance heatmap visualizing the differences between the results depicting only German participants

4.2.4 Differences observed among German students

After a detailed review of the tile-plots visualizing individual results (Figure 8), the ClusterMe team suggests that some users seemed to have unique results differing from the majority of other users for several different search queries. These persons could be outliers. A reason might be that these users had a different home country than the German majority and therefore might receive results in a different language. Thus, it was assessed how strong the observed clustering effects could also be observed within the majority-subgroup of German users (Figure 12,13). In fact, the previously observed clustering effects were less evident within the German user group. In most cases most users got the same results and in the cases when clusters were formed they mainly differed only by one search result. However, for the search terms vegan and Obergrenze there still were clusters with homogenous results of reasonable size that differed in two out of five search results, which were regarded as a relevant number.

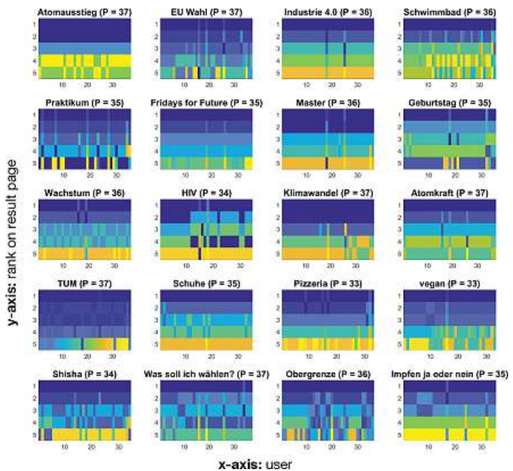

Figure 13: Distance heatmap considering the ranking of search results depicting only German participants

The number of different URLs that users get displayed within their first 5 search results are compared. The number of URL mismatches (ranging from 0 to 5) is visualized by color (dark blue to yellow). The order in which the search results were displayed was neglected.

Tile plot visualizing the ranking of the search results that were displayed to different users when they searched for the indicated search query. Each color represents one URL. Similarity of individual colors does not represent similarity of individual URLs.

Nevertheless, the fact that clustering effects mainly disappeared after selecting all German participants points toward the fact that these effects were mainly attributed to home country related differences or another factor such as language preferences that correlate with home countries. These data speak against strong search engine clustering and the subsequent formation of “Filter Bubbles”.

4.3 Illustration of the results using the example “Impfen ja oder nein?”

It was reasoned that the ranking of search queries could only have a significant effect for the information balance of users, if search results with different messages or information were ranked differently. Then, the probability of clicking the result ranked on the top and therefore receiving this information should be higher than receiving a potentially contradicting view that is displayed further down the results page.

Surprisingly, such a case has been discovered while analysing the specific URLs displayed to users. This was the case for the search

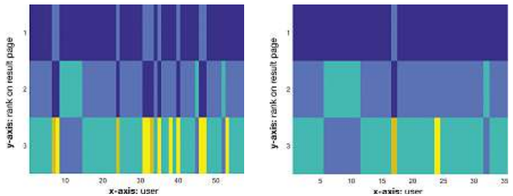

Figure 14: Ranking of the first three search results for the search query “Impfen ja oder nein?”

query “Impfen ja oder nein?” (“vaccination yes or no?”) – a polarizing topic.

When searching for this query, users got mainly the same results with no significant differences in the URLs displayed (Figure 9,10,11). In fact, in the previous analysis it was one of the most inconspicuous examples. However, the messages of the search results displayed on the top ranks massively varied: about 82% of users got the URL www.impfen-nein-danke.de and about 17% got the URL www.krankenkassenzentrale.de on the first rank (Figure 14).

Tile plot visualizing the ranking of the search results that were displayed to different users when they searched for “Impfen ja oder nein?”. Each color represents one URL. Similarity of individual colors does not represent similarity of individual URLs.

While www.impfen-nein-danke.de strongly opposes vaccination in a very emotion-driven manner, www.krankenkassenzentrale.de emphasizes the health benefits of this life-saving prevention method. Yet, as we performed the same analysis only with users that stated Germany as their home country, most users saw the same result in the first position.

Figure 14. Ranking of the first three search results for the search query “Impfen ja oder nein?” depicting only German participants
Tile plot visualizing the ranking of the search results that were displayed to different users when they searched for “Impfen ja oder nein?”. Each color represents one URL. Similarity of individual colors does not represent similarity of individual URLs.

Nevertheless, this case study demonstrates that a user searching for health-related information could end up with very different advice depending on the ranking of his search results, even though the URLs displayed to all users are very uniform in total.

4.4 Discussion

Of course, there are several limitations which have to be kept in mind when interpreting both, the data and the results. Given the low number of users analysed for this study, the temporal and local dispersion of searches and the strong focus on TUM students, we can not exactly assess the degree of personalization of web results that can not be attributed to timing and location of the search.
However, the results show that there are in fact differences between the results different users get. Depending on the search query users can be grouped in homogeneous groups that differ from one another. This can be interpreted as evidence for the existence of “Search Engine Clustering” even though the differences are subtle and the claim of the existence of “Filter Bubbles” can neither be confirmed nor contradicted. However, when we restricted our analysis to German users and thereby limited language influences on the results, differences between users greatly diminished and the results are much more homogeneous. This also speaks against the real-life relevance of search engine personalization and the formation of filter bubbles.

Nevertheless, we presented a case study for the search query “Impfen ja oder nein?”, that demonstrated that the different rankings of search results can indeed shift the impression a user gets even though all URLs are displayed.

Finally, the fact that users could compare their own results with those of other users met with great interest and enabled individual users to assess on their own how representative their received search results were.

5. Summary and future goals

The web-tool based approach that was used to assess the extent of search engine personalization could estimate the effect, that can now be assumed as fairly low. However, the approach was restricted in several ways that might have prevented the project from discovering “Search Engine Personalization” and potentially subsequent “Filter Bubble Formation”. This is mainly due to the fact that the ClusterMe team could only recruit a fairly low number of participants to use the tool within a sufficiently short period of time. Furthermore, the recruitment strategy was targeted towards students. Therefore, differences between search results TUM students received and results other persons of a different age or social-cultural background stay hidden from our view so far.

Further research should aim to target a bigger pool of more diverse users who are more spread across generations, equal male/female representations, and professions. This could be achieved with a different marketing strategy and further improvement of the website-interface that makes it easier to use. Moreover, developing the tool into a mobile application will increase its spread especially across younger generations. In general, making the tool available

to run over mobile phones will give a huge boost to its spread. Furthermore, improvements of the current visualization used on the website could enable the user to more intuitively understand how strong differences between users are. Additionally, the form of analysis that was eventually used to interpret the data should be implemented on the website. Finally, more search terms should be added to the tool in order to understand which categories of words are more affected by the clustering algorithm. This could then help spreading awareness among Google users to be more critical about their search results in these categories.

Together these steps could enable ClusterMe to get a representative data sample which will help us to better understand if and under which circumstances "Search Engine Clusters" form.

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Self Reflection

Looking back on the past two years as scholarship holders of the TUM: Junge Akademie it can be said that our project was an elaborate but nevertheless very instructive experience. In addition to the purely scientific work, the project became some kind of crash course in terms of project management and time coordination for all of us. During the progress of the project, unexpected obstacles came up. Nevertheless, we are more than satisfied with the outcome of our project ClusterMe and can proudly look back on our time at TUM: Junge Akademie.

Right from the start, we were a comparatively large project group with 13 scholarship holders, which shaped and co-determined the way we worked. At the same time, we created an enormously diverse group with members from various faculties and countries of origin. Thus the project profited from the great manpower and tasks could easily be distributed among several participants. At the beginning, however, it turned out to be a bit tricky to bring all the ideas, the different mind-sets and the different views to a common denominator. Therefore, it was particularly important to open up and talk about different view points in order to avoid problems arising in the first place. We also needed to find a way to keep all members up to date and involved in the decision-making process. We agreed to make short videos at the end of each meeting, in addition to taking standard minutes, that would summarize the things and tasks discussed. This idea turned out to be a good way to keep everyone, including the members who could not be taking part at meetings, on the same page. Ultimately, with many discussions and visualizations we managed to get our ideas on a mutually agreed path in a surprisingly short time. The enrichment by the diversity of the members was in the end greater than the challenge.

After we had found a common denominator, it was time to structure the teamwork. In order to avoid a hierarchy within the group, the different tasks varied each week. The role of the project spokesperson changed each time during the weekly meetings. For the coordination with the mentors as well as with the office of the TUM: Junge Akadmie, however, there were fixed deputies of the group. In order to maintain an overview of the numerous deadlines and different accessibility of the individual members, a group calendar was set up. This helped distributing the tasks throughout the entire working process and planning ahead. In the course of time, 13 different students developed into a well-rehearsed team.

After the topic – the ClusterMe web tool – was quickly determined, most of the work consisted in programming the tool. In addition, we needed a good marketing strategy in order to spread our message and encourage as many students as possible to participate. Therefore, we divided our group into two smaller subgroups – one taking care of the technical aspects of the project, the other one concentrating on marketing and design strategy. Trough the division of the group, the project benefited from the diversity and individuality of each of the members. Even within the subgroups, every member of the team was able to get involved in their area of expertise and thus contribute to the launch of the website.

In addition to the weekly meetings, it was above all the seminar weeks that drove the project forward. We not only had plenty of time for the project work itself, but also benefited from the lectures and seminars given by external specialists. The exchange with other people also helped to change our own perspective on the project and to rethink approaches. We were also able to support each other in discussions with members of other groups, who often faced similar challenges.

But apart from all the hard work, of course the fun was not to be neglected. Therefore, small internal team events and excursions were organized, which kept the motivation high and helped us to put the project aside for some time. Especially at times when we were

struggling with the progress of the project, such activities helped to return to the same enthusiasm and energy we had experienced at the beginning of the project.

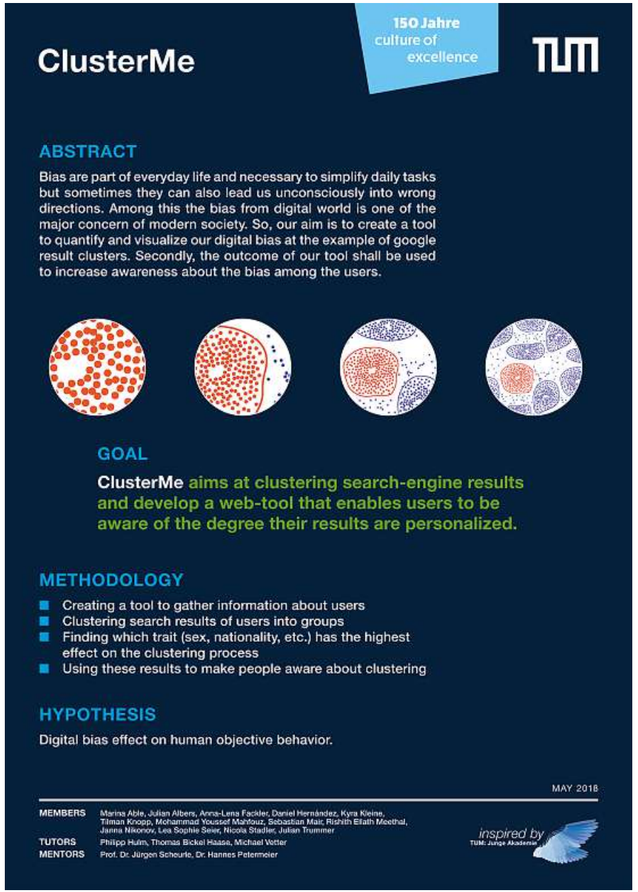
In the meantime, some of us are now scattered in different cities of Germany. Nevertheless, we hope that our project ClusterMe will be able to make an impact by introducing the website. We are proud to have shown some people that there is more than one way of searching the internet. Despite minor challenges and setbacks, working together was an incredibly instructive and exciting experience that we would not have wanted to miss.

Acknowledgement

Of course, we would not have been able to set up our project ClusterMe on our own. Therfore, we would like to offer a special thanks to our mentors – Dr. Hannes Petermeier and Prof. Dr. Jürgen Scheurle - as well as to our tutors - Thomas Bickel Haase, Michael Vetter and Phillip Hulm - who supported us throughout the way. Not only did they give valuable support and assisted when the working progress temporarily came to a standstill. They also helped finding a good structure to the regular meetings and redirected the focus on the essential topics whenever needed. They provided us with their experience in technical matters as well as in organization and planning.

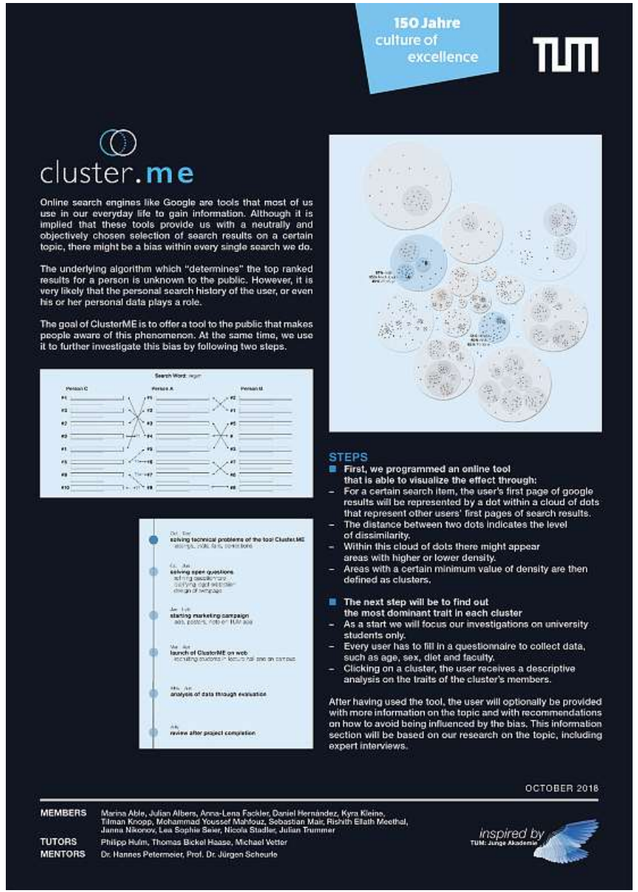
In addition, many thanks go to the TUM: Junge Akademie, who gave us a direction on the long way and still entrusted us with the necessary freedom. Thank you, for helping us during the time-consuming process of the conclusion of the contract with Heroku. Last but not least, we would like to thank all those who participated in our project and thus brought it to a successful conclusion.

The ClusterMe Team



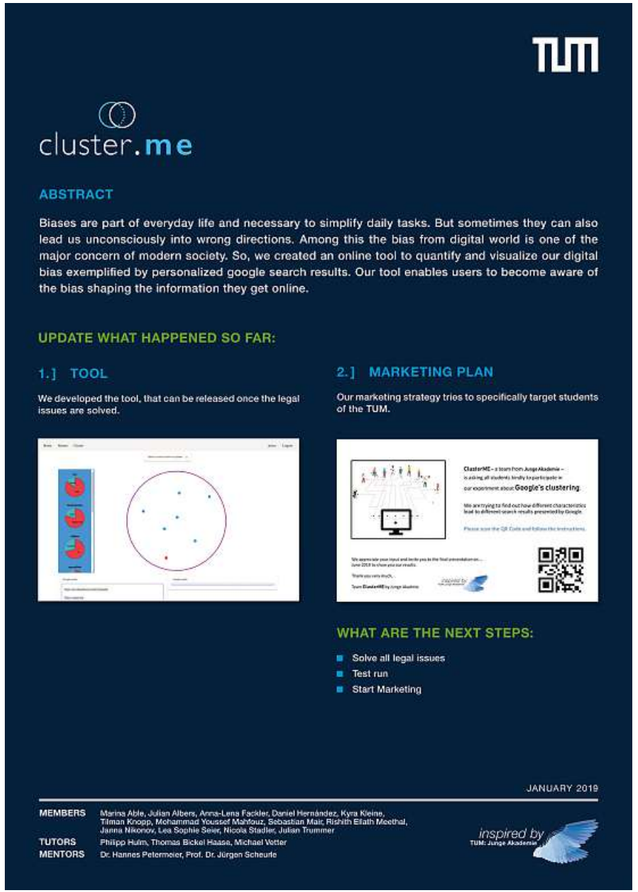
POSTER 1: The first weeks of our 20-month journey at the TUM: Junge Akademie were filled with wild discussions about the very broad topic ”Truth and Lies.” From time to time concrete projects were thought of but no agreement could be achieved due to the size of the group and the great variety of ideas and goals. However, we came to the conclusion that the topic can be found in almost every aspect of life. To find relevant material on it, most of us started with a simple Internet query, and here the first problem arose. With the same Google search word, for example ”truth,” we observed big differences between the results of our team members. This was the way the vision for the project was born: the vision of creating a tool to make people aware of the bias that search engine queries can generate. A part of that vision that we soon agreed on was the idea of particularly visualizing the clustering effect. A common perception emerged in the team of visualizing those clusters as clouds of dots with different distances between them to represent the variability of Google search results. Therefore, this sort of visualization of the clusters was already depicted in our first poster.

But we also faced two major challenges. The first challenge was to figure out the best way of implementing those ideas through an appropriately programmed web tool. Associated with this was the task of finding out which trait (sex, nationality, etc.) has the highest effect on the clustering process, and this was a problem that we would later discuss a lot with members of other groups and especially our Mentor, Prof. Scheurle. Our vision of finding out more about Google’s search engine algorithm was constrained by the fact that our methodology was only descriptive. So, while exploring the correlations between clustering and the user’s traits seemed achievable, causalities would be very hard to talk about. Secondly, organizing a subproject, focusing on working with school kids using the tool, was considered. But as we obtained more information on how difficult it is to organize such an event that includes the collaboration with schools, we decided to set our focus on university students at TUM.

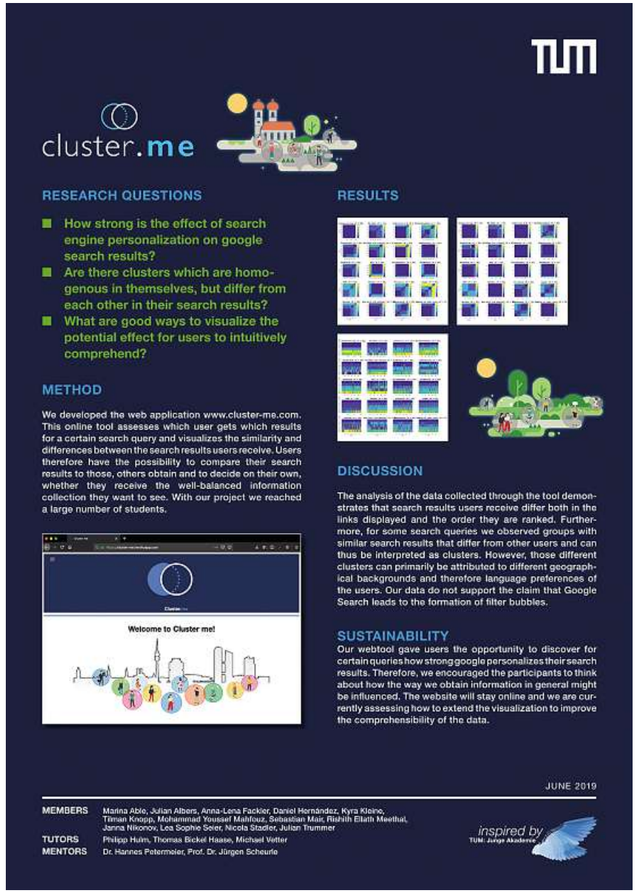


POSTER 2: By the time the second poster was designed, we had already made great advances in our project, and this progress can be seen on Poster 2. We had focused on the essentials and created a first version of our online tool that was able to visualize the clusters in which users are trapped. As can be seen, the methodology is already much more detailed and so are the images that show the visualization of the clustering. Also the description of how the clusters are generated is presented at the end. There were still some challenges to face concerning programming the tool itself, but everyone agreed on the output. Further, the part about investigating the backgrounds of the clustering became more concrete and realistic – we now wanted to find out about the “most dominant trait in each cluster” which is an exclusively descriptive proceeding. At that time, we already had quite a clear image of how we wanted to show the results to the user also.

Again, two major issues were to be solved. We had to decide on the exact search words that the tool should cover. We agreed that they should be interesting for the users, but also polarizing so we could actually see differences between the search results. At the same time, we needed some “negative controls” from which we expected to give quite homogeneous results to all members of our collective TUM students. The second issue was to manage the marketing of the whole project, since the tool would only show relevant data if enough students used the tool to genuinely create the clusters. To deal with negative effects on the neutrality of data collection like differences of time and location, we had to coordinate the dates of the marketing events with the finalization of the tool. Our discussions on that led to a quite concrete timeline that can also be seen on the poster.



POSTER 3: In order to work as efficiently as possible, we decided to split up the group into two subteams – one taking care of the technical issues of the tool, the other one working on a marketing strategy and organizing an event for the launch of the tool. This division of the group can clearly be seen on the third poster where we show the tool itself on the left side and marketing ideas on the opposite side.
At that point the ClusterMe tool was already ready to operate, with some final alterations left to implement. We had already had a few test rounds with friends and family and we were able to put small inconsistencies aside. Also, some legal issues remained to be solved. The image on the right side represents the efforts of the marketing subgroup, which mainly consisted of designing advertisements for the tool and planning an event on the TUM main campus where we would motivate students to use the tool right away. In addition to that event, a poster and a flyer were designed and distributed at the main campus, at Garching campus and at nearby student facilities. So, our plan was very concrete at that point and only few things were left to discuss. ■



POSTER 4: After solving the last legal issues, we were finally ready to launch the website in May 2019. This was accompanied by a kick-off event we organised at the TUM main campus. There, we presented our project to TUM students and motivated them to participate. Students could win sweets and TUM products by directly using the tool. Additionally, we distributed posters and flyers at sites all over Munich and used social media to reach as many students as possible.
After the website had been online for three weeks, we started on analysing the data. We discussed a lot about how to properly display the data and interpret the results. This was probably the most interesting and enjoyable phase of the project.
As a result of the analysis we developed several graphs and visualizations, such as the displayed heatmaps, which illustrate the results in a powerful and vivid way. Although we were ultimately unable to prove the existence of the cluster or filter bubbles for a variety of reasons, the graphs show that there are indeed differences in the display of search results and that these can have an enormous influence on our decisions. ■

Project Report **CredibiliTUM**

Team	Luisa-Maria Kraus Hayden Liu Weng Carolin Schimmer Lea Luka Sikau Milena Wörsching
Tutor	Beate Lang Nikolaus Pöchhacker
Supervisors	Prof. Dr. (em.) Erich Sackmann Prof. Dr. rer. soc. Elisabeth Wacker Dominik Frank

Preface CredibiliTUM by Elisabeth Wacker

In one of the most famous of movies – Casablanca – "Rick" (Humphrey Bogart) looks Ilsa (Ingrid Bergman) deep in the eyes on 3 July 1942 and says in a hushed voice "Here's looking at you, kid!" – The sentence was not in the script. And it's a traditional toast. People look into one another's eyes when toasting. On the runway it is not a suitable sentence in itself, especially when lovers separate forever under dramatic circumstances. German dubbing was correspondingly difficult. It was "Ich schau dir in die Augen, Kleines | I look you in the eyes, little one."

So what is true here? The confidence that the rescue will succeed? The credibility of the adversary who proves to be a savior? The improvised commentary? While at the same time the whole scene is set – fiction? Does Ilsa believe the toast and know that her well-being is guaranteed?

It is always difficult to separate out the personal level of emotional perception from the facts. Whom do you believe then? The ingenious actor who hits the right note, who sends exactly the core message? Or is deviating from the script a type of lie? Is the dubbing lying, with "I look you in the eyes, little one"? Is it rather the actor who is more credible, with his personality, his charisma?

How will a knowing audience interpret the situation? Will a gullible audience interpret it differently? How will specialists who believe in their own expertise interpret it, according to the demands of science?

My team has dealt with this exciting mixture of individuals who present themselves according to certain patterns, in certain places, in changing ensembles, and has thus taken up a major topic called “society.” With the social world as a complicated stage, with audiences and actors, with scenarios and cognitive intentions, the team of the Young Academy allowed itself to be taken up by an old and evergreen theme, which one can never quite do justice to, but which one should always try to get to the bottom of again and again. Truth is and remains true in contradictions, no matter whether one believes to have found the right one or whether one follows a scientific theory whose statements or facts are true, through general recognition. Even if what has been researched ultimately also remains of a hypothetical nature ... or what has been said is (still) incomplete. ■

Preface CredibiliTUM by Dominik Frank

In times when “fake news", "alternative facts", self-proclaimed "influencers" and new as well as warmed up conspiracy theories are booming, the student research project poses one extremely relevant question: Why do people believe other people? The project focuses on the question, which role the – at least assumed – similarity of sender and receiver plays. From the perspective of theatre studies the phenomenon of mimesis is addressed: When can we speak of lies or of truth? And might the non-authentic representation be more truthful than a full conviction?

I am pleased to have been able to accompany and support the project through several stages: From the idea of a staged panel discussion presented by actors*, which would have asked for strategies to generate credibility up to the question of how similarity in the personality profile on influences the assessment of credibility. Put succinctly: Are we more likely to believe others if they are similar to us? And if so: Is this a problem? If similarity in theatre leads to "fear and compassion" and moves the audience to tears (according to Lessing‘s interpretation of Aristoteles), won‘t this open the door to manipulation in political and social discourse contexts?

The fact that these discourses are conducted in an interdisciplinary and multi-perspective manner is a great achievement of the TUM: Junge Akademie. Congratulations to the students and many thanks that I was given the opportunity to accompany this exciting project, which also provided new impulses to my own research. ■

Preface CredibiliTUM by Erich Sackmann

The project addresses an important issue in modern society, the daily life of which seems to be completely determined by worldwide communications via digital media. This holds true particularly for young people. An advantage of older people – like myself – is that many of them do not know how to get access to most modern digital media. Moreover, those growing up before and during the war learned that non-critical assessment of news can end in a catastrophe.

In the project, the main emphasis is placed on the important question of how the effect of a presentation on audience members depends on their psychological orientation and sociological backgrounds. The group started the project with the idea of addressing the issue through self-performed theatre acts.

I must confess that at the beginning of the project I was quite skeptical concerning the feasibility of such a complex sociological research program carried out by a small group of five young people. Therefore I am very much impressed by the outcome of this adventure. Most impressive is how the team overcame the difficulties of the project by a high degree of creativity and by the astonishingly close cooperation among the members

Fortunately, the group overcame the initial problems by changing their research strategy and concentrating on the question: To what extent does the effect of mixing true and false statements on a listener depend on the latter’s personality structure? It was also a clever idea to apply an established strategy of sociological research based on the OCEAN concept which is currently in vogue in Germany. The most important benefit for the group is that they learned to work together and to overcome technical difficulties through a high degree of creativity.

I have two minor points of criticism. The first is that some of the presentations of the influencers were too long. Secondly, considering contemporary trends towards greater social inclusion for disabled people, it might have been helpful to put more emphasis on the question of how modern techniques of communication could help in this.

I would like to add a few personal thoughts… People of my generation are generally more resistant to fake news. In our childhood – before and during the war – we were constantly subjected to fake news distributed by radio, newspapers and movies. Some young people, believing the war propaganda, paid for their naivety with their lives. It is disappointing to see similar patterns of false reporting being accepted again by people, as if things had hardly changed.

Last but not least, it appears to me that modern western societies allow the negative features of fake news to become dominant, more precisely the important role of overstatement and/or over-dramatization in communication between people. Besides the language, it appears to be essential for the development of some type of “corporate identity” for communities and groups of people. The desire to dramatize events is of course a characteristic feature of homo sapiens and has played a central part in the education of children and of adults since the stone age. We are all fascinated by Homer’s Iliad and Odyssey, for example: A compilation of fake news from beginning to end, intended to educate young men to become heroic soldiers and the women left behind to remain chaste during the absence of their husbands.

But, taken together, it appears that more effort should be given to educating children in how to distinguish between clearly fake news and the conventional exaggerations needed to make a story more exciting. ■

Influencer B-sides: beyond your side of the screen

Standing between the carefully angled camera and the perfectly uniform white background, Eugen Bellon steals one quick glance at his phone, before carefully slipping the device away into a side pocket of his pants. Adjusting the microphone clipped to his trademark burgundy-colored shirt, with sleeves rolled up, the 33-year-old FlowFinder® cofounder starts recording their latest video for a steadily growing community of more than 100.000 subscribers. As the filming of this spontaneous video carries on, he delivers his points liberally, unbound by a script, hands waving in tune. Once Eugen reaches the closing remark, his mouth slightly arches into a smile as he delivers the finisher, a look radiating a feeling of satisfaction.

Alex Bellon, his younger brother, cofounder and CEO of the firm, has similarly been under the spotlight for other videos, donning an equally distinctive purple shirt instead. In the recordings, one of the two brothers powers through the session, while armed with but their characteristic attire, and perhaps a script and a flipchart if the video warrants so. The two of them release a constant stream of such content including both the simpler short videos and a larger number of longer, more carefully structured ones to populate their “platform for personal development, motivation, success, and happiness,” as they refer to it. In addition to the videos, members have access to articles on time management, infographics on stress, and collections of motivational quotes among others. In other words, they have access to bite-sized chunks of anything and everything related to personal growth.

The number of influencers, or content creators, such as the Bellon brothers have been rapidly increasing over the past years. The nature of their content, as well as their target audience and personal goals, is however quite varied. While some creators invite reflection, others aim to be informative, and some others simply seek to be entertaining. Nevertheless, the usage of videos is commonplace across all themes. In this feature, we look at this resource or, rather, at what lies beyond the viewer’s side of the screen.

Just as the brothers, Katharina Heilen also provides a plethora of motivational resources to her followers. In a much more casual setting, although likewise conscious of her own appearance and her environment, the 23-year-old media and cultural analysis master student and freelance writer has finished her larger and more complex tasks by midday, and now sets apart an hour of her carefully-planned schedule to record a short video for her also numerous followers. In the film, the blogger details her insights and the key aspects of the topic at hand. All the while, she aims to keep things natural, much alike a one-to-one conversation: no plans, no script, no rush; just spontaneously weaving her thoughts as they come into a coherent entity. These rather short videos are then inspected for quality before being promptly uploaded to her accounts.

However, even after the camera stops documenting a take, the job is not yet done, as our content creators confirmed: “is the tone adequate throughout the discourse? does it feel fluid and authentic? And, most importantly, will the message be meaningful to the audience?” ponder the brothers as the star of the current video falls back into position: the recording process is typically repeated a few more times in order to avoid any potential flukes and to provide different shots to choose from for the final cut. Similarly, Katharina regularly checks the responses to her posts in order to stay on top of the times, checking for engagement from her followers, as well as for further topics to develop. As soon as one entry is done, the next one looms around the corner already: “one needs to consistently deliver content in order to stay attractive [on the internet]” comments Katharina.

Indeed, influencers are competing for views and followers with no less than almost 15.000 others - and that’s just in Germany (according to the influence.co platform). Even when it isn’t a person’s main job, and while the contents and targeted audiences might be different, these sheer numbers make standing out and staying relevant no simple feat. Far from being the simple “hit record, upload, rinse, and repeat” endeavor that many still picture social media to operate as, content creation nowadays has mostly transcended its humble ways. It is less concerned about just oozing content out - perchance alongside some product placement, and more about providing food for thought and even shaping the mentality of their significantly sized communities. Therefore, the entire process should be handled accordingly. And indeed, these videos one might inadvertently

happen across when surfing the web, are but the tip of the iceberg: both of our featured content creators share a passion for helping others in their personal development.

The FlowFinder platform hosts not only the raw content itself, but also compiles it into several judiciously tailored courses and webinars, with topics ranging from fitness and awareness to business management and assertive communication. Moreover, they are especially proud of their expertise on mindsets and businesses, offering personal coaching as well. As the two brothers have understood from the mostly positive feedback from the community, their role goes far beyond the creation and upload of content, and more towards integrally helping others develop themselves and their environments.

With a similar goal in mind, but targeting women specifically, Katharina promotes female empowerment and self-confidence. While multiple English- language resources on the topic exist, she decided to fill in for the lack of accessible German-language content by channeling her own voice through a blog where she recounts personal and business success stories from women and provides tips and other helpful information to help women work on their personal development. Her videos are simply a part of the whole, where she seeks to eventually provide a space where women can interact with each other without fear.

However, the question of whether the promoted messages feel credible or not can only be answered by the consumers themselves. While the published material can be controlled for its tone or how natural or authentic it looks, it might simply not be enough. After all, as Katharina writes in one of her posts, “one doesn’t have to be especially well-known; personality is what counts.

Some people just have an infectious aura which draws others in immediately.” But how literal does it get? Would the influencer’s infectious personality reach beyond their side of the screen and into ours to define how credible their content is perceived to be? Questions like these may course through the minds of our influencers as they finish polishing their newest releases, but once they hit publish, it is up to the viewer to decide what to do with the content. ■

CredibiliTUM: The **Influence of Personality** on the **Perception of Credibility**

In a Nutshell:
- CredibiliTUM analyzed the influence of personality on perceived credibility in both the analogue and digital world
- A preliminary test with a live event and a further study with three online influencers were conducted
- Results don't show a consistent correlation between similar personalities and credibility, but does suggest more individual effects

Strengths:
- High social and academic relevance
- The study involves influencers as a contemporary communication channel
- Personality assessment is based on a widely accepted test

Weaknesses:
- The time-consuming personality test and videos limited the number of responses

Opportunities:
- The study serves as a first incursion towards more comprehensive analyses
- Can be further refined into an (interdisciplinary) research project

Threats:
- Potentially controversial content (questioning a presenter's / influencer's credibility)
- Results are only preliminary, as follow up studies would be required to confirm findings

Abstract

This report outlines the exploratory study conducted on the relationship between personality and credibility, namely, whether people believe others more when their personality style is similar. The study was conducted in two parts, with an initial trial within a live discussion setting followed by an online study with three popular influencers in the field of personal development and feminism. Both the influencers and the study participants filled out the highly acclaimed Big Five personality test, providing a taxonomy of their personalities into five dimensions of openness, conscientiousness, extraversion, agreeableness and neuroticism (or OCEAN) to compare their personalities numerically. The participants then watched short videos from the influencers and assessed their credibility and their agreement with the presented ideas. While no direct correlation was found between the two factors, minor relationships seem to be present, as suggested by results of individual influencer-dimension pairs and qualitative results.

1. Background

In today's world, a constant influx of information pours through all kind of physical and digital channels. Whether we listen to a lecture at the university, discuss political issues with a colleague, present our own research findings, or simply browse the internet, information is continuously shared. However, this information can be tainted by fake news and alternative facts which can spread globally at alarmingly fast speeds, so a certain degree of credibility is necessary to convey our points convincingly. Without it, no matter how truthful a message is, the recipient will likely dismiss it, or, what is worse, could even take the entirely opposite idea as originally meant. This possibility raises the following question: How credible is the presented content? Or even, is the person delivering the content credible? This is especially important when contradictory information is presented during a discussion, and a choice must be made as to which information to believe. This sort of interaction plays a crucial role in many deeply relevant topics such as politics and is constantly taking place all around us – even inside the social media, highlighting its importance even further.

And it is social media that plays a crucial role in the context of modern knowledge transfer, as a contemporary communication platform where everyone can be a protagonist of their own discourse, expressing their own opinion on arbitrary topics, whether socially relevant or not. Consequently, a new collective of individuals, which has understood the power of this leading role, has been partaking in directing our digital lives: these are the so-called "Influencers," with anywhere between a few hundred and many millions of followers on any of multiple social media platforms. Not only that, but their impact has been and keeps on growing rapidly: In 2018, almost every second person in Germany had bought a product due to an Influencer's advertisement, while two years earlier, only 16 percent followed this behavior (Sonnenberg 2018).

Moreover, as the interaction between influencers and followers matures, some of the former have started to provide a different kind of service, looking to provide added value for their followers rather than marketing products. Simultaneously, users claim to be no longer as easily fooled by social media advertising (Sonnenberg 2018). Indeed, whenever information or actions which we cannot directly ascertain ourselves become relevant to decision-making, the question of its credibility comes up (Köhnken 1990). It is then of interest to understand what separates successful and unsuccessful members of this collective, as "The benefits of being a highly gifted influencer seem pretty tempting. The only problem is that we do not see what happens behind the scenes" (Vice Media GmbH 2019).

Previous research in the field has shown that persuasiveness, or attitude change, is not only influenced by physical appearance, but also by apparent expertise, and by source credibility or trustworthiness (McGinnies & Ward 1980). Some of these aspects are a reflection of a source's personality (Brownlow 1992) and have therefore been largely incorporated in most communication and leadership curricula, highlighting how the first impression made and the non-verbal communication conveyed play a critical role, even beyond that of the content itself. In agreement with the preceding notions, studies in information science indicate precisely that personal information sources are typically the most trusted, even though they are not necessarily the most expert, further reducing the role of the actual content of a discourse (Wathen & Burkell, 2002). However, research has also shown that people themselves have little knowledge of what affects their attitudes. That is, they are often poor judges of the source of their own behavior (Nisbett & Wilson 1977; Wixon 1976). Furthermore, market research on the reception of information suggests that it is often inferred based on proxy measures rather than being assessed directly by the respondents explicitly (Lim 2015), so that obtaining first-hand information on the matter provides valuable insights which are normally unavailable.

2. Goals and Methods

As part of the call "Truth and Lies-Generation of competence for handling information critically," CredibiliTUM analyzed how the two fundamental aspects of personality and perceived credibility are related to each other, as this would further expand understanding of both fields and their impact on our daily lives. In our project, we focused on whether similar or contrasting personality traits between individuals in a presenter-audience relationship (both in live and digital settings) affect the perceived credibility of the former, allowing us to investigate the following questions:

- Which special features influence the assessment of credibility?
- How do they relate to the level of agreement between personal and presented views?
- Are there any conspicuous relationships between personality clusters and their perception of credibility?

Naturally, asking these questions promotes critical thought and raises awareness on the matter of credibility which are the overarching goals of the project.

2.1 General Methodology

In this explorative study, a mixed qualitative-quantitative tool was developed for the analysis of the personality dimensions under the Big Five or OCEAN model. This mixed format allowed participants to provide their own insights, as well as numerical values which enabled direct statistical analysis of the data. This tool was used in paper format with a panel discussion audience as part of a trial test (in December 2018) and then digitally with videos of online influencers (between March and May 2019), where the participants were additionally asked to rate the perceived credibility of the presenters or videos, as well as their level of agreement with the material or topic covered. Due to the nature of the visited event, as well as the contacted influencers, the whole study was conducted in the German language.

Study design
The designed tool was implemented on the EvaSys V.7.1 program licensed by the TUM to simplify the data collection process, as well as due to its reporting features and was refined after feedback from the pilot test. The largest component of the questionnaire, the personality test, was chosen to be Dr. Lars Satow's Big Five personality test, given its widespread use and immediate availability in German (Satow, 2018). While the original version included additional questions which investigated motives as secondary aspects of personality ("Bedürfnis nach Einfluss und Macht" (LM), "Bedürfnis nach Einfluss und Macht" (MM), and "Bedürfnis nach Sicherheit und Ruhe" (SM)) as well as a scale to control for the honesty of the respondent (in the form of a deliberate positive self-portrayal), these aspects made the time required to fill in the questionnaire prohibitively long. Instead, a condensed version dropping the additional questions was adopted for the main study to also account for the additional time requirement of watching videoclips. The remaining questions were however still fully capable of capturing the Big Five personality traits and providing raw numerical values on each of the dimensions, which allowed a smooth comparison of personality types in contrast to categorical classifications such as the Myers–Briggs Type Indicator.

Survey instruments
The questionnaires used consisted of three different sections: sociodemographic information (age, gender, marital status and educational level), the personality test itself, and the questions on perceived credibility. The adapted version of the personality test consisted of a total of 50 questions, with 10 questions related to each of the five basic personality dimensions: openness (O), conscientiousness (C), extraversion (E), agreeableness (A), and neuroticism (N). In each question, the respondent was asked to rate a statement in one four categories from "strongly agree" to "strongly disagree." Before proceeding with the final part of the questionnaire, participants were asked to watch a series of three videoclips from the influencers (one from each of them, chosen by the influencers themselves) with durations of three to four minutes. Finally, the respondents were asked to rate the perceived credibility of the influencers, and how strongly their viewpoints agreed or disagreed. This included a space to provide additional input as to their responses in case they so wished.

2.2 Sampling
In order to maximize the number of potential participants on our study, the questionnaire was made publicly available online, as well as shared through a series of media channels including but not limited to the TUM: Junge Akademie newsletter (sent on 29.03.2019) and mailing list (07.05.2019), individual and group Facebook and LinkedIn posts (including the TUM: Junge Akademie group), the TUM: Junge Akademie website, and private forwarding. Participation in the study was strictly voluntary and a total of 44 responses were received for the survey conducted between 29.03.2019 and 20.05.2019.

3. Outcome and Discussion

Having described the methodology followed throughout the project, the current section presents the results of both the initial pilot test, as a live event which the team was able to visit, as well as the main study with the influencers. For the latter case, the set of samples taken is first described through the sociodemographic data collected. Following this, the numerical results are subjected to correlation analyses. Finally, a classification of the comments provided by the participants in presented before proceeding with the final discussion of results.

3.1 Pilot Study (Panel discussion)
During the realization of the pilot study, which took part in a panel discussion between two presenters, attendees who were inquired regarding the study exhibited a high general interest on both the study and the personality test available. However, since the original version of Dr. Lars Satow's personality test was used, a very limited number of responses (a total of 7) was obtained - since attendees would have had to devote up to 20 minutes of their time to answer the questionnaire. In addition to this, the lack of information about the TUM: Junge Akademie or our project, as well as a clearly stated data treatment/privacy policy further discouraged participation in the survey.

Once these concerns were addressed, the group aimed to visit other live events, but was unable to gain access to a suitable event after several attempts. Organizers were mostly concerned about the length of the survey, deeming it might be too much of a distraction from the main event or, more usually, found the topic concerning, as the credibility of the presenters at the event might be put it doubt. Even when it wasn't clear that members of the audience would indeed doubt the presenters, the organizers preferred to avoid the possibility of it happening. This prompted us to consider a digital environment to conduct the remainder of the study, since online influencers are alreade used to receiving critical comments occasionally (either real ones or from trolls) and were therefore less reluctant to collaborate with our study.

3.2 Main Study (Online)
For the main study, three regularly active influencers with followings between 10.000 and 150.000 were considered. Two of them (Influencer 1 and influencer 3) run a platform together, while Influencer 2 is most active on their own blog. Two of these influencers are male and in the 25-34 years age group, while the third is female and in the 18-24 years age group. All three are currently unmarried and have finished or are currently pursuing a higher education degree, making the sample relatively homogeneous. The personality types of all three influencers are presented in Figure 1, displaying again a relatively similar profile, except for conscientiousness, agreeableness, and neuroticism.

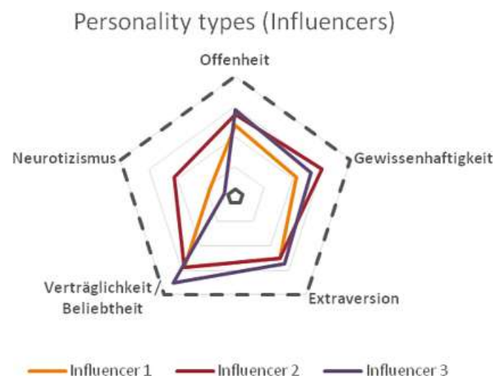


Figure 1: Personality types of the influencers

The sociodemographic distribution of the participants of the study is presented in Figure 2. A total of 44 people completed the survey, with 27 males – more than half of the participants – 17 females, and 2 participants of diverse gender. Age-wise, none of our participants was aged below 18, and more than 90% were between 18 and 34 years old, with the rest falling in the 45–59 years category. Regarding the highest level of education reached, almost half of our participants named their A-levels as their highest completed educational level, while the second largest group had completed a university degree. Due to the outdated set of degrees listed as available options, some of the responses might not correspond to the actual degrees achieved. Moreover, the limited amount of entries doesn't allow statistically significant conclusions to be drawn from individual subsets of the data.

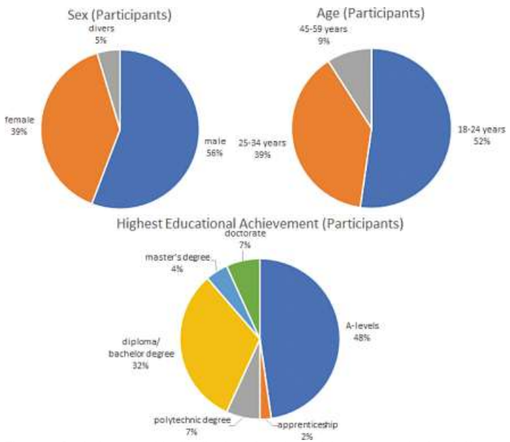


Figure 2: Sociodemographic distribution of study participants – gender (top left), age (top right), and education (bottom)

Regarding the personalities of the participants, however, a much more uniform spread is encountered in all five of the personality traits, as Figure 3 displays. This provides a good spread of personality types which manages to cover most of the possible range. Similarly, the perceived credibility of each of the influencers (Figure 4) spreads across all four available options, with Influencer 1 favored as more credible, and Influencer 2 as more unbelievable. Therefore, with similar numbers of male and female participants ranging from younger to medium aged, it can be concluded that the sample does seem to be representative of the whole population of adolescent to adult intellectuals.

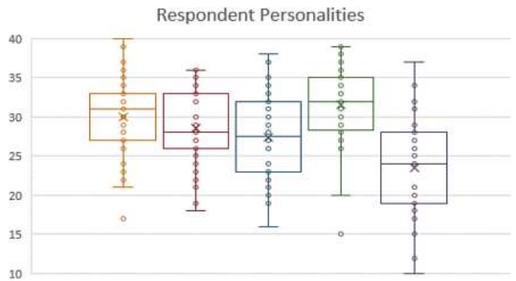


Figure 3: Distribution of OCEAN personality traits from study participants

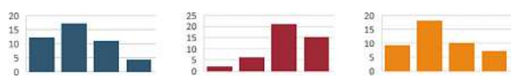


Figure 4: Perceived credibility histograms per Influencer (categories from left to right: very credible, credible, unbelievable, very unbelievable)

Quantitative results

Using the personality profiles collected from the influencers and the respondents to the questionnaire, the absolute difference in each of the five traits was calculated. Additionally, the total difference between personalities was obtained by addition of the individual differences (such that a variation of the same magnitude is weighted equally, whether it spans one or more dimensions – e. g. a difference of 2 points on Openness is considered equivalent to one of 1 point in Openness and 1 in Extraversion). Perceived credibility was then assigned a value between 1 for "very credible" and 4 for "very unbelievable," so that a positive correlation would indicate that the closer the two personalities are, the more credible the influencer seems and, conversely, a negative value would suggest less credibility for similar personalities.

In this study, both the Pearson and the Spearman correlation coefficients were measured between the differences and the perceived credibility of the influencers (Table 1) in order to better analyze a potential correlation: a discrepancy between the two values could suggest a non-linear relationship between the two values. Additionally, given the low number of samples, as well as the limited value range for perceived credibility (four options only), the obtained correlation factor is expected to be low, even if a correlation were to be present.

The results obtained indicate a slight correlation ($|r| > 0.20$) in limited cases, including a singular case where a moderate correlation ($|r| > 0.45$) appears to be present. There is, however, no trend which is simultaneously present across all three influencers, neither in individual components, nor in total difference – with one case (Conscientiousness) even yielding diverging results: for influencer 1, the relationship appears to be slightly negative (Figure 1), while the opposite is true for influencer 3, with a more significant correlation (Figure 2). While no significant correlation could be determined for the total difference, the individual traits other than agreeableness do exhibit minor correlations for at least one influencer: influencer 2 for openness, influencer 3 for extraversion, and influencer 1 for neuroticism.

In addition to the former analysis, an analogous procedure was performed using the personality traits of the respondents directly, leading to the values collected in Table 2. In this case, however, no significant correlations were detected. These results suggest that the viewer's personality by itself does not directly influence their perception of credibility. However, each participant had the chance to indicate any and all additional factors they thought to be relevant in their decisions, which leads us to the qualitative component of the study.

	Coefficient	O	C	E	A	N	Total
Influencer 1	Pearson	0.113	-0.223	-0.087	0.136	-0.237	-0.158
	Spearman	0.092	-0.267	-0.055	0.149	-0.242	-0.154
Influencer 2	Pearson	0.299	-0.141	-0.003	-0.095	0.070	0.053
	Spearman	0.311	-0.018	-0.068	-0.064	0.092	0.058
Influencer 3	Pearson	0.058	0.501	0.203	0.152	-0.147	0.194
	Spearman	0.070	0.474	0.283	0.036	-0.138	0.234

Table 1: Pearson and Spearman correlation coefficients between perceived credibility and difference in personality

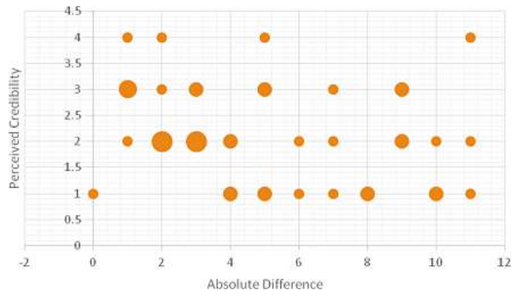


Figure 5: Perceived Credibility vs. absolute difference in conscientiousness for Influencer 1

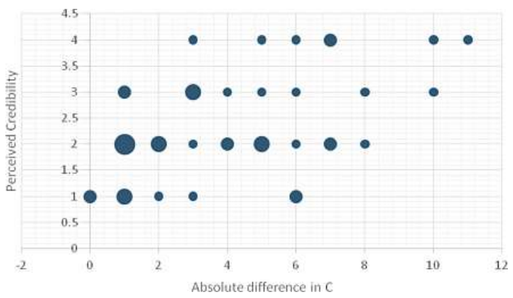


Figure 6: Perceived Credibility vs. absolute difference in conscientiousness for Influencer 3

Qualitative Study Results

Aside from assessing the credibility of the influencers, participants also indicated how their opinion corresponds to the views presented by the three influencers (i. e. whether they agree with the presented content). Regarding this point, most of the participants' views seemed to correspond with the general view of the influencers. Besides, several participants mentioned that the opinions expressed match common sense and are too broad to provoke contradiction. However, some of them also mentioned that they do not agree with Influencer 2 for praising their viewers for their achievements, as the influencer does not know their viewers (who, in the case of this study aren't their usual followers). Furthermore, participants were asked to mention factors which they thought affected their assessment of the influencer's credibility, as mentioned previously. This information is summarized into Table 3 and Figure 7.

Overall, the comments can be grouped into seven categories of variables: Content (28%), Overall appeal (21%), Video (17%), Voice (15%), Expression and gestures (11%), Look (7%), and Interest of the viewer (1%). Within these, the five most commonly mentioned variables were: "use of empty phrases" (9), "content in general" (8), "background music" (7), "amount of content in the videos" (7) and "gestures" (7).

	Coefficient	O	C	E	A	N
Influencer 1	Pearson	0.031	-0.182	-0.052	-0.187	-0.143
	Spearman	0.020	-0.229	-0.104	-0.182	-0.188
Influencer 2	Pearson	-0.010	0.152	0.036	0.033	0.104
	Spearman	0.010	0.103	0.030	-0.039	0.147
Influencer 3	Pearson	0.082	-0.201	0.041	-0.209	-0.134
	Spearman	0.079	-0.190	-0.051	-0.131	-0.133

Table 2: Pearson and Spearman correlation coefficients between perceived credibility and individual personality traits

Variables mentioned by study participants	Frequency of mentions
Content related	
1. Structure of Content	6
2. Content in general	8
3. Influencer's conviction regarding the topic	2
4. References mentioned	1
5. Statement of facts	2
6. Repetition of content expressed	5
7. Amount of content in the videos	7
8. Use of empty phrases	9
9. Praise of their audience	4
In total	**44**
Voice related	
1. Pitch and tone of voice	6
2. Sentence structure	4
3. Use of words	1
4. Flow of voice	4
5. Emphasis	3
6. Use of filler words	4
7. Accent	1
In total	**23**
Facial expression and gestures	
1. Body posture	6
2. Gestures	7
3. Facial expression	4
4. Eye contact with the camera	1
In total	**18**
Look	
1. Attire	3
2. Make-up	3
3. Hair	1
4. Background	4
In total	**11**

Variables mentioned by study participants	Frequency of mentions
Video related	
1. Background music	7
2. Video effects	6
3. Video format (horizontal vs. vertical)	4
4. Video resolution	5
5. Inserted visuals	3
6. Display of the brand logo	2
In total	**27**
Overall appeal of the influencer	
1. Charisma	2
2. Congruency regarding facial expressions / gestures and content	1
3. Nervousness	2
4. Sympathy	4
5. Self-confidence	2
6. Eloquence in general	6
7. Exuberance	1
8. Inclusive language	1
9. Natural vs. superimposed appeal	5
10. Perceived aim of the influencer: why he / she does this film	4
11. Competence radiated in general	1
12. Spontaneity	3
13. "Esoteric" presentation	2
In total	**34**
Interest of the viewer	
1. Viewer's interest in the topic displayed	1
In total	**1**

Table 3: Variables mentioned by study participants (with frequency of mention)

3.3 Discussion

From the above results, both the pilot and the main studies confirmed interest on the subject matter and hinted at a close link between credibility and knowledge transfer – since only through a critical way of thinking, while being critical of one's own conceptions at the same time, is it possible to reach the truth. Furthermore, the fact that organizers of discussions were unwilling to allow the presenters at their event to have their credibility possibly questioned, further highlights the importance of being (or simply appearing to be) credible. However, being credible doesn't also automatically mean being right, as the credible person might not necessarily be an expert in the specific topic (McGinnies & Ward 1980).

Moreover, even though the sample appears to be a good estimate of the target population (adolescent to adult intellectuals) by representing both main sexes in almost equal parts and covering both the younger and medium aged population with completed or in-progress higher education degrees, the total number of participants is still relatively low, and the categorical nature of perceived credibility in the questionnaire with just four options further limits the decisiveness of the obtained results. An example of this corresponds to the effect of conscientiousness on very similar influencers: influencers 1 and 3. Not only do they work together (meaning a similar attire and video style), but they are also brothers – leading to physical similarities as well. However, the correlations measured for the two follow opposite signs, with both values being mildly significant. Whether this is an effect of the limited number of responses and options, or the effect of a separate factor critically differentiating them, is unclear.

Though one aim of this study was to explore factors affecting credibility – something that the responses to our questionnaire attempts to do – it is essential to keep in mind that this study merely analyzes what the study participants consciously perceived while watching the videos and what they remembered afterwards. Therefore, this exploratory study is neither intended to provide an exhaustive list of relevant or irrelevant variables nor the subconscious factors which are present. Indeed, even though the responses from the participants include a wide variety of interesting variables to consider across seven different categories, it is possible that a few of the mentioned effects don't actually play a significant role in the perception of credibility and solely come up when trying to consciously rationalize the decision taken (Nisbett & Wilson 1977).

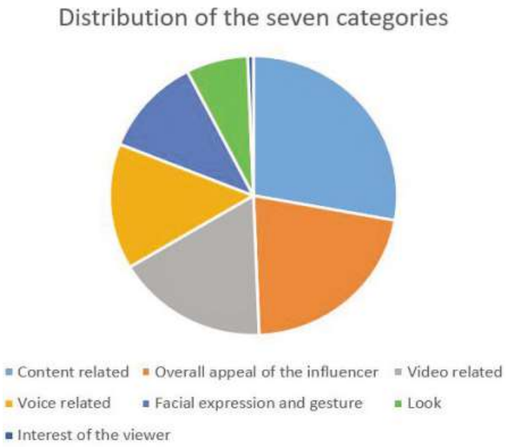


Figure 7: Variables mentioned by study participants by category

Nonetheless, some of the factors mentioned are especially interesting and warrant being mentioned. These include, e. g., "perceived aim; why the influencer does this film," "inclusive language," the "interaction of gestures and facial expressions with the content displayed" and use of "accent." All of which leads back to the results found by McGinnies & Ward. In general, it is unexpected that most of the variables were used to describe factors negatively affecting the influencers' credibility. The wide variety of inputs provided a valuable insight on the influencer's presence and their acceptance by our study sample, which potentially falls outside of their usual viewership. This is a different panorama than the one found in the comments sections of their other uploaded content, so the concrete feedback from the study can help the influencers reevaluate their own effect on others and to consequently improve their communicative skills. In a broader sense, the results of such a study have the potential to provide feedback to the influencers and deliver some new know-how on how they can improve their persuasiveness as spokespersons.

3.4 Conclusions

The study results suggest that there is no direct global correlation between difference in personality and credibility. However, additional factors seem to affect the relationship between these effects, which do exhibit some more pronounced relationships in individual cases. More importantly, our study prompted the spectators to consciously focus on the matter of credibility of one's vis-à-vis, further inviting critical thought and analysis of the discourses – both verbal and non-verbal – from influencers and the framing conditions within which they occur. The multiple motivated responses to the open questions in our questionnaire indicate that we reached the goal of promoting awareness in our participants through the application of a more critical approach to contents on their part. In the long run, we hope for a lasting effect in our participants regarding sensitivity to information and its origin, rather than blindly following trends or relying on public opinion leaders, especially with respect to advertisements or politics as prominent examples. Instead, they should be able to rationalize the input they receive and react accordingly.

4. Summary and Future Goals

Within our project we were able to conduct an explorative study into the relationship between personality and credibility with three influencers, focusing on the similarity or difference in the Big Five personality traits between viewers and influencers and how it would affect the perception of credibility. Although the sample size was relatively small, its sociodemographic data indicates the trial as a decent representation of the overall population to be analyzed. While no direct correlation spanning all influencers was identified, individual personality trait – influencer pairs did display moderate relationships, suggesting a more complex relationship behind these elements. Additionally, other allegedly relevant variables influencing the credibility of the influencers were collected and classified into different categories in agreement with results from previous studies. The study carried out provides a glimpse into the connection between the two key factors of personality and credibility but is otherwise limited by the scope of the project and the sample-size obtained. In this sense, future work to yield more scientifically significant results would rely on a continued exploration of the tendencies identified here, possibly in a more formal context. Therefore, it would be of interest to reproduce the study with a larger number of participants, over a longer time period, and including more diverse influencers and clips which would provide a more holistic appreciation of influencers and their role.

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Self Reflection

Team CredibiliTUM, a small group of five students, is notable for the great diversity of its academic backgrounds: from Engineering and Mathematics to Music Management, passing through Health and Sports sciences. We split off from the ClusterME team after we had the idea of involving arts and theatre more prominently in the context of the scholarship program and of creating a thought-provoking theatre performance about truth and lies, in cooperation with the University for Music and Performing Arts Munich (HMTM) director Sebastian Baumgarten and the August Everding Academy. We wanted to produce an artistic piece and perform it at a special location within TUM. Moreover, we had the ambition to record it and compare the differences (if any) in the perception of credibility of live and recorded theatre performances – while keeping the motif of truth and lies in the foreground.

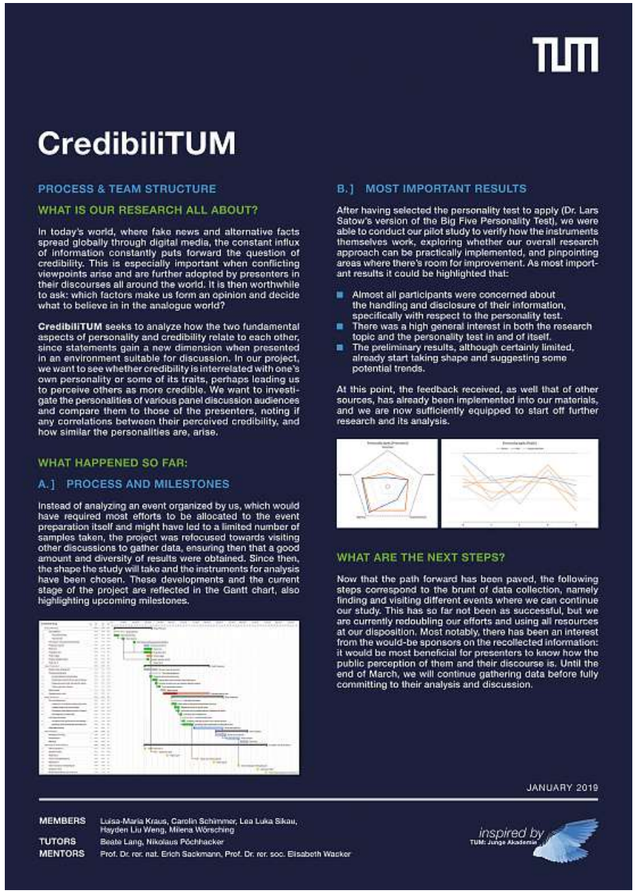
In the process of organizing ourselves and bringing the different parties with their diverse perspectives together, we soon realized that this project was too ambitious, not only budget-wise, but also logistically. Furthermore, conducting a reliable and robust study within the scope of the program on top of it, would have been extremely demanding, if not outright impossible. With this in mind, we stopped to brainstorm alternatives associated with the original overarching concept, drawing on the valuable support of our colleagues, tutors and mentors throughout the intense workshop weekends.

"And so it goes," as Billy Joel used to say. We had plenty of ideas we wanted to implement, while also developing our project planning and management skills to avoid getting stuck by trifles. We became more structured and tried to be more realistic regarding the time and means at our disposal. As time went on, we had a number of sobering setbacks, including ethical conflicts with a proposed study method and organizational barriers to the implementation of our study - we wanted something more scientific, more representative and with a deeper impact, yet did not have a clear base to stand on. At the end, reflecting on our own interests and motivations, we ended up by analyzing personality structures and credibility. We made contact with inspiring influencers and convinced them to participate in our study. Somehow, we traced our way back to our initial intention of incorporating the digital aspect of communication and the elements affecting its credibility.

Our creativity always brought us back to the discussion of producing some content ourselves, but in the end, a more critical reasoning suggested that we should concentrate on the analytical aspect first. We learned to be highly focused on the problem we wanted to tackle and on making the best out of it, even as motivation faltered and individual priorities started taking over. The topic of our year "truth and lies – handling information critically" became the backbone of the study and guided the remainder of the project: trying to make people aware of the importance of considering information critically beforehand, and more so regarding actively discussed topics, looking for the deeper implications, rather than solely focusing on the tip of the iceberg. And after all these months of working together, with all its ups and downs, we feel we've learned a lot about multidisciplinary teamwork, project management, selfreflection, and, of course, about "truth and lies".

POSTER 1: We created this very first poster for the Interim Evaluation I in May 2018. Among other details, the poster mentions our separation from the team ClusterMe and captures our original idea. At this early stage of our project work, we striving to organize an event by ourselves. However, we had already shifted our focus from our first idea of organizing a theatrical event towards hosting a panel discussion – with a twist. In this case, our utmost goal was still to compare audiences' perceptions of the speakers in the context of a live event vs. the same event in a recorded format. As the poster also conveys, the "framing" dimension was present since the beginning.

POSTER 2: Following extensive criticism of our previous concept, we turned from organizing our own event towards visiting a number of external events where we could perform our study non-invasively. We also took a step back to reflect on what we wanted to achieve, how to measure it, and, most importantly, on what "credibility" stands for. The following comments were the most important in redirecting our project in this manner: First, organizing an event ourselves would have meant a very high workload before, during, and after the event. While feasible, this meant restricting our resources in other components of the project, most prominently in the research element. Second, studying a single event run by ourselves would have decisively limited the amount of data that we could muster, as well as potentially skew it. Third and final, other members of the TUM: Junge Akademie, including mentors and tutors, made us aware that some of the elements we hoped to incorporate might be frowned upon, further skewing the results or even discouraging participation at all.



POSTER 3: With a fresh new name and a new concept in hand, we were ready to start off our study. We had the chance to conduct a first pilot study at a local event in Munich where we gathered – next to a very limited amount of data – some highly valuable feedback on our presence at an event, and on the methods and instruments we were using. We were able to strongly improve our action plan and prepared to carry out our further research, now actively collecting the data we needed. Unfortunately, persuading event hosts was not an easy job and, even after further changes in our approach, we did not get the chance to conduct our main studies. The way it was conceived, it would have taken attendees too long to answer the full questionnaire, potentially disrupting an event's schedule, but, more prominently, organizers seemed uncomfortable with having the audience judge the panelists on their credibility or with us having information on their personality profiles.

POSTER 4: After numerous unfruitful weeks of contacting and negotiating with organizers of diverse events while the remaining time to complete our projects dwindled, we decided to adapt our study yet again, by taking to the internet. It was under this iteration, that we were able to complete our study. For this version, we contacted social media influencers who were acquainted with members of our group and set up an online questionnaire where participants would base their judgements on short clips of the content creators. We were then able to compare the personality profiles of both parties and visualize the influencers' credibility across the different respondents – a highly topical theme in modern times of online communication.

Project Report **SchaschLEAK**

Team	Veronika Bauer Gabriele Fruth Bertram Fuchs Christos Gazanis Frederik Heetmeyer Thomas Just Daniel Körner Frank Latsch Alina Minth Michael Reichert Jakob Scheffels Philipp Scholl Patricia Sophia Wild
Tutor	Vanessa Buchweitz Leonard Przybilla Christopher Schlenk Evi Schmid
Supervisors	Dr. Alexander Lang Dr. Manuel Wiesche

Preface SchaschLEAK by Alexander Lang

Within the call “Truth and Lies” a rather large team formed around first ideas, focusing the topic in the direction of the economy in fall 2017. The team members were particularly interested in the messages sent by companies to consumers and wanted to show the consumers how they are entrapped by those messages. The greater benefit of the project sounded ambitious but also very promising: To make people aware of the fact that companies are not telling the truth, especially when advertising a product or service.

Working as a business consultant, usually for large companies, I help my clients to make more profit. There are mainly two possibilities in doing so, reducing cost or increasing sales. Advertising, telling stories to customers or prospects – true or not so true – is often an excellent instrument to increase sales. In recent years, consumers have become more and more educated and companies have had to get better in telling stories and making them look trustworthy. This development has led to very subliminal communication concepts, which have made it harder and harder for the consumer to see what companies are up to. The aim of the project SchaschLeak was not to point to obvious lies, like “Chocolate is good for you,” but rather to the hidden or unseen practices of the advertising companies – again, a very promising but also very ambitious undertaking.

For the different teams, the two-year journey is quite a ride. At the beginning they have to research the literature, frame the topic of their project, see what others have done and develop a project goal. They have to make a plan of how to reach their goal, define work packages and finally come up with a research question they want to answer and develop an empirical experiment to answer the question. Organizing all that, together with team members from different faculties whom they did not know before and within a very limited timescale, is surely not easy. But in the end, I am always amazed by what the teams come up with after those 18 months.

Team SchaschLeak, just as in the other teams I supervised, was chaos at the beginning. But as time went by, the first training sessions offered by the Junge Akademie and the support of the Tutors and Mentors helped the team to form a clearer picture of what they wanted and what would be feasible after about 10 months. But, differing from the other teams, this team did not go through the process from divergence to convergence only once – they repeated this process many times, each time changing their direction and their approach fundamentally and by doing so constantly starting all over again. The team was large, consisting of members from many different faculties. This probably explained the numerous turnarounds. Recalling this, the question arises, “Is it really the results that matter, or is the real takeaway for the teams the understanding of processes in complex team settings?” Is it not a takeaway to understand the different roles the team members play or the soft skills everyone involved acquires and which makes navigation in a professional setting of a company so much easier? I wish there had been these kinds of possibilities to participate in when I studied at TUM – or at least these kinds of activities were not sanctioned by the TUM administration.

After producing, I have to admit, extremely cool videos and bill boards in order to visualize the practices of the advertising companies, though with small success in regard to the project`s goal, the team agreed to target schools and to discuss the matter with students. Sure, the result of the eighteen-month project is relatively small, but, as argued above, the Junge Akademie is not about the content of the projects only. The program aims to provide four different benefits for the students. When a team finishes a project, they understand how a project is managed and how to work in a highly diverse environment, most of the time using a foreign language to communicate. Secondly, they acquire soft skills, which help them to maneuver in crises and motivational dips. Thirdly, they gain knowledge on a certain topic; and, finally and most importantly, they understand how a scientific project is organized, how a research question is derived and how an empirical experiment has to be designed in order to answer the research question.

But what is in it for the mentors? After helping to create an internet platform for the demands of the inhabitants of distinct city quarters in Munich or the development of an umbrella-share economy-system for the TUM campus in Garching or the establishment of a scavenger-hunt-game for schools to illustrate the influence of democracy on our daily life, this was my fourth Junge Akademie project. I always get to meet highly motivated and intelligent students with whom it is fun to discuss the topics around their projects, and often their different points of view get me thinking about issues which I haven’t reviewed for a long time. And all this for the small price of one evening per month – to me an extremely good deal! So will I be doing this again next year? Most likely. ■

Shifting Power to the Consumer

Advertisements are all around us. They follow us not only through our physical lives, looming around street corners and gazing at us on train stations, but also, over the past decade, we have let a new agent into our perception, and it communicates to us through large displays just as much as through the small slabs of glass every person now carries around in their pockets. We are nowadays more connected than ever before, carrying around electronic devices through which companies persistently try to communicate their messages, be it an online advertisement for wireless headphones, another corporate newsletter, or simply the subtle yet pervasive push notifications with their notification beeps and swooshes: Notifications like these interrupt us at any time and create distractions in our everyday activities. Yet, this state of affairs is widely accepted if not even expected, in a world where a boss may text an employee late at night or where it is rude not to respond to friends' messages within a certain time. Social media platforms, in particular, have facilitated much of this instant and ubiquitous communication.

Therefore, it is safe to say that the presence of social media platforms on these ubiquitous devices has altered everyone's perception of the world. Now, not just facts are instantaneously retrievable online, but also your cousin's wedding photos, a relationship update or someone's political opinion. This has led to serious research indicating that social media has hijacked our brains. An example is a 2018 YouGov survey where 57% of young adults[1] in the UK agreed that "social media creates an overwhelming pressure to succeed."[2]

It all boils down to the fact that social media networks are not free to use. After all, servers must be maintained, employees paid and shareholders gratified. Everybody has a price to pay in this game. First of all, privacy is a valuable commodity in today's internet. With a network not even charging money to be used, there must be another value each user provides to the network's creator. Obviously, these are the data active users produce, from photos to location tags and event interests, to personal preferences, hobbies, education, profession, income, device use, and so on. Monetizing this data by selling targeted ad placements is vital to sustain a viable business.

However, it is an integral strategy of such an online service to disguise these needs for the common user, presenting its services as "free". Nevertheless, nobody needs to contemplate for long to know they pay by being exposed to advertisements on these platforms. It has led to companies paying close to €60 billion for sponsored posts and other paid advertising content globally in 2018, with that figure expected to almost triple by 2022.[3] For most social media companies, advertising represents their sole significant stream of revenue. For Facebook, the share of advertising on total revenue is 99%, according to the company's recent financial statements.[4] The sector's rapid growth boosts corporate revenue and valuations and has made these networks so powerful.

Our project group, SchaschLeak, set out to challenge social media's influence on society and created an information campaign with the goal of promoting a change of behavior. Through witty posters and videos, we tried to advertise our own campaign, which in itself presents an irony. Nonetheless, of more than 100 respondents to three different surveys, we found that although close to everyone is aware of their social media use and expects its influence to grow, this is not yet enough to alter their behavior.

For that reason, we added another component to the campaigns. We saw that the easiest way to reduce the influence of advertisements on unconscious opinion-formation and purchase-behavior is to increase users' abilities to quickly detect such contents and consciously separate them from the actual posts, messages and news they are interested in. Moreover, we knew that in order to be remembered, conveying such knowledge requires making users apply this knowledge in their regular use of these platforms. This explains why our posters and videos always included a call to action: One of the posters reads "Jeder fünfte Post auf Instagram ist Werbung. Probier es aus!" (Every fifth post on Instagram is an ad. Try it!"), motivating users to open their feeds and specifically count ads. This opens up a new perspective: For the first time, users consciously separate content into organic and paid components. As another example, using a simple scenario of real users, our second information video visualizes the amount of ads provided through a whole network of friends – a bird's eye view otherwise unavailable to the common user's perspective.

Also our name "SchaschLeak" is deliberately brash, which helps us convey our message through unconventional methods. Our slogan "wir drehen den Spieß um!" (literally, "we turn around the skewer!"; metaphorically, "we turn the tables!") illustrates the mission: By "leaking" information that social media companies usually try to underplay or hide from their users, we aim to make users more aware in their use of these platforms, and to shift power back to them.

Nevertheless, it is difficult to attest a measurable outcome from such measures. While we have been able to induce surprise and interest in many people through our campaigns, it is by no means safe to say that such measures would be sufficient to create change on a societal scale.

One may view this as a central issue of our digitized society: We have all come to accept as natural the digital devices we surround ourselves with and we don't question the fact that they have become a gateway into our minds, where companies can place their products and messages and insinuate themselves, albeit subtly, into our subconscious. We know the truth about online advertising. We all accept the facts once made aware of them. Still, we don't act. Perhaps that is because, for many, the only way to avoid one's exposure to advertisements entirely – by abandoning such platforms altogether and thereby losing an easy interface with many social contacts – is just too high a price to pay. Perhaps, for others, it is just not a big enough issue. After all, if one simply believes that one cannot be influenced so easily, as we found many people do, this does not appear as a problem.

Of course, advertisements need not always be malicious and deceptive. Companies and individuals have always had the need to create awareness of the products and services they offer, providing the supply that consumers' demand can fill. Nonetheless, social media offer a much more pervasive ad experience: Whilst we are caught up in a limbic reward cycle of doling out and receiving likes and comments from friends and acquaintances, sponsored content sneaks in, algorithmically optimized and targeted to its most susceptive prey, to place itself comfortably between those short-sighted needs and feelings. Such ad placements reach our minds much more deeply than billboards and newspaper advertisements ever could – and that makes them so powerful.

It is a shocking reminder that knowledge of truth may not be enough in our world to stimulate behavior that is best for oneself in the long term. Instead, we are persuaded to give in to short-sighted needs and feelings. This phenomenon can be observed not only in relation to advertisements on social media. Take environmental protection as another example: Whilst most of us are well aware of the facts and wish to preserve our natural environment for future generations, we still fly on vacation, or drive that car, or eat that meat. Short-term desires often prevail.

We can, however, take this as a starting point for more responsible behavior. Through our project, we have indeed succeeded in raising awareness where it had been lacking. The next step, however, to take action, can only be the result of an intrinsic ability to reflect on knowledge and act accordingly. This is something nobody should be coerced into. It must stem from independent thought. An information campaign such as ours, which encourages consumers to actively distinguish advertisements from other content and which clearly visualizes the workings of platforms such as Facebook has been shown to have a visible, yet hardly measurable, effect on the individual. Hence, further steps should also allow the users to become active and learn more responsible behavior. Instead of showing them numbers and facts everyone is already aware of, we should, for instance, encourage them to open up their feeds and identify sponsored content, or ask them what value they expect from following certain influencers. This, to us, suggests a promising future approach to fostering the development of independent critical thinking in this area because those who can reflect on their impressions will at least think twice before clicking impulsively on random ads. It need not challenge the networks' existence, but, more importantly, shift power back to the consumer. ■

1 16 - 25 years old
2 Prince's Trust eBay Youth Index/You Gov (Online poll of 2,162 adults aged 16-25 between 13 November and 2 December 2018)
3 Statista. (n.d.). Umsatz mit Social-Media-Werbung weltweit im Jahr 2017 sowie eine Prognose bis 2023 (in Millionen Euro). In Statista - Das Statistik-Portal. Zugriff am 7. April 2019, von https://de.statista.com/statistik/daten/studie/457505/umfrage/weltweite-umsaetze-mit-social-media-werbung/
4 Facebook Reports First Quarter 2019 Results. (n.d.). Retrieved April 26, 2019, from https://investor.fb.com/investor-news/press-release-details/2019/Facebook-Reports-First-Quarter-2019-Results/default.aspx

Is the enlightenment about advertising practices at a dead end?

Abstract
Advertisements have a substantial influence on our everyday life. One notices this influence only when trying to quantify it. Advertisements are aiming at our emotions, but usually we do not reflect on them consciously. The primary goal of our project is to raise awareness about the amount of advertising on social media platforms and thereby change consumers´ perception of advertisements. Throughout the project, two video and poster campaigns were launched, informing people about marketing methods, sponsored posts and personalized advertising in social media. To quantify the results, surveys were conducted. Consumers usually think that their decisions are not influenced by advertisements. Thus, in their opinion it is possible to escape the effect of advertisements. In fact, a significant percentage of purchases are made after the consumer has been relayed from a social media website. As a whole, one can conclude that advertisements do not address the rationality of consumers but primarily their emotions. This leads to a discrepancy between the perceived and the empirically measured influence of advertisements on the consumer's purchasing behavior.

Background

Advertisements – our latent, loyal friends

People come into contact with advertising in the modern world on a daily basis,. During prime-time television, on the way to work through the advertisements on the subway screens or through posters at the stops, it flickers towards us. Advertising is an accepted good in our society, and, in some cases, it is only perceived subconsciously. That is why only about 86 of the more than 360 advertisements we are exposed to every day are perceived consciously.[1] The investment volume in advertising in Germany in 2017 reached 26.21 billion euros.[2] Also, about 900,000 jobs are connected to the advertisement industry.[3] Advertisements per se are not the problem, but manipulative practices, which lead to a strong influence on the purchasing behavior of consumers. In the following, we will present advertising methods that are regularly encountered in everyday life and whose influence is not perceived consciously.

Advertising Practices

Let us consider a typical commercial: At first glance, the ad seems inconspicuous. On closer inspection, however, the small print catches the eye. It takes up only little space, as it is kept as small as possible. Nevertheless, it contains important consumer information, which is not mentioned in the advertisement itself. In advertising jargon, this would be referred to as eye-catching advertising; the consumer's gaze is directed to the most striking detail.

There are also rules in advertising technology. For example, there must be no untruths in the advertising message itself. The statement may not contain any untruths, but there is no requirement for exhaustiveness in the eye-catcher statement.[4] The breakdown of the entire truth then usually takes place in the small print. Moreover, with regard to the small print, the legal guidelines remain vague. The only requirement is that additional comments must be placed in a way that is sufficiently clear and readable. This was confirmed in a ruling of the Federal Court of Justice on October 15, 2015[5] with regard to the advertising of a telephone provider. However, a certain font size or the duration of the display time of consumer information is not legally regulated.

These facts were of interest to our group, so that we decided to further address the subject of modern advertising practices. Typical advertising practices, such as the frequent repetition of certain slogans, are common (i.e., the radio advertisement of the Seitenbacher company, in which "Bergsteigermüsli von Seitenbacher" is used four times within 16 seconds). Another typical practice can be found in the advertisements of car manufacturers: A sports car drives through a mountainous and unspoilt landscape to suggest driving pleasure and freedom. The consumer subconsciously associates a reward with the product, which is received when buying it. The consumer is conditioned, so that so-called key impulses are associated with the advertised product.[6] Other widespread advertising practices include the *Picture Promise Prove Push and Attention Interest Desire Action Satisfaction Principle.*

With the entry of social media channels into everyday life, new forms of advertising have developed. They are intended to lead consumers to their purchasing decisions in some cases much more subtly than traditional forms of advertising have ever been able to. Thus, advertising in social media usually coincides with the catchword influencer marketing. Advertising campaigns in social media often take the form of sponsored posts. This is an apparently normal post in the user's newsfeed, but actually turns out to be a form of personalized advertisement. At first glance, it is easy to overlook, that certain posts are sponsored. But the effect of this form of advertising should by no means be underestimated. In 2015, 52 percent of all purchases made online by consumers were directly influenced by Facebook.[7] This is due to the fact that 65 percent of Facebook users under the age of 29 find it difficult to recognize advertising as such.[8] Not to be neglected in this context is the target group for which online advertising is designed. Young adults between 18 and 19 years of age stated social media as the most important channel for advertising consumption. This also reflects the consumption behavior of this particular demographic group. 22 percent of all teenagers use social media more than ten times a day. Against this background, the project is concerned with educating consumers about the frequency and use of targeted advertising in social media. As a result of an information campaign, we hope to increase the proportion of consumers who are aware of the frequency of the various advertising techniques used in large social networks such as Facebook or Instagram. As a target group, students from the *Technische Universität München (TUM), the Hochschule für Fernsehen und Film (HFF)* and the *Hochschule für Musik und Theater München (HMTM)* were chosen to participate in the project.

Evolution of our project and methodical approach

At first, the goal of our project was to teach consumers how to gain a detailed understanding of commonly used advertising methods. This means, we wanted consumers to be able to identify manipulative advertising practices. Eventually, this should give consumers more power about their own purchasing decisions. Based on this goal, we wanted to question the following hypothesis:

An increase in consumers' knowledge about common practices used by advertisers changes their purchasing behavior.

For the quantification of our results and to check our hypothesis, it was necessary to define the target groups that would be the focus for our data collection. Eventually, we chose to survey students in order to ensure comparable results. First, we wanted to extend the level of knowledge of students about commonly used advertising practices. Therefore, we launched an information campaign, where we used two channels (self-produced videos and posters), which dealt with manipulative advertising practices. Three different kinds of posters were spread all over university buildings; the video was published on our website. To increase our chances for a representative result, we used QR codes on our posters. The website was supposed to be a source of information about common advertising methods. Also, it was a means to collect survey results, as well as to evaluate user statistics. Additionally, individual interviews were conducted.

A quantitative evaluation of our hypothesis was not as easy as assumed.[9] Therefore, we needed to specify a new hypothesis in the same field of study.

What could an information campaign look like that aims to increase the proportion of students and other members of TUM who are aware of the true number of sponsored posts in the news feeds of big social media platforms like Facebook or Instagram?

1 https://sjinsights.net/2014/09/29/new-research-sheds-light-on-daily-ad-exposures/comment-page-1/
2 https://de.statista.com/themen/93/werbung/
3 https://www.brandeins.de/magazine/brand-eins-wirtschaftsmagazin/2017/marketing/marketing-in-zahlen
4 https://wirtschaftslexikon.gabler.de/definition/blickfangwerbung-27611
5 http://juris.bundesgerichtshof.de/cgi-bin/rechtsprechung/document.py?Gericht=bgh&Art=en&sid=39e38b3763773245cddd807460b55e6e&nr=73168&pos=0&anz=1
6 https://studylibde.com/doc/10654229/hoba-experiment; Barry, T.E. and Howard, D.J., "A Review and Critique of the Hierarchy of Effects in Advertising," International Journal of Advertising, Vol. 9, no. 2, 1990, pp 121-135
7 https://www.thedrum.com/news/2015/04/24/facebook-influences-over-half-shoppers-says-digitaslbi-sconnected-commerce-report
8 https://www.thedrum.com/news/2016/03/12/facebook-half-shoppers-to-fap-more-digitaslbi-sconnected-commerce-report
9 See chapter Outcome and Discussion

Following the success of our first campaign, we produced a new video and started a new poster campaign. Despite our repeated use of these two forms of media we changed our approach. The videos and posters were no longer intended to teach about advertisement practices but were designed to provide statistics about social media advertising. For example, one of our posters showed that every fifth post on Instagram is a sponsored one. We measured user statistics on our website and conducted new surveys.

Evaluation of the results showed that there is a demand for enlightenment about these advertisement practices. But measuring the change in the consumer's behavior was not possible with our methods. So, we decided to collaborate with schools to reach a younger target group, which is affected by these methods the most: The consumers of tomorrow.

Outcome and Discussion

Project Phase One

Posters

To raise consumers' awareness about marketing methods, we created a first poster campaign (see Fig. 1). Each poster dealt with specific advertising methods, or with companies who partly use manipulative advertising methods. To this end, we created our own slogans, which refer to known advertising slogans of companies ("Vorsprung durch Technik," "Ich liebe es!"). A main goal during the poster campaign was to raise awareness for our project and our own website. Besides the positive feedback, we also received a certain amount of criticism, mainly focusing on the point that the message was not transmitted clearly. Additionally, the colours were too dark, so the posters did not draw much attention towards themselves. One big problem was that the call to action was not clear. People were mainly confused as to what to do with the information displayed on the posters.

Video

The idea behind our first video (see Fig. 2) was to tackle those elements of advertisements, which lack any clear relation to the product and therefore might lead to manipulated consumer behavior. Thus, we considered spectacular tracking shots, painted

Figure 1: Posters of first campaign

celebrities without any link to the advertised product and non-informative slogans. One can take the "Bruzzler" advertisement featuring Atze Schröder as a classic example.[10]

Figure 2: Scene from first video

10 https://www.youtube.com/watch?v=zq9VRa7zYIE

We considered the satirical style of our video to be suitable. In the video, we promote TUMuesli using the above-mentioned elements in an exaggerated manner. For instance, we invented the character TUMan as a counterpart to Atze Schröder. For further emphasis, a narrator guides the viewer through every manipulating step. This, as well as the second video, is accessible on our website. We were able to reach 480 people via Facebook as of June 2019.[11] Unfortunately, due to the lack of appropriate sound quality, we were not able to present this video at the *TU Kino* as planned.

The following three lessons from our video campaign were learned. Firstly, we need to increase our outreach in order to have more points of contact with our target group of TUM students. Secondly, we therefore need to raise the video quality standards in order to be able to use more channels. Thirdly, we need to clarify our message.

Website

An integral component of the information campaign we designed is the website, which we hosted under schaschleak.de. We chose the medium of a web page because it serves as an information tool and also allows user interaction through online surveys. Hence, our goal was to direct as many users as possible onto our website outlet. As the first poster campaign missed a clear call to action – it just urged users to stop being manipulated by advertisements (*"Tu was dagegen!"*) but did not suggest how the website would help the consumer to achieve this – we figured that the user must have a clear reason to take up the effort to visit our web page.

Results Project Phase One

During the first project phase we collected data from a sample size of 36 people ranging from students to senior citizens. The most important aspects of advertisement turned out to be information about the product, honest advertisement and the entertainment value. In contrast, ethics and morals and the presentation of the product were regarded as less important. Additionally, questions about controversial content were asked. By a great margin, the exclusion of specific groups of people was seen most critically. Even the display of sexually explicit content and alcohol or gambling was not seen so critically. Most interestingly, the interviewed people are consuming advertisements hardly ever knowingly, as Figure 3 shows.

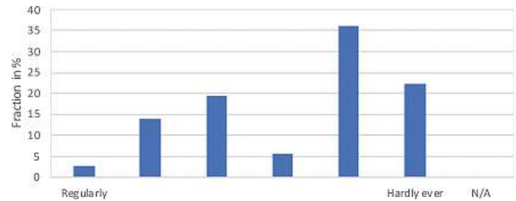


Figure 3: Evaluation of the question "How often do you consume advertisements consciously?"

Therefore, it is not surprising that about 35% of the interviewed people believed that they were not influenced by advertisements at all. In conclusion, the influence of advertisements on people´s consumer behavior works mostly subconsciously and without them even noticing the consumption of advertisements.

Project Phase Two

Posters

During the design of the second poster campaign (see Fig. 4), the criticism that had been expressed in the first campaign was taken into account and the basic idea for the posters was reworked. We agreed on a design that would look like a social media post. So, the posters only contained direct questions or statements about facts concerning social media. It turned out that, while evaluating the results of our website, the second poster campaign created a significantly higher impact on the traffic of our website (see Website below), which can be interpreted as a positive result.

Video

After redefining the research goal, we wanted to produce a second video (see Fig. 5) in order to raise awareness of the amount of advertisement in social media. Considering previous points of criticism, we contacted a professional video producer, namely *Stream*

11 https://www.facebook.com/tum.jungeakademie/videos/536334816793809/

Figure 4: Posters from second campaign.

Filmproduktion. After two weeks of a production / feedback cycle, we were able to upload the video on YouTube.[12] The video itself is aimed to visualize the amount of advertisements being created by every single Facebook post. According to our survey, every fifth slot in a social media newsfeed contains sponsored advertisements, disregarding product placements and influencer posts.[13] To demonstrate this, the video starts with a fictional setting of six friends sharing a post respectively. Since two personalized advertisements can be placed in each of the six identical newsfeeds, the social media platform is able to spread 12 personalized advertisements out of 6 initial posts. This can then be extrapolated to 30 friends, providing space for 240 advertisements.

The video was neither published by the official Facebook page of TUM, nor displayed on the info-screens inside university buildings. The main reason was the unclear connection between the content of the video and TUM. It reached approximately 100 people via YouTube as of June 2019 and was presented at the *Städtische Berufsschule für Spedition und Touristik* during our information event.

Website

The success of our campaigns could best be measured by the number of visitors on the website (see Fig. 6). The changes in the campaign described earlier resulted in much higher total website visitors and a much higher conversion rate to the online survey. Yet, it was not possible to measure exactly how many people our posters reached, and hence the conversion rate from poster impressions to our website cannot be specified.

Our website metrics improved in the second campaign as opposed to the first one by the following numbers (see Table 1):

From the numbers, it is evident we reached click rates far above numbers typical for marketing-related funnels. As a comparison, Facebook campaigns reach click-through rates of 0.11% in Germany.[14] In our second campaign as comparison, 32.6% of users who visited the website also completed the survey. Although these two metrics do not capture the same statistic, as context and platforms are different for each of them, such a comparison still gives an interesting insight to our website's performance.

Though we cannot derive a clear causality for this good general click performance of the website, it is possible to attribute most of the variance of the relative change between the two campaigns to the variables we changed between the campaigns, at least by correlation:

Figure 5: Scene from second video

12 https://www.youtube.com/watch?v=kRqlHtdn69A
13 See chapter Second survey among students of TUM: JA
14 Chaffey, D. (2019, April 16). Average display advertising clickthrough rates. Retrieved May 11, 2019, from https://www.smartinsights.com/internet-advertising/internet-advertising-analytics/display-advertising-clickthrough-rates/

Campaign	Users	Total sessions	Clicks to survey from website sessions	Survey completions
Oct/Nov 2018	75	95	21 (22% of sessions)	10 (48% of survey clicks)
Feb-May 2019	304	462	147 (32% of sessions)	99 (67% of survey clicks)

Table 1: Website statistics

- Different poster design, with less cluttered layout and more vivid colours
- Core design element: From dark animal photos to bright emojis
- Better placement of website link on posters
- Less text, clearer call to action on posters
- Placement of posters in more locations
- Distribution of the website link through TUM: Junge Akademie channels

Furthermore, we can assume that the highest share of website visitors was brought to the web page through our posters, though we did not specifically test that. It is merely a consequence of the distribution and design of our campaign. As to assessing the high conversion rates, it is possible to assume that the socially relevant context of the project made users more likely to click on links on the website and also to fill in a survey. However, such a causality cannot be proven.

In addition, we added more useful information for users, such as digital versions of the posters, links to the videos, as well as more information about our project and ways of contacting us. A clear link of our project to the TUM: Junge Akademie was also provided. All these elements are not central to the purpose of the website, which is to inform users about manipulation techniques in advertising and record their survey responses.

Figure 6: Website schaschleak.de

Results Project Phase Two

After shifting the focus of the project towards social media marketing, a second survey among 31 students between the ages of 17 and 30 was conducted. This survey included an empirical study to test how frequently sponsored posts appear between "normal" posts on social media feeds. The study showed that, on average, every 5th post on social media is a sponsored one. In general, sponsored posts on social media were seen very critically. Nearly two thirds of the interviewed students have a negative attitude towards them. Only about 9% see sponsored posts positively.

We asked about the influence of sponsored posts on the students' consumer behavior. The following figure Figure 7 shows that 47% of the interviewed students say the influence of social

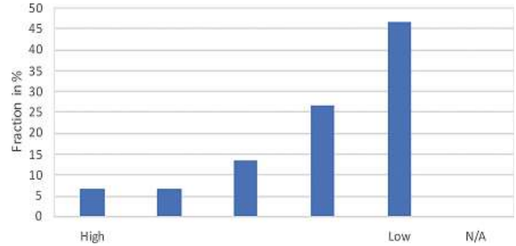


Figure 7: Evaluation of the question "How does social media marketing influence your consumer behavior?"

media marketing on their consumer behavior is low. This stands in great contrast to the already stated fact that every second online purchase can be traced back to an advertisement on Facebook.

The great success of advertisements in general and social media marketing in specific relies on a false perception of the consumer. Advertisements are rarely consumed consciously, and their effects are reckoned to be insignificant. But the amount of money spent on advertisements by companies and the measurable success of marketing campaigns speaks otherwise.

School Lecture
Following a request, four team members conducted a workshop with two classes of a vocational school. The students were around 21 years old and were following an apprenticeship in the field of tourism and traveling. The first part of the workshop was a presentation on advertising techniques and advertising in social media followed by group work and discussion in the second part. To begin with, we established an understanding of advertising methods in general by introducing the issue of daily exposure to advertisements and their psychological impact. Several examples introducing different marketing strategies like guerrilla or ambush marketing were used. Moreover, we presented the concepts of *influencer marketing*, targeting options on Instagram, Facebook's income and impact on consumers' behavior, methods of personalized advertising and, finally, data security. We formulated seven questions, which the students worked on in groups. Afterwards we discussed their results and ideas together in class, whereby we gained interesting and unexpected insights. The following Table 2 shows the questions that were discussed and the interesting insights and feedback. This is not a list of the students' complete responses but is intended to reflect the core message of their feedback, as well as the most surprising statements given by them.

Furthermore, the students took part in our survey and thereby helped generating data and its comparison with other sample groups. Within this school workshop and by talking to several teachers and the Principal, we realized there is a great interest in the issue of social media, and it is seen as highly relevant. There is a great demand for more information and education in this field. By conducting this workshop in a vocational school, we had the goal of sharing the insights we gained through our research project with a different target group and thereby to generate more impact. In conclusion, we wanted to teach the students something specific they can use as private persons and within their jobs.

Questions	Insights
What would make you change your social media usage behavior? What would it be worth to you to refrain from social media?	The students do not think anything is wrong with their social media usage. The average daily social media usage of some students is about seven hours.
What do you think about influencers? Do you think they are trustable or manipulative? With which examples can you justify that?	There are influencers the students see as role models (inspiring and motivating). However, they do not think influencers are affecting their consumer behavior. They do realize that product placement and advertisement can be manipulative (e.g. fitness drinks or beauty products).
Would you buy a cell phone with social media for your future children? At what age and why? What would you worry about as a parent?	This group was relatively critical: no phone for their child in primary school, first phone only without social media, maybe not even a smartphone. Moreover, they want to control the usage time. With 14 years their child can get a smartphone with internet and social media. They worry since "the internet does not forget anything."
As an entrepreneur / employee: Would you advertise on social media platforms? Why? Would there be moral standards for you?	Yes, the students would use social media for advertisement but did not have any common opinion on moral standards.
Are social media platforms as advertising mediums an opportunity or a risk? From an entrepreneurial point of view? From the perspective of the consumer?	Advertisement on social media brings advantages and disadvantages for entrepreneurs as well as for consumers.

Table 2: Outcome of the workshop discussions

Summary and Future Goals

So far, we have conducted our research with university students and a class of students at a vocational school. Ages ranged from 19 to 25 years. In the future, we could imagine extending our research to different age groups and also to different school types, in order to compare results and investigate trends. We are especially interested to make contact with younger students, to see if there are any differences in knowledge and behavior. As this is outside the timeframe of this project, we are planning to continue its legacy and visit schools and also compare the results between different school types. The Principal of the vocational school showed great interest in our program. There is a high potential for further schools to work with us. Generally, what surprised us towards the end of our campaigns is how large the disparity in knowledge about advertising practices is between universities and schools. In addition to holding lectures at schools and collecting results on our research, we want to display these results on our website. In particular, a comparison may be interesting between our university-focused campaign findings and our findings drawn from schools. There is scope for evaluating the differences and similarities between the two in more detail.

Research has shown that most advertisements are absorbed unconsciously because of different marketing techniques used by advertising campaigns. The importance of clarifying the amount of advertisements, especially in social media, is justified by the large amount of consumer screen time. Without knowledge and awareness about personalized advertising, the consumer is influenced easily and manipulated subconsciously. The number of schools requesting our workshop session shows that there is a great demand for enlightenment about the use of social media and personalized advertising. Everybody is affected by advertisements and should therefore deal with them consciously. ■

Self Reflection

At the beginning of our project, our main focus was on advertisements and consumer awareness of them. We started with the hypothesis that an increase in consumers' knowledge about common practices used by advertisers changes their purchasing behavior. We wanted to support a more critical awareness of commercials, reward fair commercials and increase awareness of consumers' own power. In order to reach that goal, we started to analyze existing advertisements and especially focused on lies within them. We also thought about increasing awareness in advertisements by visual methods and thought about certifying fair commercials. In that process, we noticed that creating a certificate is not that easy and for that reason, we decided not to pursue this idea and, instead, focused in the subsequent process on surveys, videos posters and the creation of our own website.

During our team meetings, we soon recognized that, in our large group, it was difficult to make progress without introducing some structure and delegating work packages. That was the reason why we decided to organize our team into subgroups ("team video," "team interview" and "team organization"). This was a good way to improve results and perform more strongly as a team.

Regarding the personal (one-on-one) interviews the evaluation team conducted, we soon recognized that it is not as easy as we had imagined reaching participants willing to take the time to sit down with us. Thus, we decided that other methods to obtain survey answers would be more successful. Perhaps, there might have been some other possibilities to continue and improve our ideas with the evaluation interviews. However, looking back, we did not put enough effort and motivation into exploring these possibilities. We could have done this better and tried different strategies to motivate interview participants for helping us in our project.

Because of the difficulties with evaluation interviews, we henceforth focused more on the improvement of our second session of posters, a new video and the online survey on our website. During this period, we also found ourselves confronted by the first problem with our research question and project goal and had to change our approach. We had to accept that our plans to raise awareness about advertisements were just not measurable, because the number of filled-in surveys was fairly small.

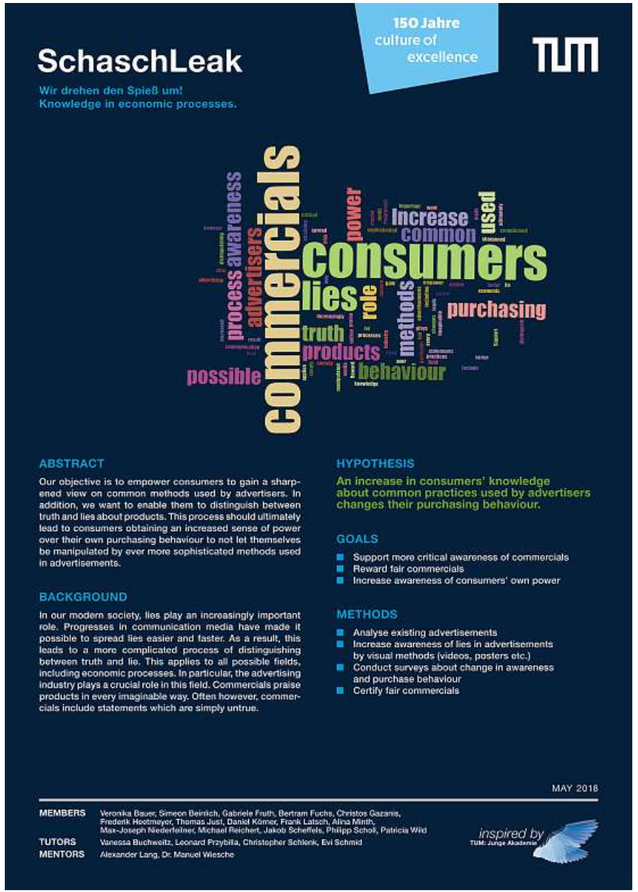
Therefore, we thought about a possible change in our project. We shifted our focus more onto social media, because we thought that this is an important topic especially in the young age-group we targeted. Through the feedback we received and by recognizing our own mistakes, we were able to start our second, improved campaign. The aim to improve our outreach had limited success. This was probably one of our weaknesses, as we could have pushed the boundaries further, as for instance when distributing our first video: Our aim was to have it shown in the TU-Film, but this was not put into action due to a technical sound problem. With some more effort, it would have been possible to fix that issue. Furthermore, we had the idea to print stickers in addition to the second poster series, but unfortunately, we never organized ourselves to use them effectively.

As our target group, we focused primarily on university students. About four months before the project's end, we also had the idea that it might be interesting to see if there is a difference between university students and pupils in schools. We arranged an opportunity to give a lecture at a school and our whole project changed again. This gave our team a vital boost towards the end of the project's runtime, as we now had a manageable activity we could pursue, and which creates significant societal impact: Giving school lectures. After one successful lecture we were motivated to expand this concept and went to other schools. Maybe one reason for our motivation was that we were quite shocked about the lack of knowledge and the social media behavior of the pupils. We developed the goal to compare the usage behavior and opinions on advertising on social media for different age groups and levels of education. So, our focus from university students as target shifted to pupils in schools.

At the end of 2017, we mainly focused on consumer awareness of advertisement techniques. We started with the hypothesis that an increase in consumer knowledge about common practices used by advertisers changes their purchasing behavior. After a lot of discussions and various suggestions from our mentors, we had to acknowledge that the methods we wanted to use were not able to measure our impact regarding the goal. Therefore, we had to modify our goal to be more specific and more measurable. Hence, we discussed and brainstormed in different settings, coming to the result that almost no one in our group was aware of how much advertisement is placed in social media, especially on the major platforms like Facebook and Instagram. Finally, we compromised on the hypothesis. Reflecting the process and the development of our goal, we all learned how difficult it is to specify a precise and also achievable goal. This is the most important milestone in the project work. Due to different mistakes, we became aware that our first goal was not achievable. Eventually, we saw the mistakes we made and we used that knowledge for our "second try."

In summary, we often changed our main focus during the project, first focusing on how big companies influence the population through advertisements and how we could raise more awareness and help consumers. Then, we shifted our focus onto social media and advertising, setting university students as our main target group. In the end, we got to present lectures for school pupils, which nobody in our team would have expected at the outset. Perhaps, one significant team strength we had was that we were flexible and did not shy away from new ideas and possibilities. We also were always open to feedback and suggestions for improvement and we tried to turn these into positive actions. Our team spent a lot of time at the beginning just thinking about different things without putting anything into action. Maybe this was due to the large team size, and it would have been better to develop subgroups earlier. Also, quite a few members of our team were absent for some time because of stays abroad, and two members left entirely for different reasons. Yet, these have never been problems for us. We were able to manage this very well. This might even be an argument in favor of large groups, as we could compensate for absence, and with the subgroups we created we progressed faster and produced results. Also, our team cohesion was good, and we always had fun and enjoyed our team meetings, which we held regularly with predominantly good attendance rates. Fortunately, all our decision-making processes happened free of disputes, with everyone accepting the final results, even sometimes as compromise. In case of problems, we did not hesitate to ask for help. At some points during our project, we could have shown more motivation and we perhaps gave up on some of our ideas too quickly. This was maybe one weakness of our team. Another one, perhaps, was the fluctuating motivation to find time during the project.

To reflect on almost two years of project work, we focused, on the one hand, on our content, including the development of our goal and research question and the way we used different methods in order to achieve the goals; and, on the other hand, on our teamwork, including team-structure, motivation and composition of the team. ■



POSTER 1: The first phase of our project was characterized by our immediate focus on the advertising industry. Our first poster reflects this early choice we made. Reason for this is provided in the 'Background' section: The advertising industry uses new communication media to praise their products however possible, be it with truths as well as wrongful or manipulative statements. Our first hypothesis assumes that knowledge about manipulative practices in that industry alone will be sufficient to change purchasing behavior. We envisioned that through our project, we would topple conglomerates and liberate the consumer's mind from the instructed hand of the advertiser. Later, the truth would surface that actually changing consumer behavior comes with more diffculties than expected – the central issue being lack of measurability of consumer behavior and the causalities behind purchase decisions.

As for goals, we contemplated about creating a certification or label that fair advertisers would add to their creations to obtain consumers' trust. This, however, would eventually not materialize. Nevertheless, our intended methods already included a research part, where existing advertising practices would be analyzed, the idea that posters and videos would be used for an information campaign, and the aim to find survey participants to measure our campaign's effectiveness. These three components would later be materialized, in one form or another. ■

POSTER 2: In the project phase preceding the second poster, both target group and hypothesis remained unaltered. Yet, what did change was a more specific idea of how our information campaign would be designed: We target general consumers, and show them our videos and posters. Then, using test groups of 2 x 30 participants, we would measure the impact of our campaign on opinions about products and purchasing behavior. With external input by our mentors, emphasis was put on defining this methodology, which served as project goal, in the well-known SMART way.

Furthermore, a rough timeline was designed, which did at that time certainly not reflect the path this project eventually took. Whilst we did produce posters and videos on time and released them according to that plan, evaluating their impact would show to be more diffcult than expected. Moreover, we failed to get our first video into tu-film, and we later dropped the at that time existent idea to produce a series of memes. The latter decision was a result of a consultation with Dr. Witzgall from ADBK Munich about our campaign and what it would take to create such memes.

Also in precedence of poster 2 was our decision to split up our large group into smaller sub- groups with assigned responsibilities. It would turn out that this decision greatly increased our output, especially on a creative front. Very importantly, those imparted with organizational tasks received the authority to delegate tasks and request status updates from the other sub-groups. Such a structure created accountability and naturally structured meetings (every sub-group would report and discuss with the others), without the need to bear hierarchies in the team. ■

POSTER 3: Towards poster three, we had undergone significant changes in our target group, the project goal and formulated a new research question. Now, we limited our campaign's target to students at TUM, because we could most directly and easily reach as well as demarcate this group. Moreover, instead of focusing on awareness about advertisements in general, our new research question considered only sponsored posts in social networks. We chose this focus because our targeted age group has significant contact with these media yet little self-reflection about their usage of such tools. Finally, we also had learned that even only helping those students recognize online ads as such would already be a significant first step towards a more conscious use.

A major setback in the project to that date was that although we had intended to measure change of consumer behavior after being exposed to our information campaign, actually measuring such changes is very diffcult to impossible due to unknown correlations and causations and little possibilities to track individual purchasing decisions.

The modifications were reflected in our revised project goal. Now, we only aimed to have more students know how many advertisements are distributed through social networks and how they can easily recognize them. Whilst this project goal is less visionary than the previously defined one, it was much more concrete and actually achievable by our methods. Our mentors and tutors were of great significance in sharpening project goal and research question in this step.

By that time, we had already learned what components of posters and video number one worked well and where we had to improve. Examples for improvements included unpleasant color choices, prohibited logo placements on posters, bad sound quality in the video and a lack of a clear call to action of our campaign. ■

POSTER 4: The final phase of our project included yet some new learnings. Our research question could certainly be answered: An information campaign that includes modern references has the ability to connect with an audience such as our targeted students and incite their interest in the topic of advertisements in social media. Our posters and videos were seen by thousands, and hundreds have engaged with our website over its lifetime, with significant improvement in engagement of the second, revised campaign over the first. More importantly, we talked to peers about our project and know were able to make them think. Our revised website even included a value for its visitors: Tell us how you perceive advertisements in social media and we'll show you lots of interesting facts about them. This is the call to action we had lacked before.

On a team side, one may conclude that our early division into subgroups had remained virtually unchanged. We were able to compensate members staying abroad in an acceptable manner. That is because responsibilities of each member were known by their belonging to a sub-group.

Finally, the latest modification of our project goal must be mentioned: Since our information campaigns had indeed aroused interest in the topic, we were able to then target our focus on schools and educating younger students about possibilities and dangers of using social media excessively. Being a completely different type of main activity, we now have the goal to convey our learnings from the project about manipulative advertising practices in social media and how to best identify them, to as many students as possible, by holding presentations at schools. ■

Project Report **SciCom**

Team	Barbara Gleißl Sebastian Leicher Himanshu Panandikar Sabrina Schwarzmeier Sebastian Siegel Patrick Strobl Maryam Tatari Victoria Treßel
Tutor	Alexander Biederer Dr. Matthias Lehner Xenia Priebe
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Science, Innovation Transfer, and Societal Participation

Team SciCom is a part of the year 2017/II of the TUM: Junge Akademie scholarship program. The project topic is ‘the influence of communication of scientific insights on political decisionmaking processes’. The goal is to develop a platform to foster increased collaboration between university students, the Bavarian Parliament, and local polital institutions. Interviews and surveys – with both politicians and students – show that there is mutual interest in increased interaction and a desire to collaborate. Especially in local politics, the opportunity to incorporate external scientific advice is often feasible due to time and cost reasons. On the other hand, students are looking for cooperation partners for their scientific theses in economy and society. Combining these two interests for a mutually beneficial relationship is the central concern of Team SciCom. Therefore, Team SciCom developed a web-platform with the aim to support local politicians in their job as well as to get university students motivate to participate in politics. The website offers both groups the opportunity to get in touch with each other and to exchange tenders and applications. The key feature of the website is a tendering platform for politicians to float internships, theses, or student-assistant jobs. Search functions are integrated to enable both parties to develop a personal contact in case of mutual interest.

Behind this is the fundamental insight that science does not work independently of society. At that point, humanities and social sciences come in. Without considering social structures and social processes, hardly any innovation in engineering and natural sciences can be successful. Therefore, innovation transfer from universities and research centers to society must be realized. The following examples illustrate the situation:

How could smart cities be created without any knowledge about the future coexistence in the cities?

How should researchers develop intelligent food and supply chains for the world's growing population without considering the situation in developing countries?

How could robots help the elderly without taking their needs into account?

How should large-scale technology projects such as intelligent energy networks be integrated into society without taking into account the associated social, economic, and ecological factors?

Not only applied research, but also foundational research is confronted with questions that cannot be answered without social sciences and the humanities:

What are the criteria we use for our research?

How can science work beyond our common understanding?

How do we learn from failed approaches?

Questions of humanities and social sciences must be addressed right from the start in the design of technology and not only in a subsequent "add-on" that comes into play when the technology has already created facts.

The interactions between science, technology, and society must be examined from three perspectives - knowledge, evaluation, and communication:

Science & Technology Studies (STS): Social scientists and humanistic scholars research the social aspects of science and technology – including philosophers, historians, sociologists, political scientists, and psychologists.

Ethics & Responsibility: Economic and medical ethicists, environmental and technical ethicists evaluate research and development.
Media & Science: Communication and media scientists examine how research and society can exchange ideas.

In an increasingly informed society, the call for participation in decision-making on infrastructure and technology projects is becoming louder and louder. The previous response of the constitutional state were planning approval procedures in which the phase transitions from the preparation of the plan by the project developer to the consultation procedure, public interpretation, discussion, forwarding of the result of the consultation up to the planning approval decision were legally precisely defined.

However, the participation of citizens and authorities is often declared as a "hearing" in a manner that appears to be in the hands of the authorities. A so-called "preclusion effect" excludes any kind of objection after expiry of the preclusion period. In this case, learning processes are not possible, although technical, social, and economic conditions can change. It is a "linear" legitimation procedure that must take account of a changed complex world.
To what extent is participation possible without gambling away the decision-making capacity and sustainability of a society? The rules of the game between citizen participation, technical-scientific competence (research institutes, universities etc.), the parliaments as democratically legitimized decision-makers, the judiciary and the executive must be rethought. The technical-economic-ecological development is changing political structures. The initiative of Team SciCom is a first step in this direction.

Klaus Mainzer

Students Giving Policy Advice – A New Form of Political Participation?

“Wir sind hier, wir sind laut, weil man uns die Zukunft klaut!” ("We are here, we are loud, because our future is being stolen!") sound the chants over Odeonsplatz in Munich as a few hundred children, teenagers and young adults gather with their homemade cardboard signs in front of a wooden stage built on top of a flame-red fire truck. The vehicle is fitting: the young protesters have come together to set the current climate policy ablaze. They represent the Munich chapter of “Fridays for Future,” an international movement of students which aims to highlight the issue of human-made climate change and expedite improved environmental protection legislation. To achieve this goal, the young activists take to the streets – at times when they are supposed to be at school, such as this morning of Friday, 26 April 2019.

Among them is 18-year old Björn, who first got involved with “Fridays for Future” earlier this year when an environmental club was founded at his school. Since then the soon-to-be high school graduate has regularly participated in the weekly school strikes. When asked about his motivation, Björn explains that the catastrophic dimensions climate change is expected to assume have been known for decades, but nothing much has been done about it. He worries about the continuing extinction of species and the negative impact on human lives that can already be witnessed. “If our future is at stake, we have to speak up, and especially when we see things going wrong, we need to act.” Björn believes that the school strikes are a great instrument in drawing public attention to this issue and alarming political decision-makers – and he appears to be right. News about the movement is shared by local, national, and international outlets daily, and the protesters’ demands inevitably reach both the general public and, eventually, their true target: the politicians.

Many high-profile politicians, including Chancellor Merkel, have applauded the protesters and encouraged them to continue their fight against climate change. Others, however, have voiced criticism, explicitly targeting the lack of expertise among the young activists. Christian Lindner, leader of the FDP, gained notoriety for expressing the view that the youth movement could not be reasonably expected to understand the complex global relationships and technically sensible and economically feasible solutions related to climate change: “This is for professionals.”

Not only did Lindner’s comment spur a debate on the democratic participation of youth, but it also raises the question “What makes one an expert?”

There are, in fact, plenty of examples of young people functioning as experts and successfully advising politicians. One of them is Ramona Fruhner-Weiß, who became involved in politics when she was still a student. Meeting her at the Technical University of Munich, her political expertise and experience showed through in her thoughtful and precise responses, despite her young age. Ms. Weiß’s political engagement was catalyzed when she wrote her master’s thesis in cooperation with the county council Fürstenfeldbruck. Her topic examined the feasibility of building a local biogas power plant by changing the waste collection system of the county. Contradicting expertise on the same subject, the results of her work indicated an economic gain and a significant ecological benefit of a biogas power plant. The importance of her work is underlined by the fact that she not only presented her findings in the county council as a counter-argument to the official experts but also during expositions on the topic.

Additionally, newspapers became interested in and reported on her results. Despite the high relevance of her thesis and just like the young students of “Fridays for Future,” Ms. Fruhner-Weiß also faced adversity related to her work. During the presentation in the council, her expertise was repeatedly questioned. Moreover, as her study contributed to a highly controversial topic, the different parties in the council tried to reinterpret her results according to their preconceived opinions. She witnessed obvious black-and-white thinking among all parties, where politically neutral scientific results became distorted. Ms. Fruhner-Weiß also experienced the general tendency of politicians not to take young people and students seriously during her later work as a member of the city council of Puchheim. Experienced politicians were especially prone to exhibit this tendency if they did not feel supported in their own opinions.

A counterexample for this assumption is the open-minded mayor of Feldafing, Bernhard Sontheim. When in 2010 the old train station of Feldafing was reconstructed and changed into the new town hall, Mr. Sontheim initiated a student project for the design of the forecourt of the new building. During the interview at this exact location, he appeared not only as a politician who is used to making decisions, but also a creative mind who values out-of-the-box thinking and creative approaches. Being aware that students need practical projects to gain experience, Mr. Sontheim realized the potential of a collaboration. The idea behind this cooperation was to collect creative and unconventional solutions from the students that might later be implemented by a company. After developing four different concepts, the students presented their ideas to the city council. Different parts of these four concepts were then later implemented in a final design by an architect. The pavement of the forecourt was changed to signal to car drivers that the area is reserved for pedestrians. Additionally, the students suggested limited-time parking instead of permanent parking spaces to achieve the feeling of a village center and not a park and ride area.

But it was not only the positive results of this project that made Bernhard Sontheim believe in students as valuable contributors to civic affairs; he sees great potential for student corporations in all areas of public life where creative and out-of-the-box thinking is necessary. Whether it be in the context of master’s or bachelor’s theses, student projects, or internships, Mr. Sontheim has suggested different design projects and feasibility studies in urban development or tourism in and around Feldafing as possible future challenges for students.

The positive outcomes of the projects in which Ms. Fruhner-Weiß and Mr. Sontheim were involved exemplify the great opportunities student-politician cooperations offer regarding the development of out-of-the-box suggestions and evidence-based solutions to political issues. If society wants to benefit from young people’s creativity and scientific expertise, it is crucial to foster their engagement in politics from the earliest stage possible and to take their ideas and suggestions seriously, because young people can be experts, and – as Lindner put it correctly – after all, that is to whom we should listen. And so Björn and his fellow student protestors will take their stand again next week until their voices are finally being heard by Mr. Lindner and in politics in general. ■

SciCom – Bringing Scientific Truth to the Political Decision Making Process

1. Abstract

We investigated the overarching topic of "truth and lies in scientific insights," aiming to better understand the process of policy advice and improve communication between science and politics. Therefore, we conducted a review of relevant literature on models of interaction between science and politics as well as carrying out interviews with German politicians.

From these interviews, we gained the insight that the increased involvement of university students and PhD candidates in the policy consulting process at the lower levels of German government would be a positive and welcome development. Based on this information, we decided on the development of a platform facilitating collaboration between politicians and university students or PhD candidates as the primary goal of our project. We posit that such a platform would be mutually beneficial and increase the level and quality of scientific advice in the policy-making process at the local level of the German government.

After the politician interviews, we enhanced our knowledge base by conducting a survey with 32 students and PhD candidates. By using open and closed questions, we confirmed that students and PhD candidates are motivated to provide political advice, with 66% of the survey participants receptive to the idea of using an online application facilitating first contact between themselves and politicians. The survey also provided valuable insights into functions users deemed important.

From this empirical basis, we followed an iterative, user-centered design process for the development of the collaborative platform in the form of a website. The first working prototype of this SciCom website was tested by both politicians and students/PhD candidates in an alpha test involving a so-called thinking aloud session and a questionnaire, which assessed usability. The main limitation of our results are methodological issues with the thinking aloud method and the homogeneous demographic composition of the sample, limiting generalizability.

Future research focuses on implementing the feedback obtained in the alpha test, optimizing existing and adding new useful features to the software. The improved platform will then go through a beta test, again utilizing the thinking aloud method, obtaining the System Usability Scale score (Brooke 1996), and administering the User Experience Questionnaire (UEQ; Laugwitz, Schrepp, and Held 2018). Furthermore, we envision a kick-off event with local politicians, university students, and educational staff, where the website will be introduced and launched to achieve successful proliferation.

2. Background

Governments implement a great array of policies, such as climate policy, digitalization policy, or foreign affairs policy, to achieve their political goals and fulfill election promises. In assessing their governments, citizens often refer to their perspectives on particular policies. Therefore, governing politicians seek to tailor their initiatives to their societies' current problems and upcoming challenges. Consequently, a policy can be seen as the pursuit of certain goals by setting these goals and associated milestones, granting the required authoritative power to agents, and defining an approach or actions (Colebatch 2002). The policy process is in fact evolutionary. Colebatch (2002) describes it in this way as it involves a complex cycle of development – negotiating between existing policy and related issues, looking for alternative responses, comparing them, and finally making a decision. This decision is then implemented, evaluated, and amended. The process will not terminate at once, but it will rather revolve around again with a new related problem or goal.

In the process of policy-making, it is important to truthfully describe the status quo (i.e. current issues) and to assess to what extent approaches to solutions are truth-based. Such a description is in concert with the aim of science to give a generate true and accurate knowledge on how the world works. This requires the use of the most precise tools and concrete concepts based on experience, observation, trial and error, revision, evaluation, paradigm shifts, and peer-review considerations – the tools of science and technology. Though these tools and concepts only approximate the truth – otherwise their evolution would be nonsensical – they yield the most truthful depiction of the status quo. Thus, looking at the influence of scientific insights on policy making is to observe how truth, in the form of scientific truth, is devised in a process that can be disorderly, ambiguous, and must appease different agents and interests.

To investigate our main theme of "truth and lies in scientific insights," we focused on scientific advice in the policy-making process. We studied the influence of communication of scientific insights on the political decision-making process, focusing on the interaction between scientists and politicians on the matter of public policy. We looked for ways to increase the influence of scientific "truth" on the political decision-making process and consulting. To do so, we asked ourselves a series of questions: What is the status quo of policy-making in Germany and Bavaria? How do different parties utilize scientific insights when devising their plans? How does scientific consultation occur? How are academia and researchers, particularly young researchers such as master or PhD students, relevant to policy-making practices? How can their projects, which are science-based and scientifically verified, be used in a consultation process? How can we facilitate the relationship between academia and the public policy sphere and increase scientific influence?

Considering the above questions, we found it impactful to build a bridge between students and young researchers and Kreistag politicians (or politicians in general) by programming a web application to connect these groups and influence the consultation process. Students and young researchers do have a scientific approach while tackling an issue and their projects (final projects, class projects, or internships) target complicated questions while scientifically approved. Additionally, students themselves can be interested or knowledgeable in political issues and willing to take part in a consulting process. Furthermore, local politicians can benefit from results gained in academic research, when discussing an issue in their region or aiming for a new policy. Therefore, we narrowed down our focus by highlighting the policy consulting process at the local level and the contribution that students can make to such a process.

In the following, we first seek to understand the interaction between science and politics on a theoretical level by means of reviewing the relevant literature in Section 2.1. After gaining a general understanding of the subject, we focus specifically on policy advice at different levels of government in Germany in Section 2.2.

2.1 Models

We live in communities whose social bond comes from objects fabricated in laboratories (Latour 1993). Our issues are hybrids: partly scientific and related to nature, partly political and related to society. To resolve them, there should be closer interaction between the part with scientific credibility and the part with political authority, whereby scientists are asked to participate in policy-making process by presenting evident and truthful information and giving their advice on the issues. Such advice can be a valuable, or even essential, input to sound policy-making, but its impact depends on how it is formulated and communicated as well as how it is perceived by its target policy audience and by other interested parties (OECD 2015).

It is worth noting that, generally, political consulting refers to advice on tactical aspects of politics, such as communication, campaigns, and public relations. Typically, consulting firms and agencies carry out this form of consultation. Policy advice, on the other hand, pertains to the actual content of political topics. Nevertheless, the kind of consultation suited to our setting is the content-related consulting which is usually provided by non-governmental organizations, such as think tanks, foundations, and, of course, scientists (Fleischer, Veit, and Hustedt 2010). In all, the scientific advisory process includes 5 steps: (1) framing the question, (2) selecting the advisors, (3) producing the advice, (4) communicating and using the advice, and (5) Assessing the impact (OECD 2015).

In addition to the general advisory steps mentioned above, there are models describing the interaction between science and politics in the political decision-making process. These models consider varying influence of both sides, and are: (1) the Technocratic Model, (2) the Decisionist Model, and (3) the Pragmatic Model.

In the Technocratic Model, science sets goals for politics and proposes solutions. The policy only serves to implement these

proposals (Fig. 1a). In the Decisionist Model, politicians are responsible for defining goals and use science as a source of information upon which they base their decisions (Fig. 1b). Finally, the Pragmatic Model proposes that goals can only be identified and substantiated in an interactive process of coordination between science and society (Fig. 1c). This model, therefore, presents a mixed form of the former two (Edenhofer 2011; Kevenhörster 2013).

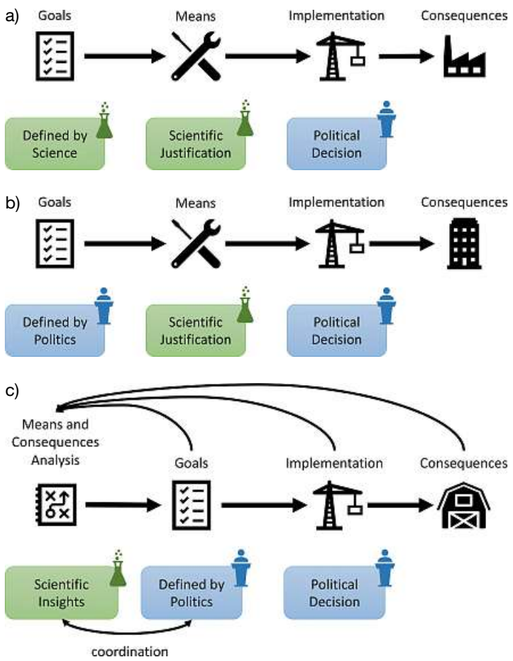

Figure 1: The (a) Technocratic, (b) Decisionist and (c) Pragmatic Model of Interaction between science and politics in political decision-making processes (Edenhofer 2011; Kevenhörster 2013)

2.2 The status quo of policy advice in Germany

2.2.1 Bundes- and Landtagsebene

In Germany, the form and extent of policy advice varies between the different federal levels and depends on the means through which politicians get advice and acquire information. At the level of the Bund, members of the parliament are able to use the "Scientific Service of the Bundestag" (German: Wissenschaftliche Dienste des Bundestages) to obtain information on a certain topic. Also, at the state level, all Landtage in Germany have a scientific information service available for the members of the parliaments (expect for Saarland). However, these information services only gather existing information and present it to politicians in an understandable manner but do not conduct research of their own. The consultation of external scientists and experts is also an exception to the norm for these services.

Politicians themselves can decide to utilize external consultation, where politicians' staff members can also act as gatekeepers regarding the selection of experts. Here, the political orientation of the experts usually plays a role as well as the acquaintance of the politician or staff with the expert. This is true for all horizontal and vertical levels in politics, only the resources regarding external expert consultation differ (Dagger 2004). Whether scientific policy advice is taken from a national academy like Leopoldina or acatech or research institutions like the Helmholtz Association, Fraunhofer Society or Max Planck Society, from lobby groups, think tanks or institutions close to a political party, or from professional agencies like McKinsey and Roland Berger depends on the level of politics, the time and monetary budgets of the politicians, and the scope of the related political issues. Since research takes time and most issues in politics are pressing issues, most of the advice is in the form of impact analysis.

Due to the monetary and time budget constraints, internal policy advice from staff or other party internals is preferred. Also, the understandability of party internal experts or experts close to the political party is higher than from fully external experts according to interviewed politicians (see Section 4.1.1). Trust and competence are also perceived to be higher for proven party-internal experts. Trust and exclusiveness of information are important factors in policy advice. For politicians on the Land and Bund levels it is also common to hire students as interns from certain fields to carry out information gathering and give presentations.

2.2.2 Kreistagsebene and below

The information process in local-level politics is mainly based on personal research, expert assessment, and administration reports (Off-Nesselhauf, personal interview, 13.11.2018; Forster, personal interview, 02.11.2018; Drexler, personal interview, 05.11.2018). Discussion in the factions and parliament, together with exchanges with other parliaments, are additional parts in this process (Lenz-Aktaş, personal interview, 20.09.2018). Policy advice is given internally by party members who are experts, or by external partners like architects or law firms. Receiving scientific advice from universities or institutes is much less common (Off-Nesselhauf, personal interview, 13.11.2018; Sontheim, personal interview, 30.10.2018; Forster, personal interview, 02.11.2018). The special situation that most local politicians are working in honorary positions leads to big constraints regarding time and budget. Due to that, contact with Universities and Scientists is often nonexistent (Forster, personal interview, 02.11.2018).

Assigned external advisors either consult the administration, for example during city planning projects (Sontheim, personal interview, 30.10.2018), or the parliament directly, for example with presentation of their reports in the boards or plenum. The information for the politicians is available as complete report or as a summary in the form of a presentation (Holmer, personal interview, 9.11.2018; Off-Nesselhauf, personal interview, 13.11.2018). The problems with this process include a lack of transparency (Off-Nesselhauf, personal interview, 13.11.2018) and the questionable objectivity of the consultants (Forster, personal interview, 02.11.2018). Additionally, the availability of high-quality advisors poses an issue (Sontheim, personal interview, 30.10.2018).

3. Goals and methods

Having reviewed the relevant literature and having analyzed policy advice on different levels of government in Germany, we found that the advice process is more organized and well defined at the Bundestag and the Landtag levels, as covered in Section 2.2.1. As described in Section 2.2.2, in the Kreistag and lower levels, the policy advice process is more nebulous. It was not possible to gain a clear understanding of the system merely by reviewing literature and so, in order to obtain further information, we decided to conduct semi-structured interviews with the concerned parties, mainly local politicians in the state of Bavaria. The methodology behind these interviews is laid down in Section 3.1. Apart from helping us understand the policy advice process, the interviews also gave insights into our setting of further goals. As the results covered in Section 4.1.1 explain, increased involvement of university students and researchers in the policy advice process at the lower levels of German government would be a positive development in the eyes of the parties interviewed.

Based on this information, we concluded that developing a platform that facilitates collaboration between politicians and university students or doctoral researchers was to be the primary goal of our project. We posited that such a platform would be mutually beneficial and would increase the level and quality of scientific advice in the policy-making process on the lower levels of the German government.

Next, as described in Section 3.2, university students and doctoral researchers were asked in a questionnaire about their views on "policy advice by students" and on the collaborative platform that we have envisioned. The results of the survey are covered in Section 4.1.2.

An alpha test was conducted to assess the usability of the first working prototype of the SciCom website, which is the collaborative platform. The methodology of this test is described in Section 3.3 and the results are presented in Section 4.3. The development of the SciCom website is covered in Section 4.2.

3.1 Interviews

Unlike the Bundestag and Landtag levels of German government, extensive literature describing the policy-advice process at the Kreistag and lower levels is not available. To gain a qualitative understanding of this process, we conducted semi-structured interviews with participants who are described in Section 3.1.1. The interview procedure is given in Section 3.1.2 and the content of the interview is covered in Section 3.1.3. The results are documented in Section 4.1.1.

3.1.1 Participants

10 participants were interviewed to gain an insight into the policy advice process at the local government level in the German state of Bavaria. The majority of the interviewees were local politicians and in order to get an idea of the scientific side of the policy advice process, a professor at TUM and NGO employees

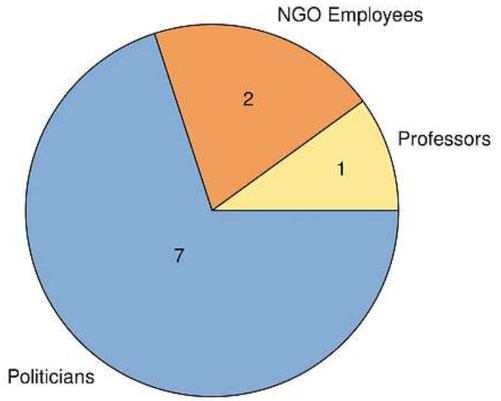

Figure 2: Background of interviewees

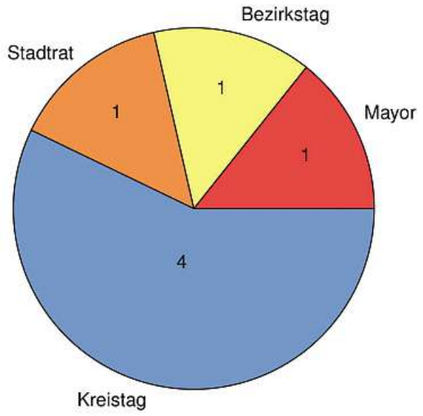

Figure 3: Level of government of the local politicians interviewed

were interviewed. The professor had previously provided scientific advice and the NGO employees had a history of activities in local politics. The background of the interviewees is depicted in Fig. 2.

A variety of politicians closely associated with local politics were interviewed in order to get a broad range of opinions. Fig. 3 shows the level at which the politicians operate. Two female and 5 male politicians were interviewed.

3.1.2 Procedure
The interviews took place either at the interviewees' offices or by telephone and were conducted by 1 - 3 interviewers. The interviewees first provided their informed consent, including their agreement to an audio recording. The option to go off the record was also available. The semi-structured interview had a duration of 60 - 90 minutes. The interviewees were asked questions which they could answer in an open-ended manner. Additionally, the possibility to provide information and insight outside the basic interview structure was also made available. Extensive notes were taken by the interviewers. The content was summarized and collated at the discretion of the interviewers.

3.1.3 Material
A high-quality audio-recorder was used to record the interviews. Three different interview guidelines were prepared for the politicians, NGO employees, and professor. These questionnaires were broadly similar. All three groups were asked questions regarding their background, past experience with political decision-making processes, specifics regarding the same but focusing on the role of scientific advice, as well as their opinions on and suggestions for improvement on these subjects. Politicians were further asked about issues that have arisen in the past in this context. Scientists and NGO employees were also asked about the manner and format in which they have interacted with politicians. The guidelines broadly consisted of 40 questions.

3.2 Questionnaire
Whereas the interviews mainly provide qualitative results and reveal the politicians' points of view, the aim of the survey was to collect opinions from students and doctoral candidates about policy advice and our online application. The combination of the subjective statements and the quantitative data leads to a profound understanding of the needs of our target groups and allows a user-centered development (Beyer and Holtzblatt 1998) of our platform.

3.2.1 Participants
To collect meaningful data, we set ourselves the internal goal of finding at least 25 survey participants. Ideally, these participants should be from different subject areas and at different levels of their academic education in order to avoid biasing the survey results due to participant selection. For this purpose, a balanced gender and age distribution is also important (Brace 2004).

We surveyed a total of 32 participants, with an average age of 24 years (SD = 5.72). Eight were female and 24 were male. Furthermore, 8 studied in a bachelor's program, 18 in a master's program, 4 were doctoral candidates, 1 person was in a study program leading to the exam of the Bavarian state and 1 was an alumnus. The distribution among the different study courses is shown in Fig. 4.

3.2.2 Procedure
The data was collected via an online questionnaire containing both open and closed questions. Students were free to fill out the form at their own pace on their own devices. The completion of the questionnaire took between 10 and 15 minutes.

3.2.3 Material
The questions to the participants were grouped as follows:

1. Demographics: age, gender, major, level of study, preferred method of communication
2. Political interest: method of informing oneself about local political topics, level of knowledge about political issues in hometown, previous discussions with politicians
3. Opinions on policy advice by students: qualification of students for policy advice, better political decisions through students giving policy advice, willingness to give advice to politicians
4. Opinions on the application and its features: app usage, preferred device, matching based on knowledge, integrated chat, rating system of given advice, staying in touch after project, anonymous advice, political affiliation, external links to advisory work, motivation for app usage, time willing to spend on free advice, payment expectations per hour, preferred way of communicating advice, personal or digital advice
5. Space for final comments on the topic or on the questionnaire itself

3.3 Alpha Test
The alpha test was conducted to assess the usability of the first working prototype of the SciCom website.

3.3.1 Participants
Six students and two politicians participated in the alpha test of the website. All students were male with an average age of 27 years (SD = 2.28). One politician was female and the other was male. Their age average was 25.5 years (SD = 2.12).

3.3.2 Procedure
The test sessions took place at the participants' homes in a one-on-one setting. The participants first provided their informed consent, including their agreement to an audio recording of the test session. They were then introduced to the thinking aloud method (see Section 3.3.3.2) and given a scenario for their use of the SciCom website. The students performed five tasks on the SciCom website using the thinking aloud method, while the politicians completed eight tasks. Following the thinking aloud test, the participants filled out a short questionnaire containing demographic

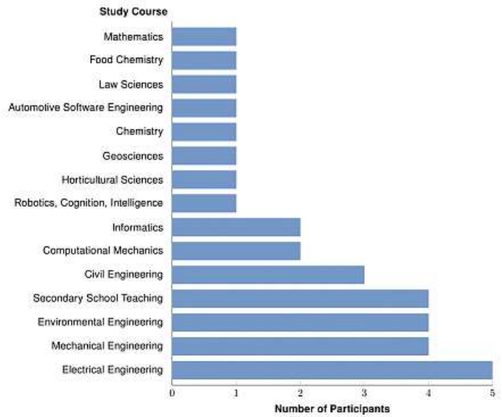

Figure 4: Study courses of the participants of the survey

items and questions regarding the website's visual design and functionality. The study concluded with the System Usability Scale (SUS; Brooke 1996) described in Section 3.3.3.3. Overall, the test sessions lasted between 30 and 60 minutes.

3.3.3 Material

3.3.3.1 Technical Equipment

The tests were performed using the participants' own laptop or desktop devices and web browser of their choice. A high-fidelity web prototype of the SciCom website was used for the testing. The participants were informed that at the time of the study the prototype was lacking some functionalities and was only available in English.

3.3.3.2 Thinking Aloud

The thinking aloud method is, as its name suggests, a method that requires participants to verbalize their thoughts as they interact with a system to perform a set of given tasks. Many notable usability researchers consider it to be the most valuable method available to usability engineers (Nielsen 1993). It is widely used due to being inexpensive, simple, robust against errors made by experimenters, and very flexible.

The tasks for the alpha test were selected because they represent typical interactions students and politicians are, respectively, expected to have with the SciCom website based on our findings from the user research detailed in Section 4.1. The politicians were asked to register for the website, use the login and logout functionality, create a project, select applicants for a project, edit a project, search for another politician's profile and edit their own profile. The students were also required to register for the website and edit their profile information. However, the rest of the tasks differed among the two user groups, as the students further had to search for a project, apply for it, and verify their application status afterwards.

3.3.3.3 Questionnaires

The final questionnaire inquired about participants' age and gender. The politician version further asked for feedback regarding privacy options, such as blocking other users, availability of information to non-registered users, the uploading of one's curriculum vitae (CV), and the precision of shared locations, as well as preferences for system notifications. Additionally, among the students, interest in looking up other users' profile information was voiced. The System Usability Scale (SUS) is a ten-item scale developed by Brooke (1996), employing a five-point scale from "Strongly Agree" to "Strongly Disagree." A German version of the questionnaire by Rummel (2015) was used to provide a quantitative estimate of the SciCom website's usability and allow for comparison throughout later iterations of the software.

4. Outcome and discussion

4.1 User Research

In the two following subsections, the outcome of the interviews with politicians and of the survey among students and doctoral candidates is described and discussed.

4.1.1 Politicians

All interviewed politicians stated their interest in working with students. They were open to offering opportunities for internships, theses, and student jobs. Possible projects for the students could be lay-out plans, budget plans, administrative work and long-term projects such as working on the proposals of the politicians (Sontheim, personal interview, 30.10.2018; Drexler, personal interview, 05.11.2018; Forster, personal interview, 02.11.2018). To encourage exchange and collaboration between students and politicians, we defined the design of a website for exchange on project offers as our goal.

In the survey, the most frequently mentioned expectation that the politicians had for students was professional competence, proven by a bachelor's degree in the respective subject area. Further prerequisites were:

- creativity,
- motivation,
- open-mindedness,
- the ability to adhere to specifications,
- a local proximity to the political project (optional).

All surveyed politicians were willing to pass relevant contact data and framework data of the political project to students. The publication of sensitive or confidential data (concerning the person or the project) within the website/app was not seen as desirable, however. Politicians would like to receive the following information from the students (most often mentioned):

- degree, scientific activities, competences, number of semesters,
- subject, focus, interests, motivation,
- place of residence (optional).

80% of the respondents mentioned an interest in using an app or website that connects students and politicians. According to them, a combination of an app and a website is best suited for this purpose.

Respondents most frequently requested the following criteria for the app/website:

- user friendliness (intuitive operation),
- personal added value,
- reasonable structure, high-quality information preparation,
- ensuring short response times by students,
- transparency, independence, data protection,
- creation of a basis of trust.

In addition, the respondents mentioned the following functions that the application should have:

- communication function between users (only for the initial contact via chat or voice messaging),
- discussion forum for topics of general interest and a support/help button.

All surveyed politicians were interested in an event that strengthens the exchange between them and the university, for example in the form of a kick-off event to introduce the app/website. However, they mentioned time restrictions as a possible hindrance.

4.1.2 Students and doctoral candidates

44% of the surveyed students/doctoral candidates think they have a "good" or "very good" knowledge of the political issues in their hometown. This means they are interested in local politics and might also know how political decisions are made on the municipal level.

The most important results of the survey concerning policy advice by young scientists are:

- Overall, students and doctoral candidates feel confident to provide policy advice, mostly if the issue is related to their field of study.
- Students in early stages of their course of study are not considered as qualified to provide policy advice (not before obtaining their bachelor's degree).
- Students and doctoral candidates are motivated to provide advice in order to have a positive impact on political decisions.
- 66% of the surveyed students/doctoral candidates can imagine using an online application which facilitates the first contact between them and politicians.

These results show that students and doctoral candidates feel capable to provide policy advice, which could be initiated by an online platform.

According to the participants of the survey, important features for such an online application are the following ones:

- matching based on knowledge,
- integrated chat function,
- rating function of given advice,
- opportunity to stay in contact after the end of the project.

72% of students/doctoral candidates indicated that altruism is a "strong" or "very strong" motivation for giving advice to politicians, whereas getting money or a letter of recommendation is less important. One should take into consideration that this result could be biased because of social desirability which can occur in such questionnaires. It means that people answer questions as desired or expected by society rather than how they truly think about it (Nederhof 1985). Furthermore, it might also be that people who participate in a questionnaire for altruistic reasons are more likely motivated by altruism. Taking this into account, altruism might not be the strongest motivation but nevertheless one of the reasons for giving advice to politicians.

We asked the participants to tell us how much time they would spend on giving advice without receiving money. 19% indicated that they would spend three hours or even more, 72 % would spend one or two hours, and only 9% would spend less time. These results show that most of the surveyed people are willing to spend their time giving free advice. The payment expectations of the respondents (if they receive monetary compensation for their policy advice) are between 1 € and 50 € per hour. The average was 18 € per hour (SD = 11.45).

4.2 Platform Development

Based on the insights gained from the interviews with the local politicians and the survey of university students, a user-centered

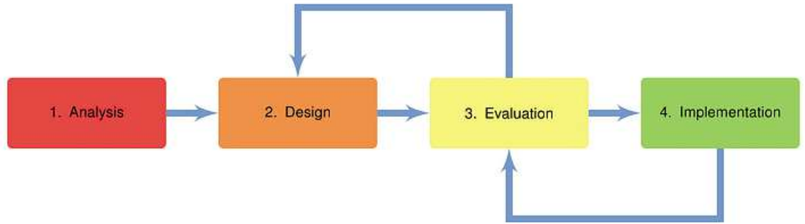

Figure 5: User-centered Design Process (Modified, taken from Havik (2017))

design process shown in Fig. 5 was followed in the development of the collaborative platform. The prototyping, interface design, and implementation of this website is covered in detail in Sections 4.2.1, 4.2.2 and 4.2.3, respectively. The development process was iterative and the first working prototype was tested both by students and by politicians in the alpha test. he goal of this test was to assess the software's usability, which is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (International Organization for Standardization [ISO] 2018).
As described in Section 3.3, this test involved a thinking-aloud session where the test subjects were asked to complete predefined tasks followed by a questionnaire. The results of the alpha test are documented in Section 4.3. At the time of writing this report, the suggested changes along with multiple improvements to the website are being made.

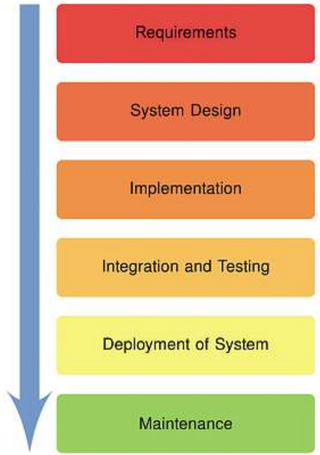

Figure 6: Waterfall model (Modified, taken from Sharma (2016))

In order to develop a platform based on the insights presented in this chapter, an iteratively modified waterfall model was used which is shown in Fig. 6. While the overall structure remains sequential, the phases of system design, implementation and testing take place in three iterative loops (Sharma 2016). In the following paragraphs, the most significant tasks of prototyping, user interface design and implementation are presented. Section 4.3 then describes and analyzes the results of the alpha test and shows its design implications.

4.2.1 Prototyping

Using the results of the previously presented expert interviews with politicians and the questionnaire for students, the needs of the respective groups were analyzed. Subsequently, the requirements and limitations for the platform were defined and a feature list specified. The first prototype for the user interface/front-end was created using the tool MarvelApp and focused on the accessibility of the functions rather than the design, which will be discussed in the next Section 4.2.2. A mock-up by this tool allows workable links and transitions between multiple web or app pages and provides an efficient way of validating initial ideas. The prototype was presented to the mentors/supervisors of the SciCom project team and in a static form in front of the year cohort 2017/II of the TUM: Junge Akademie. Valuable insights were gained for the interface design and iterations of the feature list.

4.2.2 Interface Design

The online tool MarvelApp was used to create an overview of all sites required for our online platform. Furthermore, single sites could be connected using workable links or buttons that allowed for an initial visualization of transitions. The following table gives an overview of sites created and lists their functions.

Name	Description	Functions
Homepage	Site that appears when entering main URL in browser	■ Login button ■ Registration button ■ Button linking to “About us” page
About us	Site giving a description of the project, our team, and TUM: Junge Akademie	
Login	Dialogue asking user for his username and password	■ Verify login information and take user to his homepage ■ Clickable link and instructions in case user forgot his login data
Registration type	Site allowing user to select to register as either a politician or a student	■ Link to registration dialogue for respective user type
Registration	Dialogue enabling user to register as politician or student	■ Prompt user for name ■ Prompt user for email address ■ Prompt user for password ■ Button to complete registration
Homescreen	Site user sees after logging in	■ Overview of recently created projects ■ Overview of recently created profiles ■ Search function ■ Link to user’s profile ■ Logout button
Profile politician	User profile for politicians	■ Information that can be provided: political position, party, profession, website, email, mobile number, zip code, city ■ Every piece of information provided in the profile has the option to remain hidden to other users, customizable ■ Option to upload profile picture ■ Overview of projects the politician has created in the past ■ Overview of applications received ■ Button to create new project
Profile student	User profile for students	■ Information that can be provided: university, study course, semester number, link to CV, email, mobile number, zip code, city ■ Every piece of information provided in the profile has the option to remain hidden to other users, customizable ■ Option to upload profile picture ■ Option to upload CV ■ Overview of projects the student has applied to, including status of the application (i.e. accepted, rejected, in review) ■ Overview of bookmarked projects
Create project	Dialogue available to politicians wishing to tender a project	■ Information that must be provided: project title, type of project (e.g. final thesis, consulting project, study project), timeframe, description, tags, prerequisites to be fulfilled by applicants (i.e. academic degree, study course, party affiliation, place of residence)
Chat	Exchange between users through direct messages	■ Type and send ■ Send files and appointments
Terms of use	Legally required page	■ Must be visible in the footer of all sites
Data protection notice	Legally required page	■ Must be visible in the footer of all sites
Imprint	Legally required page	■ Must be visible in the footer of all sites

Table 1: Overview of sites (own depiction).

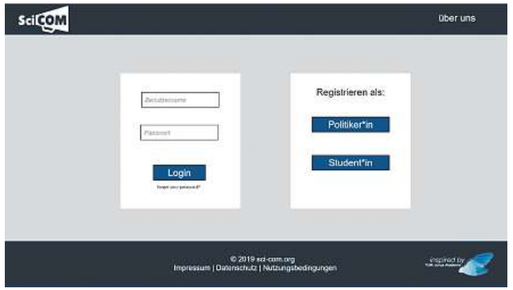

Figure 7: Login/registration

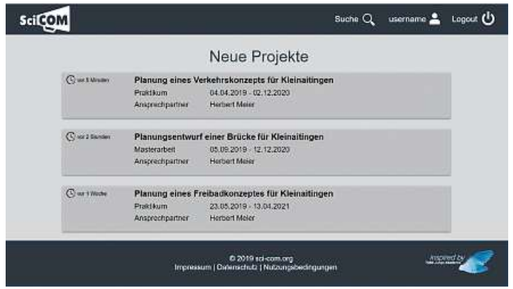

Figure 8: Homescreen

As a design basis of our platform, we decided to adhere to TUM's official corporate design guidelines. Therefore, Arial regular was used as the main font (Technische Universität München 2019a). The color scheme was based on official primary and secondary color palettes as well as accent colors (Technische Universität München 2019b). To ensure satisfactory visibility and readability of site elements and text (especially for elderly users), color contrasts were tested and adapted using an online contrast checker tool. Fig. 7-10 present the current version of the design for selected sites.

4.2.3 Implementation

A student assistant was hired on an eight-hour (weekly) contract basis based on his proven experience in web development. Regular exchanges were made with the assistant by communicating our desired functionalities and testing them thoroughly once implemented. This approach allowed for the initial identification of bugs. Further bugs were identified during the alpha test, described in the following section.

Figure 9: Student profile page

Figure 10: About us page

4.3 Alpha Testing of the platform

4.3.1 Results

4.3.1.1 Thinking Aloud

Several usability issues could be identified during the thinking aloud session. For the registration, these included confusion about the two separate registration buttons for politicians and students, the lack of password verification, the login button being too small, and irritation about the pop-up window not closing after successful registration. Politicians criticized the process of creating a project, finding it unclear what sort of input and which input format various input fields in the project creation form required. The process of selecting an applicant to work on a project was also deemed confusing due to the complex navigation through several mislabeled and obsolete buttons and important information not being displayed on students' profiles. The access to those profiles also posed problems as clickable areas were not marked accordingly. Furthermore, the politicians suggested that one's own projects be included on one's profile page, which should also serve as home screen. The search functionality was perceived as unintuitive, as only a person's username but not their actual name yielded results. Moreover, a combined search for projects, students, and politicians, ideally providing suggestions via autocomplete, was advocated. Other general criticism from politicians included objects being too inconspicuous and buttons being labeled incorrectly or not precisely enough.

Among the student participants, the issue of not understanding what kind of input certain input fields required occurred again when searching for a project. They also stated that there were too many input fields and found fault with the list of results which would not include similar or related results. The navigation caused problems for the participants due to the lack of a "back" button. Like the politicians, they experienced uncertainty whether objects allowed for interaction and, if so, with which areas of the objects. While not a usability issue, it is nevertheless noteworthy that students voiced doubts that the required information for an application would suffice for politicians to make an educated decision about which applicant would be most suitable for the position. More specific information, possibly including a letter of motivation, would be necessary. Like the politicians, the students at first perceived their profile page as the home screen. The difference between the two was unclear. Therefore, they suggested merging the home screen and the profile page. Finally, the students criticized the fact that there was little information displayed on the profile page and that it was unclear who else could view this information.

There were, however, also aspects of the website that earned the participants' commendation. The calendar format which is used to select a time frame for a project was viewed as very positive by both politicians. Students reported that they enjoyed the comprehensive, well-structured overview for projects.

All participants were able to complete all tasks, albeit with some trial and error involved, especially in the task that required students to search for a project.

4.3.1.2 Questionnaire
Students reported hesitance to upload official certificates to the website, with two of the six participants completely against it and the others agreeing to it only with reservations. However, all but one of the participants were willing to upload their CVs. They further agreed that website visitors who are not signed into the application should be limited to viewing projects by their titles. Their preferred method of receiving notifications is via email, and for some additionally within the app itself. Most students preferred a fairly high precision at communal or county level for one's location displayed in the app. Moreover, four of the students would like to be able to search for all other users in the app – a functionality that at the point of the alpha test was only available to politicians.

Like the students, politicians find it useful for users to upload their CVs, prefer notifications via email and in the app, want the location displayed at county level, and want users that are not signed in to only see projects, however, including their full information. Furthermore, they want the option to report students for purposely biased advice.

On a general note, several participants, both among the students and the politicians, stated that they would favor a system that grants the users freedom to apply privacy and functional settings as they see fit.

4.3.1.3 SUS
The overall SUS Score (M = 72.50, SD = 8.86) indicates a "good" score according to Bangor, Kortum, and Miller (2009) whose benchmark allows for a classification of SUS scores on an adjective rating scale as seen in Fig. 11. It also shows that the system's usability is considered acceptable. Notably, the usability was rated similarly among politicians (M = 73.75, SD = 8.84) and students (M = 72.08, SD = 9.67).

4.3.2 Discussion
4.3.2.1 Summary and Implications for the SciCom Application
The SUS scores indicate adequate usability for an early stage prototype but also call for improvements in order to achieve excellent usability. These results are in accordance with the feedback gathered during the thinking aloud. The participants completed all tasks without many unnecessary steps, but they reported being confused and uncertain about what they should do along the way. The most frequently mentioned problems were related to the design of the application, such as objects being too inconspicuous or mislabeled, the top-level navigation, and the lack of clarity regarding required input and input format. Most of the usability issues detailed above can be addressed by increasing the salience, i.e. the visual noticeability, of relevant objects by increasing their size or changing their colors. Another possible way is improving the perceived affordances of the objects, that is whether a user perceives that an action is possible or not possible respectively, thus whether an object affords an interaction (Norman 1988). Some of the usability issues, however, require a restructuring of the website, including the navigation bar, the sequence of pages through which a user can or must navigate, as well as the order of objects within the page itself. In particular, the fact that the users automatically perceived their profile page as the home screen needs to be addressed. By changing the site structure to match users' expectations, the website allows for an efficient use. This is not only a key aspect of the ISO definition of usability (see Section 3) but also emerged as critical for local politicians,

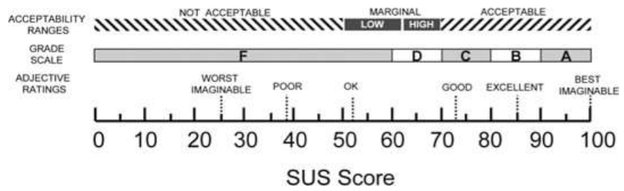

Figure 11: Classification of SUS scores on an acceptability scale, a grade scale, and an adjective rating scale. Reprinted from "Determining what individual SUS scores mean: adding an adjective rating scale," by Bangor, A., Kortum, P., Miller, J., 2009, Journal of Usability Studies, 4 (3): 114–123.

who are under tight time constraints in their voluntary political work. Efficiency will further be fostered by ensuring adherence to a consistent design that follows known standards.

Finally, the proposed privacy concepts for the application are in accordance with the preferences the participants indicated in the questionnaire and can therefore be implemented as intended.

4.3.2.2 Limitations
Regarding the above results for the alpha test, a few limitations must be taken into consideration. Firstly, the thinking aloud method, notwithstanding its many advantages, also poses methodological detriments. The constant monologue in a thinking aloud study creates an unnatural situation for the participant. Some people also tend to hold back thoughts in attempt not to appear slow on the uptake to the experimenter, leading to a loss of potentially valuable information. Moreover, participants can easily be biased by interposed questions. Especially inexperienced experimenters may unintentionally influence a participant's responses and opinions (Nielsen 2012). Another limitation lies in the small number of participants. A general recommendation for thinking aloud usability studies suggests a sample size of five participants. This recommendation is based on Nielsen's (1994) findings that five test subjects are on average able to identify 81% of usability problems present in a software. In the alpha test, six students participated who according to Nielsen (1994) are expected to find 86% of usability issues. However, only two politicians took part in the study who are estimated to identify only 49% of all usability problems. Nonetheless, sufficient information could be gathered even with such a small sample to allow for reasonable changes to the SciCom application.

The final limitation that must be taken into consideration when interpreting the results of the alpha test is the demographic composition of the sample, which can only be described as extremely homogeneous both in terms of gender and age. This might limit the generalizability of the results as research suggests that men and women may have different preferences for website design (Moss, Gunn, and Heller 2006). More problematically, older users have been shown to exhibit lower performance when interacting with websites than younger users, which can be attributed to the inevitable cognitive decline accompanying high age (e.g. Chadwick-Dias, McNulty, and Tullis 2003; Romano Bergstrom, Olmsted-Hawala, and Jans 2013; Wagner, Hassanein, and Head 2014). Thus, their usability requirements differ from younger people such as the participants in the alpha test. Although the preliminary results from the alpha test provide helpful recommendations for improvements to the SciCom application, a second study involving older participants is essential to guarantee adequate usability for all target groups.

5. Summary and future goals

This section provides a summary of the project to this date and touches upon future work, including a "beta test" of the website before the final version is launched at a kick-off event.

5.1 Summary

During our project we conducted several interviews with local politicians to identify problems regarding policy advice. In these interviews, we found that policy advice was seen as necessary but both time-consuming and financially challenging, especially at the local political level. When asking students, we found that they would like to get involved and give advice to local politicians on issues within their field of study. They would also be willing to work on topics related to local political issues on a pro-bono basis. From this empirical input, we developed an application with the goal of linking politicians and students. With the application, politicians can advertise their questions and the subjects to be investigated, and students can register to get in touch. In order to improve the usability of the application, we performed tests with potential users and iteratively optimized the app. With the current state of the application, it is possible for both politicians and students to exchange their expertise and make a difference at the local level.

5.2 Future goals

5.2.1 Future Research
Following the iterative approach of the user-centered design process, future testing is indispensable to optimize existing features and add new useful software features. A beta test to evaluate the changes made to the SciCom application following the alpha test is already planned. Again, a thinking aloud experiment will be performed as the qualitative data it will provide is expected to offer valuable insights at this development stage. In addition to the SUS, the User Experience Questionnaire (UEQ; Laugwitz, Schrepp, and Held 2018) will be administered. This 26-item

questionnaire is composed of six subscales that, unlike the SUS, not only measure system usability but also user experience. As we are aiming to design a software that not only allows users to achieve their goals but also creates a pleasurable experience in the process, the additional insights the UEQ will provide will be very helpful for future design decisions.

Given the limitations regarding the participants in the alpha test (see Section 4.3.2.2), the beta test sample must comprise older users among the politicians and display an equal gender distribution among both user groups. A larger sample size than in the alpha test, especially for the politicians, is also desirable.

5.2.2 Kick-off event

Following the beta test, the website will be further improved with bug-fixes, design and functionality upgrades, and new features where requested. A kick-off event is envisioned where the website will be launched. Local politicians, university students and educational staff will be invited in order to introduce them to the concept of the platform and to achieve successful proliferation. ■

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Self Reflection

Looking back at our time at the TUM: Junge Akademie, we realized how lucky we were to have had the chance to work together in a diverse team. Our different academic backgrounds and nationalities not only inspired interesting and educational conversations during our spare time but also shaped our work on our project. We were regularly faced with many distinct viewpoints and ideas about problems and questions throughout our project. It was an incredibly valuable experience to learn about the different approaches other disciplines take in the scientific research process, and one that we are certain will come in handy as we one day progress to the working world or into an academic career.

Another aspect of our time together that we truly appreciate was the great team work. Every team member was highly engaged in discussions during our team meetings, and we made it a point to make sure everyone felt that their opinions mattered. To keep everyone involved, we followed our plan of action to have weekly meetings to discuss the topic and distribute tasks. The meetings had a rotating system for a moderator and a scribe for writing the minutes. In order to really come together as a team, we further made sure to also have fun and enjoy our time together. Sampling Indian snacks, participating in a pub quiz and beating an escape room were just a few of the great moments we were able to share.

However, that does not mean that we did not put effort and time into our project. At the beginning, we spent many meetings trying identify the right research topic. During this process, our mentors provided us with valuable insights and encouraged us to think big. It was thanks to their input that we eventually decided on investigating the differences between policies that became legislation and the expert scientific opinion on the topic, as well as the interplay of these things with public opinion. Herein, we looked at various socially relevant and controversial topics such as the usage of genetically modified organisms, autonomous driving, and nuclear energy, amongst others. Although the work in the task forces we created to tackle these different topics was productive and gave us the opportunity to learn about scientific matters beyond our courses of study, after a few months we came to realize that our research idea was neither methodologically sound nor inspiring to us. Having a topic with which we ultimately did not connect caused an all-time low in motivation for the team.

After some serious discussions involving all team members, we decided to shift towards a more hands-on outcome with higher social impact: The development of a platform for policy advice connecting scientifically literate people with politicians. Therefore, we kept the overall topic of policy advice but changed the outcome to something we were more passionate about. Making such a big change at a fairly late point was admittedly scary but, after all, we ended up being very glad to have taken this step, as we were once again highly motivated and excited to follow a common vision. Experiencing first-hand that taking the risk of starting over leads to better results than continuing to push on when you have hit a dead end served as a valuable life-lesson to all of us. One regret we have, however, was consulting with our mentors only after the decision was taken and the project direction changed. We realized that we would have benefited from their advice and guidance while planning our new project.

Learning in our exploratory interviews with politicians in the local Munich area and with current university students that there is in fact the need for such an application, encouraged us to continue in this direction. For the development of the website we invented our “SciComathons” which, organized as a Hackathon, were very helpful in making fast progress. It was thrilling to work together in such an efficient manner, and being able to watch our vision take shape. At this point, the first test of our website with students and politicians has been completed, and we are working hard on implementing all the improvements necessary for the SciCom website to become a success. We are excited about the launch of our website, and even more for it to have the positive impact on the quality of political decisions that we envisioned.

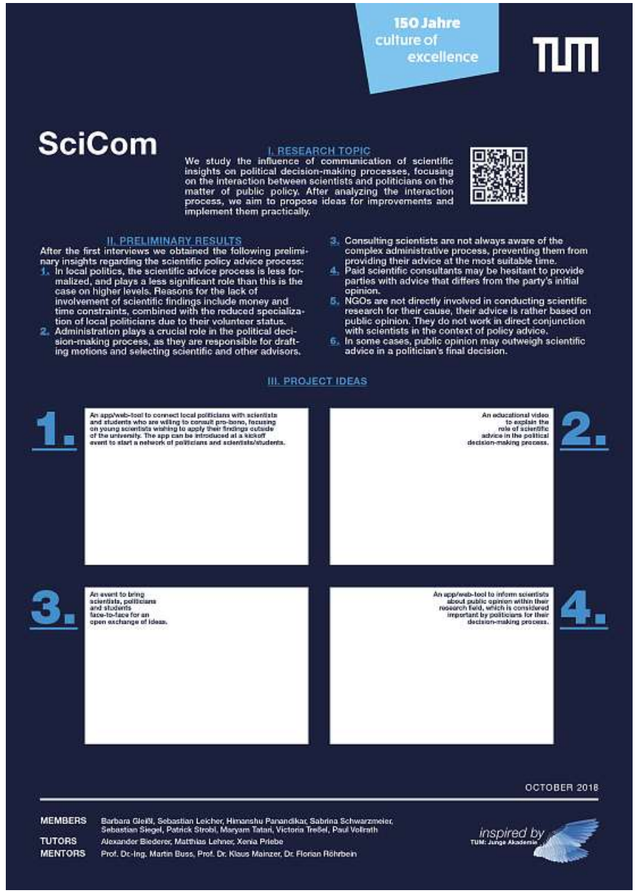
We would like to thank everyone who contributed to our project, beginning with our various interview partners, both when defining our topic and within the scope of alpha and beta tests of our app. Students participating in our survey helped provide us with quantitative data on which to base our ideas and improvements. Our industrious programmer, Travis Tang, receives our thanks for turning our vision of a platform into reality. Our mentors, Prof. Buss, Prof. Mainzer, and Dr. Röhrbein gave us invaluable feedback, advice, as well as useful contacts. Our special thanks go to our tutors, Alexander Biederer, Matthias Lehner, and Xenia Priebe, who went out of their way to attend our meetings and brought us back on track whenever we went off on one of our many tangents. They believed in us even when we became dispirited and guided us out of our trough of disillusionment. Last but not least, we are grateful to Peter Finger and Maria Hannecker for facilitating our project and answering our many queries with patience and kindness.

Our posters serve as documentation of our team's evolution as well as the development of our project idea. In the following, we reflect on each of the posters and seek to guide the reader through our key project milestones.

POSTER 1: Our first task as a team was to narrow down our very broad overarching topic of "Truth and Lies in the Communication of Scientific Insights." In our initial research and team discussions, we decided to focus on the process of scientific advice, with the goal of finding areas for improvement. Our project would then ideally provide an applicable and valuable solution.

To gain a deeper understanding of the field of scientific advice, we conducted literature reviews and consulted our mentors, who had themselves given scientific advice in the past. The diagram shown on the poster depicts the main stakeholders of the process as well as their interactions. Bias is introduced in various of these interactions, impacting political decisions and ultimately influencing citizens' lives. Having gained an initial appreciation for the complexity of our chosen field, we decided to keep our research question broad and focus our future project thinking within it.

Another crucial aspect addressed by the poster is our team structure. We realized early on that our team's diversity in terms of nationality and disciplines was one of our greatest assets. A lot of time was therefore dedicated to better understanding different perspectives within our team and making the best possible use of each member's unique skill set. Our rotary system for moderation and minute-taking was well-established at this point, and would remain so for the remainder of the project's duration. ■



POSTER 2: Between the first poster and the next, we had identified various project ideas, many of which turned out to be a cul-de-sac. Therefore, we opted for an entirely different approach for Poster 2. Given that it was to be presented at Year 2017/I's symposium, we decided to make this poster interactive, allowing participants to contribute to our ideas.

We had conducted interviews with various local politicians at this point, which strengthened our understanding of the political advice process as well as the problems it entails. Nevertheless, deriving a distinct, achievable project idea from this proved challenging. As a first step, we decided to focus only on the interaction between politicians and scientists. Next, through a series of brainstorming sessions, we derived four possible project ideas, all of which were appealing to us but needed focus. These were: a tool to connect local politicians and students; an educational video; an event-facilitating exchange between politicians and scientists/students; and a tool to inform scientists on public opinion within their research field.

Throughout the symposium, participants voted for their favorite project idea and contributed thoughts on post-its as well as through discussions. This allowed us to gain an outside perspective on our ideas and progress. Though our team is highly diverse in many aspects, our thought patterns tended to diverge, creating cycles that slowed us down and drained our motivation. By involving outside opinions, we were finally able to break through these cycles and decided to create an online platform connecting local politicians with students willing to consult them, to be launched with a kick-off event. ■

POSTER 3: We worked diligently on our platform idea and conducted another round of interviews with politicians as well as a survey with students. From this research, we were able to derive key functionalities that our platform should offer in order to cover applicable use cases. Both students and politicians seemed keen on our idea of connecting them.

We introduced our hackathon-based “SciComathons”, where we took an evening to sit together and create the first basic prototype of the platform, complete with all key functionalities. The results are shown by the images on the lower right side of the poster. The SciComathon format worked well for us, and has since recurringly been used when fast progress was required.

With our project taking shape, we hired a student assistant to help us program the website. Determined to fulfill scientific requirements in further implementation, we planned to use alpha and beta tests to iteratively test and improve our platform ■

POSTER 4: Fulfilling the goals we set within Poster 3, our base functionalities were implemented leading up to Poster 4. The first prototype of the website had been tested within alpha tests, giving us key areas to work on as a next step. Furthermore, we decided to fully redesign our website based on the TUM style guide. All changes and adjustments will be verified in a beta test, after which we aim to finalize the website and officially launch it.

An important aspect which we discussed within our team was the sustainability of our project, i.e. how it should develop once our official project time at the TUM: Junge Akademie was over. The two main options we decided on was either to offer the finished platform to a younger generation of teams, giving them a fully functional tool which they can change or extend; or, alternatively, to encourage the setting up of a task force within the academy, dedicated solely to maintaining the platform.

As our project’s final phase, we plan to officially launch our finalized platform within a kick-off event, to take place at the University. This will aid proliferation and ensure a smooth launch. ■

Symposium of the Year 2017/II

Symposium

Starting something new is always a difficult task. Last year´s scholarship holders were the first to replace the usual annual conference with the format of a scientific symposium. Learning from their experiences, the year 2017/II tried to improve the format and established the symposium as a recognisable event happening every year at TUM. This year´s symposium Wahrheit 2.0 wanted to shed light upon the topic of truth and lies in a journalistic, political and social context.

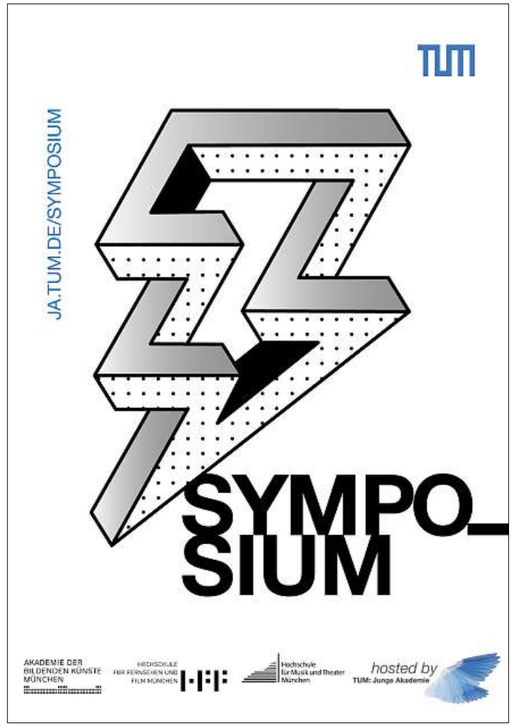
After an introduction from Prof. Dr.-Ing. Gerhard Müller, Prof. Dr. Thomas Hanitzsch from LMU started the evening with his keynote. As a former journalist he outlined the overall development of journalism in Germany and asked questions about the credibility of journalists. Furthermore, he presented and discussed the results of his newest research study on this topic.

Subsequently, the focus was shifted towards the projects of the year of TUM: Junge Akademie. Introduced by a short movie, the different student groups of the year 2017/II presented their final research results in four pitches. These pitches closed the first part of the symposium and lead into an active break. During this break, the participants of the symposium were encouraged to join in depth discussions about the finalised projects of year 2019.

The second part of the symposium was opened by Prof. Dr. Eugénia da Conceição-Heldt from the TUM School of Governance. Her keynote *Accountability in the Digital Age* took a closer look at the political spectrum of the topic truth and lies.

Despite the seriousness of the matter, the Austrian entertainer Florian Scheuba concluded the evening on a rather light-hearted note and reminded us all, that there is more to life than black and white discussions about truth and lies.

Veronika Bauer and Thomas Just




WAHRHE


WAHRHEIT 2.0


WAHRHEIT 2.0

Projects in Flow

inspired by
TUM: Junge Akademie

The “Cloverleaf” initiative for Bicycle Service Stations at TUM is completed!

We are proud and happy to announce that, after the first installation of the three Bicycle Service Stations at TUM campus Garching in March 2017, people at another three campuses of TUM are now also able to benefit from the idea of team “TUM Bike-Sharing.”

With the start of summer 2019, TUM students and employees can now realize basic maintenance and repairs to their bicycles directly on the campuses of Munich City, Olympia-Park and Freising-Weihenstephan. With a sturdy air pump, it is easy to correct tire pressures. If screws have loosened, various tools are available to stabilize them again. As a result, everyone now benefits from the bicycle service stations and TUM can be seen to be promoting individual and sustainable CO2-free mobility in Munich, giving further encouragement to students and employees to use their bikes for daily transportation.

This project was enabled through close cooperation with the real estate management team of the central department of TUM. The funding was made possible by the university management board. In particular, Ms. Isabell Thömes (Garching & Olympiapark), Ms. Tanja Jovanovic (Munich City) and Mr. Martin Flad (Freising-Weihenstephan) from the real estate management of TUM contributed to the project’s successful implementation. In coordination with former scholarship holders and the office of the TUM: Junge Akademie, they coordinated the location planning, ordered the bicycle service station kits and commissioned their assembly.

The original goal of the project group during the period 2012 until 2013 was the development and installation of a bike-sharing system that would substantially improve the mobility of those students and employees who spend a good deal of their daily time at the campuses of TUM. Since that time, MVG, the Munich Public Transport Company, have taken over the idea of the team and have installed the bike-sharing system not only in Munich but also in the city of Garching and at additional places on the Garching Campus, too.

We wish you all the best and happy cycling on all your bike trips in and around Munich and Garching!

Project Work within the Team of “TUM Bike-Sharing”

In 2012, sixteen students from nine different faculties of the TUM joined the team of TUM Bike-Sharing. Supervised by two postgraduate TUM students, Martin Rothbucher and Sebastian Schuon, as well by Prof. Dr.-Ing. Klaus Diepold as project mentor, the team worked within the period of one and a half years on the development of the bike-sharing system. The interdisciplinary – and quite often intense – exchange between the students during the group meetings led to highly productive discussions. The process of exploring different concepts generated a colorful variety of ideas and possible project directions. All the participants were able to gain valuable experience in the exchange of ideas and opinions. Moreover, during the period of intense project work on the TUM Bicycle Service Stations, the project group developed a profound sense of team-spirit. ■

TUM Campus run 2019

On Wednesday, 5.6.2019 it was time once again. Already the evening before, it was clear that the TUM: Junge Akademie is once again inviting to the largest in-house sports event at TUM. The team of the student representation had set up the impressive start and finish gate of the 7th TUM campus run at sunset on Tuesday evening.

As in the previous year, over 1,500 participants were able to attend. The demand was so high that six weeks before the race, all tickets were sold out. This was a tremendous success for the organizing team, which spent over five months preparing the campus run.

This year, four PhD students and three students from diverse fields of study of TUM teamed up with the TUM:JA office team for the run. Five of them were participants in last year's run and had volunteered to participate in the organization, as well as a representative of the student council from the department of mechanical engineering and the leader of the Taskforce Event of TUM: Junge Akademie. (See table)

The day of the run promised to become hot – and it got very hot. Already in the morning the temperature exceeded the 25°C. The team prepared everything with the help of many dozens of volunteers. One third of all participants were women, one third registered for the 5.5 km and two thirds for the 11 km. More than 130 different teams took up the challenge, more than 70 of them from the chairs of all faculties of TUM.

This time the lane started in front of the Leibniz Supercomputing Centre of the Bavarian Academy of Science and Humanities. Once started, the runners head west, almost until the fire station of TUM. There they crossed and passed by the central library storage. From there they returned to the central area of the campus – Lichtenbergstraße, Boltzmannstraße and Ludwig-Prandtl-Straße, with many crossings inbetween. The course was set in a way that enabled the participants to see a big part of the campus itself, and the people who have never been out at the campus before, learnt a lot about TUM.

The winning times were outstanding despite the very high temperature. The fastest man over the 5.5 km finished in less than 19 minutes, the fastest woman over the same distance in just under 24 minutes. All information about the winners in the 10 categories can be found at www.ja.tum.de/campuslauf.

Next year, TUM: Junge Akademie celebrates its 10th anniversary and we have planned something special. We consider developing the run further, as the demand for this year has been enormous. We have 1,500 runners and the tickets have already been sold out six weeks before the run. Therefore we think: There is still a lot of potential.

Acknowledgment

The TUM Campus Run has been organized by TUM: Junge Akademie since 2013 on Campus Garching for the entire network of the Technical University of Munich. It goes back to the idea of the student research team, runTUMfit of TUM: Junge Akademie. They hypothesized that simple methods could improve the fitness of TUM staff. After almost a hundred people took part in the first rounds, the format grew quickly. Already at the fourth round in 2016 there were 450, in 2017 more than 1,000 and since last year more than 1,500 TUMlings. The staff of the TUM: Junge Akademie office, Maria Hannecker and Peter Finger take responsibility for and coordinate the event, each year with a small but highly motivated group of volunteers from the academy and beyond. In addition, many other people and institutions are involved, whom we would like to thank:

TUM CEO Hans Pongratz for the award ceremony and Christoph Gschnaidtner for the wonderful moderation, the colleagues of the TUM "Immobilienmanagement", the TUM Management Board for supporting the idea and financing the shirts for all runners, the staff of LRZ for their hospitality, the TUM post office and logistic support, the team of Caverion – facility management, the TUM fire fighters, the TUM shop for sponsoring, the AUTUM for manufacturing the cups, the team of ProLehre Medienproduktion for the medial covering, the professional support given by the "event team" of student council, the deans of the department of Informatics, Mathematics, Mechanical Engineering and of the Graduate School of Bioengineering for opening their roads, the Corporate Communications Center of TUM, the municipality of the city of Garching and the local police, the para medical teams of BRK and all volunteers who were helping on the day of the run and many others! Thanks for the brilliant idea and to all people involved – see you next year!

Luis Arévalo Villa (student council)	Student Mechanical Engineering
Isabel Aschenbrenner	PhD student Biochemistry
Saskia Hutschenreiter (Taskforce Event)	Student TUM School of Management
Jakob Kempter	Student Informatics
Stephanie Kulpe	PhD student Physics
Daniel Kucevic	PhD student Electrical and Computer Engineering
Frieder Loch	PhD student Mechanical Engineering

Prof. Dr. Filip Mess
(Winner of the Professors-Challenge)

“It was incredibly beautiful on the course, as there was huge consent, especially here on the campus. Of course, it was also really hot on the course. However, it was a great experience, so many runners, so much support at the run as a whole, really brilliant! It is great, what happens here every year.”

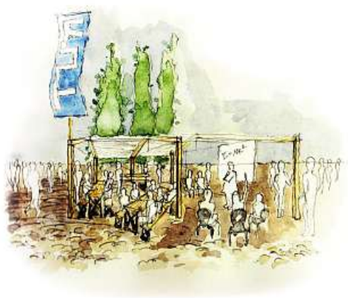
Anindya Sundar Paul
(Master student informatics at TUM)

“This was my first running event. Not only that, I had never run more than 10 km at a time. So this was also my first 11 km run. The medal will always remain close to my heart!”

Charalampos Magdalinos
(Master student informatics at TUM)

“I found the whole organization very good. It was amazing running with my professors and fellow students! An unforgettable experience in my last semester!”

StreetScience@Streetlife



University research and its application in everyday life is a cornerstone of our society. In order to strengthen public confidence in science, we set ourselves the goal of bringing knowledge of science and, above all, enthusiasm for science to all sections of the population. To this end, we organized an event in which scientists could give a first-hand account of their everyday life and their research. This communication focused on the direct dialogue between presenters and visitors to create a personal added value for both sides. To achieve this goal, we organized a booth at the Streetlife Festival Munich. Due to the great popularity of the festival, it provides a perfect framework for entering into discourse with different groups of people. In addition, the non-science-related public venue attracts visitors who do not expect to encounter scientists talking about their work.

Public Engagement

From the United Kingdom the concept of Public Engagement (PE) has spread around the world and, with increasing proliferation, variations of the term have occurred. As we seek to encompass a wide range of benefits, the definition of the National Coordinating Centre for Public Engagement (NCCP) fits our purpose best:

"Public engagement describes the myriad of ways in which the activity and benefits of higher education and research can be shared with the public. Engagement is by definition a two-way process, involving interaction and listening, with the goal of generating mutual benefit."

One important aspect of the above definition is the focus on mutual benefit which has been proven to have positive effects on all parties involved

Motivation

We planned to communicate science in a non-science-related public venue because of the advantages of attracting visitors who do not expect to encounter scientists talking about their work. For one, up-front advertising is not necessary to attract visitors. Secondly, the pass-by visitors that finally attended StreetScience took this decision without having to drive to a specific science communication venue. For this reason, they might be different from visitors to other science communication venues and not open to the influence of those existing venues. Both reasons make public events the ideal place to mutually benefit visitors and scientists, when scientists dedicate themselves to Public Engagement.

The booth

To offer a wide variety of possibilities on how to approach science, the event was divided into three parts. First, we invited scientists from TUM to give talks about their work and the impact of that work on society. Thanks to the diverse topics covered by TUM we were able to present themes from robotics to microbiology to politics and more. Second, we asked student groups to exhibit their work and to answer upcoming questions. Third, we offered hands-on experiences, like building mathematical bodies or accomplishing small experiments, to discover basic principles of science, especially for children (though we soon realised that their parents were often even more interested!).

Past Events

StreetScience took place twice, in May and September of 2018, embedded into the Streetlife festival. The common positive feedback from the visitors, as well as the speakers, showed that the tested structure is employable and has an impact. Our initial hypothesis, that we address the sociodemographic average, was falsified. Nevertheless, we were able to show that our format offers a relevant complement to existing science communication venues in Munich. First of all, many visitors reported attending no other comparable venues. Second, we were especially successful in addressing a younger audience than the Münchner Wissenschaftstage. Furthermore, we evaluated the number of pass-by visitors and publicity-influenced visitors and were able to demonstrate independence from advertising as a principal means of attracting a significantly large audience.

Impressions

The Projects Future
In line with our belief that science should be communicated broadly by many scientists, we wanted our initiative to be carried on. This goal to establish StreetScience as an ongoing format supported and promoted by TUM has been achieved: The event will be carried on by the TUM: Junge Akademie and will take place for the third time from May 25th to 26th, 2019.

Qualitative statements of visitors…

"Thank you so much! For the first time it was fun to study mathematics."

"I think this idea is great, so much so that I'm here for the second time today. Interesting presentations – Thank you."

"I think it's great that the TUM brings their hands-on research closer to people, not just in the lab, where ordinary people never get! Keep it up."

…and speakers

"This is certainly a one-time thing, that scientists go to the streets and stand at the front door and say: 'Hello people, this is who we are!'"

Prof. Dr. Edgar Biemer, Emeritus of Excellence

"It's wonderful to have the general public to be curious about what we are doing and it's actually our duty to communicate it to the general public."

Prof. Dr. Gordon Cheng, Director Chair for Cognitive Systems

Buddies for Refugees

Buddy for Refugees in a nutshell

- 6 semesters: summer 2015 until summer 2018
- 537 refugees participated
- 640 students and employees of TUM engaged as Buddy
- Capacitation program: appication trainings, intercultural workshops
- Beside program: sports, cooking together, lecture series, career events
- Friendship – tolerance – understanding – integration – academic education

Facts and figures about the Buddies

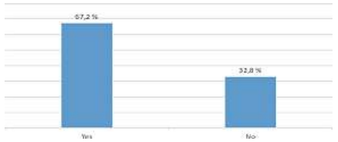
General information

640[1] Volunteers from the TUM have been working together during the six semesters as buddies, many of them over several semesters.

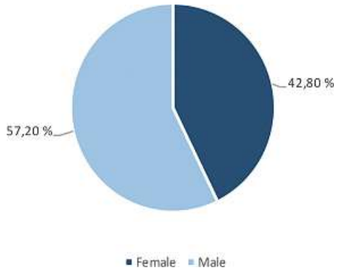
1 14 with double allocation within one semester, thus 625 individuals active as buddies

participation period	number
one semester	356
two semesters	186
three semesters	80
four semesters	15
five semesters	3
	640

About 2/3 of the buddies are still in contact with the assigned guest auditor (see graph):



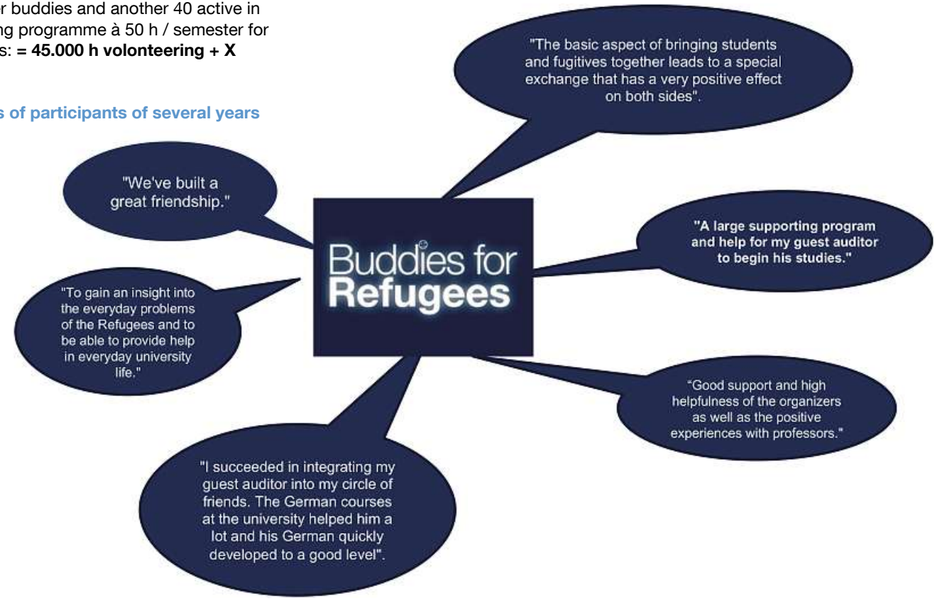
Gender of the Buddies



Titles of the lecture series: "Insights into Migration"

600 volunteer buddies and another 40 active in the supporting programme à 50 h / semester for six semesters: **= 45.000 h volonteering + X**

Testimonials of participants of several years



Projects in Prospect 2019

Africast

With the Africa initiative that was launched last year, the Technical University of Munich (TUM) aims to build and promote long-term collaboration in the fields of education, research and entrepreneurship with partners from the African continent. The objectives are to work together with partners on location and to set examples in terms of promoting the sustainable development of the continent. One area of focus is the country Ghana, where TUM has built up a partnership with the Kwame Nkrumah University of Science and Technology (KNUST) located in the city Kumasi. Ghana is among the fastest growing economies worldwide and it remains interesting to see how the partnership with the university will develop in the next years.

Unfortunately, only a few individuals seem to be informed about the collaboration between TUM and KNUST. The goal of our project Africast is to raise awareness of this cooperation between the two universities and maybe even to strengthen it. With the realization of a podcast series, we intend to inform the public about the ongoing projects in the context of the scientific collaboration as well as the multiple differences and similarities between the two continents concerning the life of students.

Concept of the Podcast Series

Expertise, a sense of humor and spontaneity are our guidelines for the cross-cultural interviews between us, four students from TUM, and students or professors from KNUST in Ghana.

Starting with a general overview of Ghana and the life of young academics at KNUST in the first podcast, we will discuss specific projects in the following, for instance waste management in Ghana. As we do not have a profound knowledge about Ghana and its cultural characteristics, we want to emphasize that we are always interested in a respectful dialog whose purpose is not to evaluate or expose anyone or anything. We see ourselves as neutral reporters who link general information with first-hand experience reports and make them accessible to a broad public. One may be tempted to talk only about differences between the two continents, but our hope is also to raise public awareness of and interest in possibly unexpected similarities.

Each of the interviews will last about 15 minutes and for reasons of authenticity, we will keep editing to a minimum. In this modern and fast-paced world, we consider this as the perfect time frame for conveying a message without overloading the listeners with too much information. In order to achieve the best possible quality, we will conduct the interviews in a professional dubbing studio with the support of a sound engineer. In total, we plan to organize three individual studio sessions producing six voice files that deal content-wise with different topics. Starting in June, we plan to publish a new podcast episode monthly until the end of 2019.

The podcast series will be published free of charge via the online video platform YouTube. When the time comes, we kindly invite everyone to listen to the podcast series and spread it virally.

Building Relationships

It is essential for the project Africast to build a network of contacts with students, professors and researchers from Ghana in order to obtain their input about the country, the university and common projects.

When an academic delegation from KNUST visited TUM in March 2019, a first meeting was set up between the team Africast and professors from Ghana. It served to present the project idea and collect constructive feedback. The delegates were very interested and some of them may participate as future podcast guests. The Dean of International Students offered to be a reference person at KNUST and suggested that we visit Ghana as soon as possible. Through such a visit, the team members would be able to gain a deeper understanding of the country and its people. We are therefore currently trying to secure financial funding for a trip of five days in August 2019.

Another important partner for the project team is the Ghana Students Union in Munich. In two consecutive meetings, we were able to pitch the project idea of Africast to a group of Ghanaian students. As a result, we gathered helpful contacts of students from Ghana who are currently in Germany and interested in joining the podcast series as speakers. Two of them have already confirmed that they will join the first podcast recording session in May.

Research Project

The first step has thus been taken to try to promote an increased awareness of the cooperation with KNUST. To evaluate the impact of our project and to improve our podcast series, we have developed the following research question that should offer revealing insights: *"To what extent does the podcast series Africast enhance knowledge and interest relating to the collaboration between TUM and KNUST among students at TUM?"*

We consider the students of TUM as the most interesting subgroup of our audience with respect to understanding the overall impact of our project and for the purposes of drawing our final conclusions.

We intend to gather the personal responses of around three hundred TUM students who will be asked to fill out an online survey after listening to the podcasts. With the help of the collected data, we want to investigate if the podcast series is the adequate format to successfully increase awareness about the collaboration between TUM and KNUST. We may then complement the quantitative data with qualitative expert interviews to gain even further insights. ■

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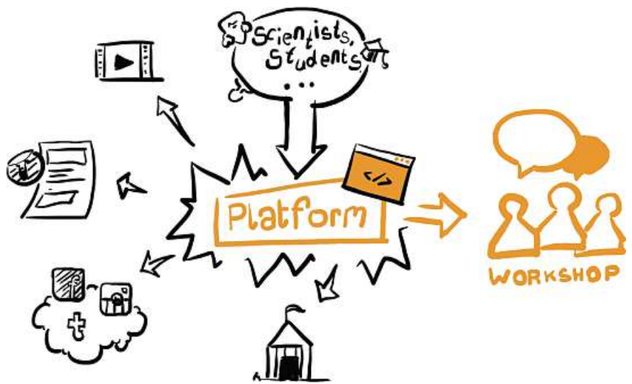
Digital Enlightenment

Background

In a world where technologies invade homes and give access to all kinds of knowledge and information, where millions of scientists are working in diverse fields and publishing millions of articles, where almost 24000 institutions of higher education worldwide are training students in thousands of disciplines, and where, above all, education is recognized as a basic human right, there are several questions which humanity needs to ponder on. Two important such questions are: Why does the gap keep growing between science and the population at large? And how can we ensure that, in the future, science will be able to exert a greater impact on people's lives and behaviors?

These questions initiated our first discussions. The primary research led us to the key spect of our project which is Science Communication. We took our time in the first phase to research the academic work done



in this field and after long debates we decided that within the framework of this project, we should engage with our own experience of science communication by implementing some of the theories and aspects we have read about. The outcomes of this engagement will be the basis for our research later.

Why Digital Enlightenment?

Ever since the inception of the Internet, virtual communication and resource sharing have brought one much comfort and convenience. However, in recent years, data scandals of giant companies such as Facebook and Google have cast doubts on personal data protection and cyber security. Despite the scale and seriousness of the issue, we have noted a lack of basic knowledge and awareness among the general public. To address this gap, we decided that Cybersecurity should be the object of our sciencecommunication engagement and we kickstarted our project "Digital enlightenment".

Project Idea

Our goal is to communicate scientific knowledge about Cybersecurity to young people (university or high-school students) using diverse media and actions.

More concretely, we will develop an online platform called "Digital Enlightenment". This platform will be the framework for our on- and off-online actions. It will be as well our communication tool to reach our target group and gain more visibility. In general, through "Digital Enlightenment", we hope to generate awareness, build a community and launch events to raise awareness about Cybersecurity.

The general topic is already decided but the specifics of the content will be discussed in the next month as shown in the Project Plan. The Project will include a series of events conducted either in High Schools or in Center for Young People (Jugendzentrum) in Munich.

Activities	Time									
Months	April 19	May 19	June 19	July 19	Aug 19	Sep 19	Octo 19	Nove 19	Dec 19	Jan 20
* Bayern School Time						Bayern School Year				
*TUM Vacation Period										
Plan and Research Phase										
Finish project planning										
Research for Platform Content										
Research on Interesting Actions										
- Email Experts										
- Create and send survey										
Project Launch and Execution Phase										
Project KickOff										
Decide on actions and content										
- Contact experts or guests for content										
Contact Schools and Jugendszentrum										
Workshop										
Project Evaluation Phase										
Workshop Evaluation										

Project goals

Within the framework of this project and the planned actions we aim to:

- Introduce the topic of Cybersecurity in scientific terms to the general audience;
- Raise awareness about Cybersecurity among young people by explaining its scientific and technological background and exposing them to a basic scientific knowledge related to the topic;
- Determine factors that have an impact on the efficiency of science communication in the field of Cybersecurity through the analysis of the outcomes of the implemented actions.

Research question

What are the most effective communication strategies to increase young generation's awareness about cybersecurity?

Project Plan

Our preliminary project plan is shown in the following chart. The plan is subject to changes based on our further research and brainstorming results on awareness-raising activities.

Cooperation

Would you like to cooperate with us to raise awareness about cybersecurity among the young?

Send an email to:
dig_enlightenment@ja.tum.de

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EvaluaTUM

Introduction

The overall goal of our project is to improve teaching. Within our project, we focus on the evaluation of lectures as a form of communication between students and lecturers. To approach this task, we have divided our project into three different phases. Firstly, we will conduct a comprehensive situation analysis in which we will research the relevant literature and ask students and lecturers about the evaluation system. Secondly, we will compare the current EvaSys questionnaires. In a third step, we will implement different evaluation methods focussing on identified potentials found while analyzing the current situation. Finally, we will compare these methods in terms of response rate as well as the satisfaction rates of students and lecturers.

Scientific Question

Taking into account the boundary conditions of the TUM system, what sort of methodology can be developed to improve the current feedback instruments for teaching at TUM that will

1. tap the full potential of the evaluation process and
2. address the motivation of students, the benefits for lecturers and the participation rate in lecture evaluation?

First Results: Evaluation at TUM

One first step to determine possible changes is to thoroughly understand the current evaluation system and identify involved instances. A general overview of the evaluation process is shown in figure 1. Our work will mainly focus on the steps shown in the middle row. According to the TUM guidelines, the lecture evaluation is carried out after two-thirds of the semester. The results are planned to be published at the end of the semester, reviewed with the students and analyzed by the evaluation management of TUM. As a consequence, consultancy meetings for lecturers with evaluation results significantly above or below the average are organized.

A second step is to obtain an overview of the students' perspective. Therefore, we carried out a survey among the student representatives of different faculties. The responses clearly show a high degree of variation in how the evaluation process is implemented in different fields of study. One example is the time of evaluation: Most of the faculties evaluate during one of the last lectures, but some after the examination or in the middle of the lecture period. The results of three questions answered by student representatives are depicted in figure 2, taking into account the responses of 11 out of 21 student councils. The proportion of students filling out the evaluation seems to be characterized by a rather large variance, ranging from 3% to 90%. These numbers depend greatly on the type and size of lectures as well as the module level (Bachelor's or Master's level). Nevertheless, one can infer that faculties evaluating with paper have higher response rates than the ones using online evaluation. A similar positive correlation exists between the response rate and the time given by the lecturer to fill out the evaluation questionnaire.

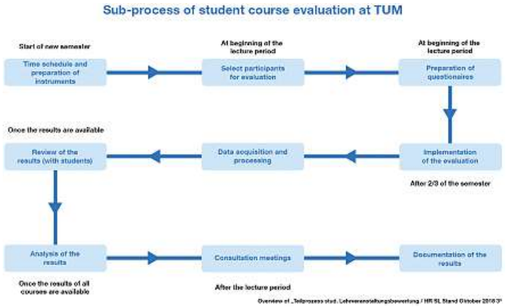

Figure 1 : Overview of evaluation at TUM

Future Plans

After completing the analysis of the current situation, we will try to improve teaching by incorporating what we have discovered into our project. To that end, we have already started to collect some exciting ideas which can be grouped into six subject areas (figure 3):

1. The first area is live evaluation. This would mean that the assessment is more frequent but less comprehensive.
2. In the scope of the evaluation of the student representatives, one important question in particular arose: "Which questions can help the lecturer to improve his or her lessons?" This suggested the idea to us that the questionnaire should be adapted to contain fewer questions but more free-response options.

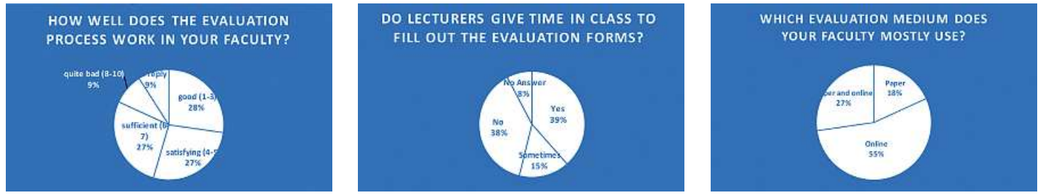

Figure 2: Answers of the student representatives to selected questions of our questionnaire

3. Another point mentioned in this evaluation was the old-fashioned style of EvaSys. To address this problem, we will try to find out if there would be a better acceptance of EvaSys if it had a different design, e.g., including some images.
4. During our research, we also found a document ProLehre, which advises evaluating the lecture after $^2/_3$ of the lecture time. A discussion followed as to whether this point of time could be improved. As a result, we thought about testing the use of different times to evaluate lectures.
5. A further problem in some faculties is the lack of adaptation of the questionnaire to the courses. One possible solution that might address this problem would be to develop modular questionnaires.
6. The sixth approach is concerned with using the unused potential in the interpretation of the results. We thought about comparing the current presentation of the results with an alternative method, such as an interactive tool that can display correlations as well as the numbers and results from the current system.

Current progress

At the moment we are preparing a comprehensive analysis of the current situation concerning the course evaluation at TUM. Therefore, we are comparing the existing questionnaires and are trying to answer, for example, the following questions: How does the type of question influence the result of the survey? How often do questions that are not tailored to the course occur (e.g., questions about a central exercise, but where none exists)? Furthermore, we are analyzing the "teacher survey" which recently took place at TUM. Our goal is to get to know the evaluation process from a different perspective, to establish the right toeholds. Thus, the during winter semester 2019/20 we want to implement and compare different methods for lecture evaluation as a first "test." Consequently, we are researching those methods to achieve the best possible results from our test. ■

Figure 3: Overview of the project ideas

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FRESEARCH

Background:
Scientific advance is often represented in the media as the result of individual geniuses working tirelessly alone until they make their big breakthrough. However, the reality of modern research is often a very different one. Cutting edge scientific work will generally require a multitude of resources, many of which may not be easily accessible to an individual. This certainly includes funding, but additionally comprises specialized equipment, laboratory space, collaboration partners and, last but not least, effective mentoring by established experts in the field.

Conversely, however, these resources alone cannot produce valuable research either. A good idea remains the essential ingredient for any innovation. Thus (a) developing new ideas and (b) matching the people with ideas to the resources they require can be considered a core problem of modern science. We aim to make targeted, local but scalable interventions to meet these challenges.

Goals:
To help connect innovative students with the professors and chairs that can adequately support them in bringing their scientific ideas or interests to fruition. To achieve this, three sub-goals have been defined:

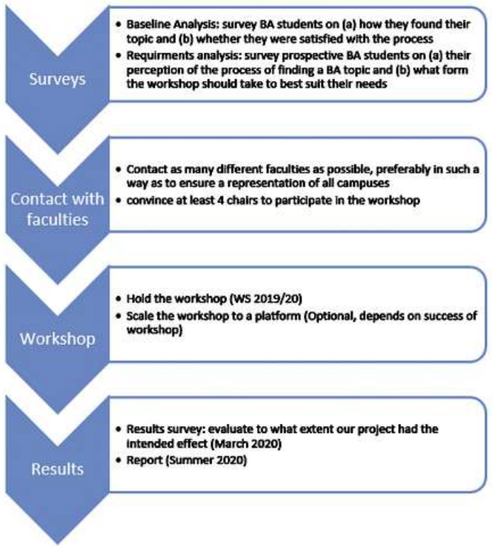
- Firstly, we would like to understand how students approach the task of finding their Bachelor thesis project and to analyze their perception of this process. Do they find it difficult to find a project? Do they want to contribute their own ideas or prefer to simply be given a topic? If the former, what obstacles do they face to (a) formulating their idea and (b) finding a supervisor?
- Secondly, we would like to organize a workshop. The aim of this workshop will be twofold. On the one hand, it should support the creative process of the students, giving them the information and tools necessary to formulate their own ideas for a Bachelor thesis. On the other hand the workshop will also serve as an initial contact point between students and faculty, giving faculty direct access to innovative students.
- Lastly, if the workshop proves successful, we would like to scale it up to become a more comprehensive and durable matching platform

Research Question:
What does a methodology look like to increase the satisfaction of students with their thesis topics.

Hypothesis:
With regard to our research question, we hypothesize that, for students, monetary funding is not the limiting resource, rather getting in touch with the right people like professors, chairs, etc., is the limiting factor. Those people can provide the necessary knowledge and infrastructure in order to realize a proper research project from an original idea. This is why we propose a "Creativity Workshop" in order to generate witty ideas for research projects and a platform to connect these engaged students with the right chairs to support them in their research.

To collect relevant data, several surveys will be conducted. These will include a baseline analysis, targeted at current BA students, to gain an insight into the status quo ex ante. A requirements analysis will be conducted to gauge the demand for specific interventions. Lastly, a survey will be conducted after our intervention in order to measure its effects compared to the baseline.

Current Progress:
As part of the call "Multimodal Science Communication," our team has chosen to explore the interactions between science and the economy. Within this broad subject, we focused our efforts primarily on how research is funded. Specifically, we wanted to know how scientists acquire the resources they require and how the structures to provide these resources can influence the direction and outcome of scientific projects. Through an iterative process of individual research, literature review and meetings with our supervisors, we increasingly discovered that many of our preconceived notions regarding this topic were mistaken or incomplete. After exploring diverse ideas such as crowdfunding platforms for universities, the modified lottery method of distributing grants, and the influence of political decision-makers on research, we ultimately converged on our current mission. We consider this project an effective and achievable way to make a positive difference relevant to the core problem we have identified.



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Quintessence: A project in progress...

Introduction and abstract

We, Quintessence, are a research team consisting of six students exploring the possibility of improving the commonly prevalent lecture environment for students at our university by means of changing the structure of the setting in which these are held. The aim is to develop methods for a smoother, more comfortable, and more thought-inspiring lecture that can be applied independently from the specific lecture subject or lecturer.

Hypothesis, goal, and research question

The first steps of our project, when our team first met in November 2018, consisted of a first phase of preliminary research in order to figure out how we wanted to proceed. It culminated in the formulation of our goal and research question, which we want to investigate during this 20-month scholarship.

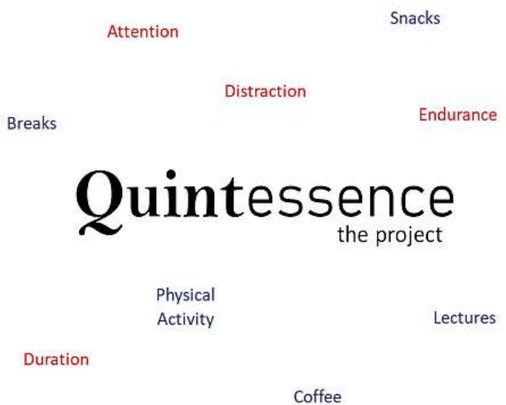
Our primary hypothesis is that an *environment that requires a high level of continuous mental activity can be optimized to human mental capabilities.* We derived this from our preliminary research, which showed that there exists a vast discrepancy between the scientific data on the capacity for human attention and the format of lectures commonly found at university. Even after as short a time as 15 minutes of concentrated mental activity, humans start to exhibit measurable signs of attention loss and distraction. We found this to be at odds with most of the common lecture sessions at TUM, which are generally laid out into 90-minute lecture blocks, with no break in between.

These considerations and further reading allowed us to formulate a precise goal and research question for this project. We want to *improve the individually perceived attentiveness of TUM students in university lectures by 2020*. As such, our project consists of an implementation component, but we are simultaneously investigating a corresponding research question, namely: *How could an implementable concept be constructed such as to cause an overall improvement in the individually perceived attentiveness of TUM students during university lectures?*

Our current progress

We are currently in the process of wrapping up the first phase of our project, which is mainly focused on research into core issues surrounding attention, distraction, and their interplay in learning and lecture environments, as well as on solutions to those problems. The efforts of our literature research have culminated in the creation of a Final Research Documentation which concisely summarizes the key points that will serve as a foundation for the development of our implementable solution.

To finalize this first phase, we will also conduct a series of case studies at other universities to gain further insight into how a strategy to improve attention in lectures might affect students and, thus, help us understand what components are essential for our solution to be successful. Our first case study will take place at *ETH Zurich*, where we will observe their lecture structure, which is



significantly different from what we are used to here at TUM, in that each 45-minute lecture block is always separated by a 15-minute break. We will aim to study and observe the effect of this system on the perceived attentiveness of the students there in order to apply that knowledge to our own project. In addition, we are also in the process of collaborating with the *Hochschule für Philosophie München* in a similar context. Finally, we want to travel to *RWTH Aachen,* where a lecture-break concept has already been introduced, and we hope to acquire some very valuable impressions there that will help us in designing our own implementation of a lecture-break concept.

How the project unfolds

From June 2019 onwards we will be spending time planning our own lecture-break concept to be deployed and tested at TUM. In parallel we will be designing an assessment environment, such that we can measure the effects our intervention has on students' attention. Everything should be ready to be rolled out to selected lectures by November 2019 and the implementation phase completed by Christmas. Then we will take the remaining months to properly catalogue and present our results, as well as offer a recommendation to the university about the prospect of implementing or further developing our solution.

Timeline

- 4 Phases
  - Research (R)
  - Planning (P)
  - Implementation (I)
  - Documentation (D)
- Phase transfers

For more information, consult
www.ja.tum.de/projekte/quintessence
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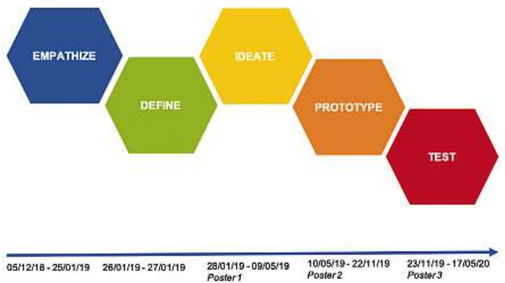
Scienciety

Abstract:
The transfer of scientific facts to society is difficult. The trend of too low vaccination rates1 and the fear of consumers concerning genetically modified food2 are only some examples of this challenge. Surveys have shown that scientific education, especially in schools, is perceived to be ineffective at teaching an understanding of the methods and processes used in science. In particular, children from a low socioeconomic background are adversely affected.3,4 We believe the pupils' understanding about the process of scientific thinking can be improved by playing a "science game" as part of their extracurricular activities.

Project goal:
Our goal is to engage pupils (especially those who are underprivileged) in the process of scientific thinking. We would like to…
a) …enable easier access to an understanding of the scientific process.
b) …make engaging with scientific topics fun and exciting for pupils.
c) …make knowledge about science less dependent on the socioeconomic status of the pupils' parents.



science society

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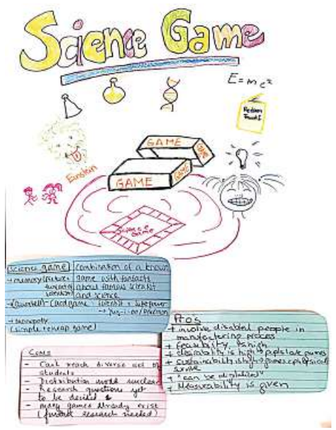
Project structure plan and time schedule:
For the development of our project ideas we use the design thinking process, which consists of five steps: Empathize, Define, Ideate, Prototype and Test5. Using, e.g., creative techniques, interviews and literature research on competition, target group and scientific methods during the first three phases, we decided to develop a "science game" and are currently working on a prototype. In this phase, we are already looking for internal (at TUM) and external (museums, after-school carers, etc.) partners, as we will need them to reach our target group. It will take some time to acquire these partners and plan the implementation together with them. In the final phase, starting in fall 2019, we would like to test our "science game" prototype.

Research question:
How does a "science game," played in extracurricular venues (e.g. after-school care), improve the participating children's understanding of the scientific thinking process? Is the effect on the pupils influenced by their socioeconomic status? How do the results of the participating group compare to those who did not play the game?



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study strats

The main idea of our project is to develop a tool that can recommend to students the learning modality with which they would most likely perform best in tackling learning tasks. We aim to implement and test the diagnostic tool for a number of general variables – including learning style, active/passive learning, personality (intro-/extrovert), reflectiveness of people, how people approach problems, etc. – so that we can refine its ability to predict the learning modality with which participants would perform best.

Our hypothesis is that different people perform better at certain learning modalities compared to others. We expect most people to do well with active learning.

To develop the tool, we did some research about learning styles, learning types and personalities. For research we read papers, did an online search, and met with Prof. Dr. Müller and communicated with Prof. Dr. Maul to gather some information about their experience with learning at universities.

In mid-April we went to the Max Planck Institute of Human Development in Berlin and met with Azzurra, our supervisor. Drawing on the information we assembled from our research and following our discussion with Azzurra, we decided to focus on the differentiation between active and passive learning methods. In Berlin we planned the implementation of a set of experiments, developed milestones and work packages for the coming months.

Our project is subdivided into different phases, as follows: a pilot study and experiment 1 (phase 1); the optimization of the tool and experiment 2 (phase 2); and experiment 3 with a control and validation group (phase 3). Our engagement with the last phase will depend on how successful our first phases are.

Phase 1

First of all we will carry out a **pilot study** to test whether the diagnostic tool we are developing right now is likely to be successful or not. We want to do the study with approximately twenty participants. They will answer a questionnaire regarding learning styles, active and passive learning, etc., and perform some tasks regarding active and passive learning provided by Azzurra. Then we will provide three different learning contents which the participants must learn using an assigned strategy. We provide three different strategies relating to active and passive learning for every content: listening to a "lecture" in a video (passive both in terms of content and learning pace); reading a given text (passive in terms of content, active in terms of learning pace); and individual online research (active both in terms of content and learning pace). At this point, we will evaluate the success of learning using an "examination" based on the content but also containing transfer questions relating to the given learning strategies (reading, video, and online research). Finally, after about a week, the participants will take another examination with slightly different questions about the content they were supposed to learn so that we can evaluate whether the participants were able to remember what they have learnt or whether they forgot most of it.

With the pilot study we aim to optimize our questionnaire, topics and tasks for **experiment 1** which will be carried out with a larger number of approximately 120 participants. The modification of the tool might include dropping questions or reorganizing the structure to make it as short and predictive as possible. The structure in experiment 1 is the same as in the pilot study.

Phase 2

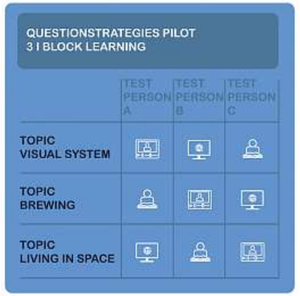
Assuming that experiment 1 of our project is successful – i.e., that we discover that people do learn better with certain modalities than with others, and that we can identify aspects of our tool that correlate with the learning performances – we want then to test and validate our optimized tool in **experiment 2**. Therefore, we will run an experiment in which we compare the outcomes of a case and validation cohort.

Approximately 120 Participants will take part in our optimized experiment and will then be randomized into either the case cohort or the validation cohort to perform one of our learning tasks. The case cohort will get the learning modality (fitting task) which, according to our tool, would be the suggested best one for them. The blinded validation cohort will receive a modality we think will not work as well for them (non-fitting task). Afterwards, we will evaluate their learning process using the corresponding "examination".

Our hypothesis in this experiment is that people in the case cohort will generally perform better in the learning task than people in the validation cohort.

Phase 3

If our developed tool is successful regarding the results of experiment 2 we will run an **experiment 3** in a non-controlled environment to test its performance there. For this we will test students of Azzurra in the WS 19/20. Experiment 3 will be planned in more detail as soon as we review the results of the previous experiments.



We are very excited about the potential results of our research and we are looking forward to the next few months.

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Science Hack

The TUM: Junge Akademie Science Hack

Annually, students use Christmas to return to their homes and families, take a break from their studies and enjoy their well-deserved breaks. It is a time of calmness and thoughtfulness. This year though, a bunch of motivated and highly caffeinated students spent their first advent hacking away together at a set of different and difficult challenges, well into the night and the next day. During the first ever TUM: Junge Akademie Science Hack, 40 participants had the chance to (net-) work with the five sponsors and challenge-providers in a protected but encouraging environment. At the end of the two coding-intensive days a jury honored the best participants with proper awards.

Organization of the Science Hack began back in Fall 2017, when determined scholars of the TUM: Junge Akademie decided to organize a hackathon.

Citing Wikipedia: “A hackathon (also known as a hack day, hackfest or codefest) is a design sprint-like event in which computer programmers and others involved in software development, including graphic designers, interface designers, project managers, and others, often including subject-matter-experts, collaborate intensively on software projects.

The goal of a hackathon is to create usable software or hardware with the goal of creating a functioning product by the end of the event.”

As the TUM: Junge Akademie does not only consist of programmers and people involved in software development, the team decided to shift the focus of the Hackathon towards natural sciences, to allow students from all disciplines of natural sciences with some kind of coding experience to participate. Thus, the Science Hack was born.

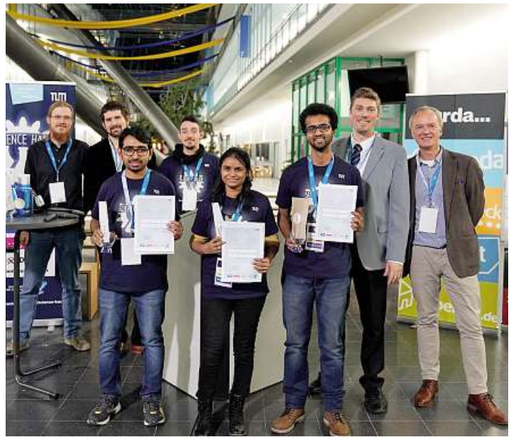
Under the lead of Peter Finger, the small group, consisting of Justus Wolf, Alexander Biederer, Jonas Ruchti, Vadim Goryainov and Daniel Körner, spent countless hours constructing an event, which should open the TUM: Junge Akademie to the outside world, while

at the same time proudly displaying what the scholars are capable of. The Science Hack was scheduled for the 01.12 – 02.12, two weeks after the hackaTUM, the biggest Hackathon at TUM. It was decided that, as with that event, the Science Hack should also take place in the Magistrale of the MI-Building of TUM in Garching.

In close contact with the Taskforce CAP, the team managed to find a set of generous sponsors who also agreed to provide interesting and diverse challenges. Having BASF, Hubert Burda Media, ITK, Pixida and T-Systems backing the plans, the team went ahead and crafted a marketing campaign containing a website, flyers, posters, and online advertisements, with several information events in and around TUM, to reach out to as many participants as possible. Participants had to register online while providing personal data such as a CV and a short statement of motivation, as well as their project preferences and a short self-assessment. Despite these hurdles, all 40 open places were quickly filled with skilled participants.

On the day of the event, seven teams spent exactly 1717 minutes, or about 30 hours, working on the challenges set out by the partnered companies as well as the TUM Chair for Data Processing. Catering – with lunch, dinner, breakfast and lunch again, as well as snacks, coffee, and energy drinks – was provided for all participants. On Sunday afternoon, each team presented their results to the jury composed of Senior Vice President Dr. Hans Pongratz, Emeritus of Excellence Prof. Georg Färber as well as two doctoral students from the TUM chairs for Database Systems and Software and Systems Engineering.

Overall, feedback from participants was positive. In particular, the relationship with the mentors who put up the challenges was praised, and the organizational team, including several additional volunteers from the TUM: Junge Akademie, also received compliments for the highly professional nature of the organization. An important incentive that had motivated participants to enter the Science Hack was to improve their skills in programming. According to one participant, they exceeded their own expectations of what could be achieved in such a short time. From multiple sides, the organizational team was contacted with hopeful requests for repeating the event. In fact, the second annual Science Hack is scheduled for December 06-08, 2019. ■



Our industrial partner

Our industrial partner

Pixida Group

Pixida is an international group of innovative technology companies offering comprehensive interconnected digital solutions.

The group creates digital value by transforming entire product portfolios with cutting-edge technology, innovative business models, system integration with the best available 3rd party applications and a reliable operation of systems with the goal to maximize the business value.

Customers benefit from the tremendous experience out of more than 500 successful projects and over 220 experts specialized in Digital Services, Data Science, Location-based Services, Mobile & Cloud Applications, Embedded Systems and Product Innovation. The international network consists of eight business locations in Germany, USA, Brazil and China, a multinational team from more than 26 nationalities and a strong backbone of specialists and partners.

Pixida's persistent success is reflected by an average growth of more than 25% per year and several top-class awards.

Cooperation TUM: Junge Akademie

Since 2016 Pixida GmbH is a cooperation partner of „TUM: Junge Akademie". Together with passionate students, our experts in Digitalization, Internet of Things (IoT) and Mobility exchange knowledge on potential solutions for urban and public challenges.

The first workshop at Pixida's Headquarters in Munich was organized in 2017 raising the question "How to use data to shape smart urban environment?". 'Smart City' and 'IoT' are important Business Areas at Pixida. IoT, in this context, enables the connectivity to generate information from data for social benefits. The event started with short keynotes by our Data Experts on the topics of IoT, Data Analytics and Cloud before going deeper into the issues. In a further collaboration in 2018, our technical experts from the Business Unit Software Development advised students in an ambitious project to strengthen Munich resident's participation in political processes. "Muc.me" is a web-platform made by students of TUM: Junge Akademie and allows, especially young citizens, to engage in their local community. On Muc.me users can anonymously contribute their ideas to district committees by e-mail.

On December 2018, Pixida took part in the first edition of TUM Science Hack. The interdisciplinary student team developed together with our expert a concept "PAM – Personal Air Quality Monitor".

Additionally, the students presented the final concept to Pixida's Managing Directors and Business Unit Managers. For all participants, it was an incredible opportunity to interact with our team finding and discussing unique solutions to important and current issues.

In 2019, Pixida hosted the workshop "Smart Cities and Digitalization" for enthusiastic students. Urbanization has a major impact on society and in the environment. The changes in urban areas cause new challenges and require innovative solutions. The workshop was focused on IoT applications within Smart Cities, an exemplary approach to measure air quality and an evaluation of blockchain cryptography.

In different workshops, the students visualized and discussed several IoT solutions and improvements through Data Analytics dealing with questions such as "Smart Cities and IoT – what does it mean?" or "How to use IoT and the cloud to make a city smarter." The final topic focused on "Blockchain - a broken chain of trust". We would like to thank all the students for their high degree of social commitment and performance!

Let's continue our exciting and constructive cooperation in the future!

TUM: Junge Akademie

“It is a self-developmental experience to be in an interdisciplinary project of TUM: Junge Akademie. Working with teammates from different perspectives is like wearing a pair of glasses that has helped me to see and understand issues better, renovate my mindset, and look for more inclusive solutions.”

Maryam Tatari, Year of 2018,
TUM School of Governance,
Science and Technology Studies

“Learning from each other, exchanging ideas and critique – the projects that grew within the scholarship program are more than impressive and showcase what can be achieved as a colorful team. In particular, I am inspired by the chance to develop a project from research to practical implementation and to over-come limits within my team.”

Jaimee Lau, Year of 2019,
TUM School of Governance,
Political Science

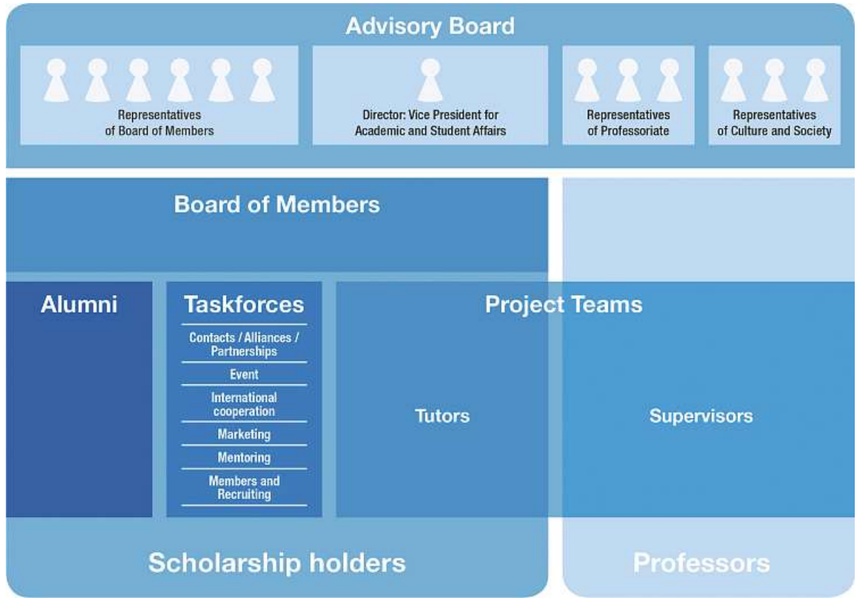
“TUM: Junge Akademie is unique, because it brings together talents from different backgrounds and actively encourages the formation of diverse teams. The ideas we work on in a project go beyond just creating some-thing and also consider the impact on society, within and outside of academia.”

Patrick Sowinski, Year of 2019,
TUM Department of Informatics, Robotics,
Cognition, Intelligence

The Academy

The TUM: Junge Akademie is TUM’s scholarship program for exceptionally talented and dedicated students with a special affinity for research and teaching. The scholarship holders are students from all departments of TUM and our partners, University for Television and Film Munich, University of Music and Performing Arts Munich and Academy of Fine Arts Munich. The Academy prepares young talents to further the development of an advanced society. Within the scope of an active network, the TUM: Junge Akademie provides the necessary space and support for its scholarship holders to flourish, giving students the opportunity to work freely on self-imposed questions, to unfold their individual talents and to learn to take responsibility for their technical and scientific ideas.

Right from the beginning, the participants are involved in a vibrant network consisting of alumni of the Academy, currently active professors and the TUM Emeriti of Excellence, as well as the young researchers themselves. There are exclusive workshops and cultural events as well as financial resources to implement project ideas and to facilitate comprehensive measures of training and personal development beyond the respective fields of study. ■



The Boards of the Academy

Since the Academy's foundation in 2010, the Advisory Board represents the organisational unit of the TUM: Junge Akademie with decision-making power. At the scholarship holders' request, the Board of Members was launched in order to collect the members' views as a design committee and to pass those ideas on to the steering committee.

The Advisory Board – Where decisions are made

The Advisory Board represents the Academy's governing body, whose members meet twice a year. It primarily decides on the medium to long-term strategic and organizational issues of the TUM: Junge Akademie.

Since 2016 the President of the University of Music and Performing Arts Munich, Prof. Bernd Redmann and the President of the University of Television and Film Munich, Prof. Bettina Reitz have further enriched the collaborative nature of the Advisory Board.

The strategic themes include in particular the purpose and direction of the TUM: Junge Akademie as well as its interaction with TUM's several institutions and their programs, such as the Munich Center for Technology in Society (MCTS), the TUM School of Governance or the TUM University Foundation. New proposals from the Board of Members are also discussed here.

In addition, the Advisory Board is responsible for key operational tasks, which include the selection of new scholarship holders or the definition of possible project topics from the wide variety of the submitted project ideas. ■

Members of the Advisory Board 2018/19:

Director:
Prof. Dr.-Ing. Gerhard Müller,
Senior Vice President Academic and Student Affairs

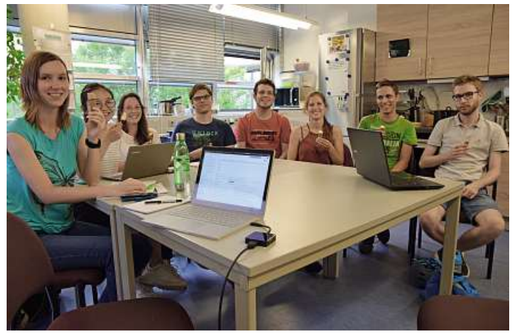
Scholarship holders:
Alexander Biederer
Beate Ursula Lang
Dr. Matthias Lehner
Jonas Ruchti
Sabrina Schwarzmeier
Konrad Weiss

Professors:
Prof. Dr. med. Pascal Berberat (from May 2019),
TUM School of Medicine
Prof. Dr. Sonja Berensmeier,
TUM Department of Mechanical Engineering
Prof. Dr.-Ing. Klaus Diepold (until May 2019),
TUM Department of Electrical and Computer Engineering
Prof. Dr. Sabine Maasen,
Munich Center for Technology in Society
Prof. Dr. med. (em.) Michael Molls,
Speaker Emeriti of Excellence
Prof. Bernd Redmann,
University of Music and Performing Arts Munich
Prof. Bettina Reitz,
University of Television and Film Munich

Board of Members 2.0

A board of members for the members. This is the mission of the members council of the TUM: Junge Akademie. Each project group and each Taskforce send their representatives to the periodical meetings to keep their peers up to date, discuss ideas, give advice and support each other. Besides the regular visitors, all members and alumi are invited to join the meetings and contribute their experiences and opinions. The meetings are intended to offer a platform to synchronize the different groups and people in order to achieve vivid cooperation and synergy.

The Board of Members elects six student representatives in the Advisory Board. By this integration of the Board of Members into the Advisory Board the scholarship holders are able to actively participate in the decision making process and can represent their interests. Proposals for changes of the scholarship program are handed to the Advisory Board, the director and the office team. Together with them the scholarship holders take action to implement these changes.



But what about the 2.0?

Since the reportings are now done separately this will be not longer part of the meetings. In the future, the topic selection will be more democratic and event driven. Hence, the board is more flexible and keeps the discussion time to a reasonable level. This step became necessary due to the increasing number of project groups and Taskforces. Furthermore, a new code of conduct ensures the culinary supply of each meeting. ■

Committed: Taskforces, Tutors, Supervisors, Office

In TUM: Junge Akademie, all scholarship holders participate in a self-organized Taskforce of their choice. These are "International Cooperation," "Event," "Marketing," "Mentoring," "CAP," and "Members."

The Taskforces of the TUM: Junge Akademie give you the opportunity to shape the future of the program and enable you to contribute your own ideas and personal talents within it. Throughout the program you will acquire skills related to the Taskforce you joined, such as design, event planning, project management, and many more. Furthermore, you will expand your network by collaborating with scholarship holders from other projects and years.

On average, each Taskforce meets twice a month to discuss progress and plan future activities. Besides this, group representatives meet regularly to keep each other updated. The work in the Taskforces is an important part of the scholarship program in addition to your project.

For more information check out the respective pages for each of the Taskforces. ■

Taskforce CAP

CAP stands for “contacts, alliances, partnerships” and these are the key points of reference for the work of Taskforce CAP. In general term, we have two main goals:

1. To generate funding for those activities of the Junge Akademie which are not covered by the budget provided by TUM.
2. To establish and maintain a network between scholarship holders, alumni and companies through partnerships.

Providing funding for activities of the Junge Akademie not covered by the budget from TUM.
TUM provides the main funding for the Junge Akademie as a scholarship program. This funding is intended for the academic benefit of the scholarship holders, e.g., to enable workshops or to support the students’ projects. However, the money cannot be used for things like food or accommodation. As the Junge Akademie has on average two weekend seminars per semester, which take place in locations around Munich, scholarship holders would have to spend money to attend them. To avoid this and to enable every student to participate in the Junge Akademie regardless of their financial situation, we as Taskforce CAP seek additional funding to cover these expenses. This is done by finding external partner companies and organizing events like the Science Hack, which will be introduced below.

Establishing and maintaining a network between scholarship holders, alumni and companies through partnerships.
The Junge Akademie understands itself as more than a 20-month scholarship program, but as a network of talented and dedicated people, who want to actively contribute to the development of our society. Therefore, it is important to have not only scholarship holders, alumni and professors involved in the Junge Akademie, but also to establish and maintain partnerships with companies. Through the connections inside this network, all parties involved benefit from the exchange of ideas and from practical of cooperation. Since 2016, the Junge Akademie has been happy to have a precious and lasting partnership with Pixida. Besides keeping in close contact with us, Pixida also sets up workshops for the scholarship holders and helps directly with their projects wherever possible. We as Taskforce CAP take care of this partnership with Pixida and aim to establish cooperation with new partners.

Science Hack. In December last year, Taskforce CAP organized the first Science Hack, which was a great success. The Science Hack is a hackathon hosted by the Junge Akademie, in which both companies and chairs of TUM provide tasks for the participating students. Due to the variety of the tasks, not only people who study computer science but a broader variety of students can participate. The goal of the Science Hack is to use the already established contacts of the Junge Akademie – with companies as well as within TUM – to provide a unique event for all students in Munich. In addition, we hope to raise awareness among new companies of the benefits and opportunities gained by sponsoring the Science Hack or by establishing permanent partnerships with the TUM: Junge Akademie. On December 6th-8th, the second Science Hack with the slogan “towards a sustainable future” will take place at the main campus of TUM. Currently, we are still in the planning process, but we are happy to already have ITK and Burda confirmed as partners for the Science Hack. Additionally, we are talking with BMW and Pixida to hopefully establish further partnerships for the event.

Members of CAP. The current CAP team was formed in February 2019 and consists of eight students from the Junge Akademie Year 2019. Unfortunately, we have no members from other years or former members of CAP still involved in the Taskforce project. This posed a challenge for us at the beginning, but we have now overcome most difficulties and working towards engaging with more partners and ensuring the success of the second Science Hack 2019. Our team members are:

Nitish Nagesh
Friederike Jungmann
Daniel Frey
Yushu Yang
Xingyi Huang
Simon Gandorfer
Kilian Lupp
Bruno Villela Pedras Lago ■

Taskforce Event

The Taskforce Event of the TUM: Junge Akademie was formed at the same time as the foundation of the Academy. Our principal goal ever since the beginning, and still today, is not only to create opportunities and an environment for all scholarship holders to find out more about one another outside the context of university life, but also to establish connections between current and previous scholarship holders.

Various interesting and exciting events are held every semester. Besides regular events such as the monthly "Stammtisch," we also offer opportunities for you to learn or experience things in different fields. For example, the "Lederhosetraining" takes you to the English Garden in summer time to have exercise and to enjoy nature; the "Photo workshop" gathers all people who are interested in photography to learn more about taking great photos; the "Opera night" leads you to the backstage to gain insights into what happens behind the scenes and possibly even to engage directly with performers.

Classic events you must not miss:

Running Dinner
At the Running Dinner, you will have a three-course menu (appetizer, main course and dessert) at three different places. The great thing is that you and your team mates are just responsible for preparing one of the three courses, while being a guest for the other two courses. Thus, during the event, you will get to know 12 other people. To conclude the evening, all participants meet in a bar after the dessert.

Bouldering Night
In a small group of about 10 people we will visit the "Boulderwelt München." Beginners as well as experts are welcome here either to improve your technique or to learn more about the sport. Another good thing is: Entrance is free!

Summer festival
Every year, the TUM: Junge Akademie celebrates summer by gathering and enjoying delicious grilled food and cold beverages, sometimes with sport challenges too!

Street Science
The Streetlife Festival is a great opportunity for scientists to share their everyday lives and research findings. The focus of the communication lies in the direct dialogue between lecturers and visitors in order to create a personal added value for both. To achieve this goal, we organize a booth at the Streetlife Festival Munich. Due to its high popularity, it provides a perfect framework for entering into discourse with various population groups.

What are you waiting for, Leute!
Come and join our events together! ■

Taskforce Members
Ho Huang, Head of the Taskforce
Saskia Hutschenreiter, Head of the Taskforce
Anna-Lena Fackler
Sophia Hasbach
Dominik Irber
Tilman Knopp
Luisa Kraus
Carolin Schimmer
Nicola Stadler
Samuel Valenzuela

Taskforce International

This taskforce is part of the TUM: Junge Akademie program and founded by students in January 2019.

In times of right-wing populism and increasing isolation of countries, international organizations like the European Union fear inconsistency and decreasing acceptance. It is more important than ever to build transnational connections and look out for partners who are like-minded. This taskforce feels the urge to bring a greater international perspective to the TUM: Junge Akademie in order to exchange, to create and to engage in a discourse.

Who we are

We are eight students from different fields of study who are fully motivated to build up networks with other international universities which have similar programs to the TUM:Junge Akademie.

Our goal

We want to create an intercultural exchange amongst students from international universities involved in similar projects as the TUM: Junge Akademie. During this exchange, we will give an interdisciplinary scientific insight into the work of the different TUM Campuses. The students will explore the fields of research at TUM through a variety of organized workshops, guided tours and playful challenges. Needless to say, there will be a leisure program, trips to cultural events and places of interest and tradition. Through such workshops we want to foster relationships and networks with our international partner universities.

The program

The duration of the program will be one week with a maximum number of ten to fifteen participants. It is similar to the concept of a summerschool. The workshops are going to take place in groups and there will be at least one big tour around Munich. The participating students should have the possibility of proposing their own ideas for events, tasks and improvements to the program. We propose a one-to-one-pairing during the exchange so the TUM-partner can help to look for accommodation, bring the German language closer to the visitor, and give insights into German culture. Furthermore, the taskforce members will work on planning and implementation.

Current project

Our latest project is to build a partnership with Imperial College London.

In fact, Imperial College London is ranked as one of the top ten universities in the world and offers several scholarships which fit with our profile. We are planning an exchange program with scholarship holders for the end of 2019 or at the beginning of 2020. For more details, see below.

History

On 25th April a delegation from Imperial College London visited the TUM Campus in Garching. Three members of the Taskforce International attended the meeting. We conducted a guided tour through the entrepreneurship centre of TUM and the Makerspace. In a presentation, we explained our goals and the program. To foster the relationships, build a network and improve our work, Prof. Buitendijk, the vice provost for education, invited us to the college in London. With this visit we hope to find partner students who want to collaborate on a common project so that our exchange can start as soon as possible. ■

Taskforce Members

Karlis Blums
Alexander Karollus
Jan Kochanowski
Johaina Kullab
Dominik Schindler
Tobias Spöttl
Stephanie Stockert
Maximilian Wagner

Taskforce Marketing

The Taskforce Marketing aims to increase the brand image and recognition of the interdisciplinary scholarship program of the TUM: Junge Akademie.

Our project involves, on the one hand, several activities related directly to TUM – concerning, for example, potential applicants, members and employees of TUM – and, on the other hand, activities outside the university environment – such as contact with current and potential corporate partners and alumni employers. Moreover, we constantly support current scholarship holders and their interdisciplinary teams, with graphical materials, branding strategies, general tips and valuable contacts related to marketing. The nature of our responsibilities requires that we work closely together with the TUM: Junge Akademie main office and the Taskforce Event, for instance regarding events such as Fit for TUM or Tag der Initiativen in Garching.

The Taskforce Marketing members are involved in diverse projects depending on the current needs of the organizations as well as on the skills and personal interests of the members, keeping in mind the goal of helping them to develop new competencies.

In the last few months, the Taskforce has realized many successful projects and campaigns, including the restructuring of the website for better clarity, and the production and distribution of various marketing materials. The new image movie, posters and flyers were part of the advertisement efforts during the application periods and these have helped to increase awareness and to enhance the public image of the TUM: Junge Akademie as a whole.

Members interested in participating in our Taskforce have previous experience in Graphics Design, Strategic Marketing and Event Coordination. However, previous knowledge in these fields is not required. First and foremost, we look for students who are enthusiastic about what we do and who believe that through a high-quality marketing strategy, the TUM:Junge Akademie can be positioned as a prime student initiative in Munich.

Moreover, members of this Taskforce are given the freedom to participate in existing projects of their interest as well as to come up with new ideas. As members, there are plenty of chances to grow personally and professionally.

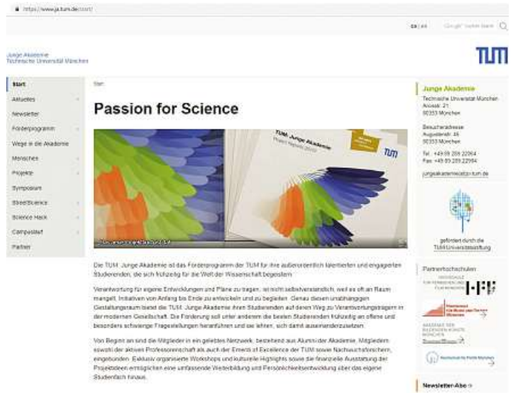
Past Projects

Junge Akademie Image Film: Passion for Science

“One of the best things I did last year in the TF was the new JA image film that we did in cooperation with Medienzentrum. We designed a script and invited scholars and alumni to be interviewed by us, about their projects, their current studies and interests and their future endeavors. The focus of the movie was to showcase the variety of benefits and opportunities scholars get through the program. Moreover, it had the ambition to inform the program’s other stakeholders and sponsors about its impact in society and current structure. We were able to accompany the filming team during two days and travel between campuses to get our footage. Emphasis was also laid on documenting the research labs and public spaces of TUM where interviews were conducted, e.g. the architecture space on the top floor at main campus, or HMTM’s old building. The latter was a particularly interesting experience. Normally, only students of the university can access the premise, but we had an appointment with a student inside to conduct the interview. So our first challenge on the day was to sneak past the guards with huge bags that were obviously camera equipment. But due to caution and luck we made it inside! That helped me realize that sometimes being a little audacious and unconventional can help in creative

projects. Thanks to the support from our partners at Medienzentrum, the specialists afterwards skimmed through the footage and selected a good sequence that formed the story line of the film. In exchange with the program coordinator we refined the first version to meet the intended audience better." – *Frederik Heetmeyer*

Update of the website
"The internet presence of the Junge Akademie is currently being redesigned to be more informative and easy to navigate. The page has recently moved to a shorter domain: ja.tum.de. English translations have been provided for all sub-pages. The list of members is currently being updated and the structure of the website will be reworked to be more intuitive. Another goal is to make the page more visually appealing with new pictures and more vibrant colors" – *Patrick Sowinski*



Science Hackathon 2018
"I was involved in promoting the last year's Hackathon. My jobs were designing/starting flyers and posters as well as helping to organize the distribution of both. What I have learned from the project is that good communication between all involved parties is crucial. If it is bad, the whole project will suffer. It is good to set deadlines a few days before something really needs to be done, which gives room for some delays." – *Daniel Körner*

Flyer for TUM: Junge Akademie Year 2020
"Flyers are a great way to motivate people to apply for the Junge Akademie. All the relevant information can be seen on the flyer. It also has details about what to expect from the program and testimonials from those who participated in the past or are active right now. When creating the new flyer for the year 2020 applications, we looked for new testimonials which represent the diversity of our members. We also added the Academy of Fine Arts Munich (ADBK) to our flyer to encourage students to apply." – *Patrick Sowinski*

Article for Campushunter Magazine
"Writing this article helped me see the Junge Akademie from a different perspective. Observing from the point of view of the promoters and organizers of the development program made me understand what motivates them to work year after year in optimizing the methodologies and encouraging interdisciplinary work. The article seeks to encourage the participation of students in similar programs since in the near future the ability to work together will be increasingly relevant due to our hyperconnected society." – *Daniel Hernández*

Projects in the making

Development of Flyers for the Symposium 2019
One of our projects requires us to design marketing material for the Symposium 2019. Our graphic designer, Luise Eichhorn and Daniel Hernández are currently working hard to design eye-catching and appealing flyers for the event. Here we can see some examples of the current status of their work.

Science Hackathon 2019
After the success of the Hackathon 2018, several members of the Taskforce are working on the 2019 edition.

"I am currently contributing to the marketing of Science Hack 2019. Science Hack is a unique twist on the Hackathon concept, where passionate people of all disciplines can collaborate on creating solutions with real world impact. It is our job to communicate everything that makes the Science Hack special. If we can get people to be as excited as we are about this event, then it will be a job well done!" – *Altan Birler*

Future goals
Our long-term goal is to standardize the marketing material of the TUM: Junge Akademie. A corporate identity concept accompanied by a set of intelligible tools and guidelines will hopefully improve the coherence of the image we project and simplify the creation of marketing material for upcoming events and projects.

Taskforce Members

Altan Birler
Vanessa Buchweitz
Niklas Dreymann
Lukas Egerer
Frederik Heetmeyer
Daniel Hernández
Daniel Körner
Jaimee Lau
Rebeca Marichalar
Jonas Ruchti (Head of the Taskforce)
Patrick Sowinski
Elena Tangocci

Taskforce Members

We, the Taskforce “Members,” are responsible for all issues concerning the active members of the TUM: Junge Akademie, our Alumni and members-to-be. Therefore, we act as a link between the academy office and our members.

Annually, we plan and organize the application process. As part of this process, we organize several information events in order to provide insights into the TUM: Junge Akademie for interested students. Students are given the opportunity to meet active members and gain first hand insights into the TUM: Junge Akademie. Our goal is to popularize the scholarship program and to attract more potential members. We have, furthermore, sent postcards containing information about the scholarship program and the information events to each and every student from the “Hochschule für Film und Fernsehen.”

In addition, we have asked former and current mentors of the TUM: Junge Akademie to act as potential referees within their faculty. For students who do not receive a nomination but who still want to apply unsolicited, it has previously been very difficult to find a professor to write a recommendatory letter for them. From now on, these students can contact one of these referees who, with their detailed knowledge of the program, will be able to judge the student’s suitability for it and, if appropriate, write a letter of recommendation for the student. With this strategy, we hope to encourage students to apply even if they are not nominated, as we believe that a person’s ability to participate effectively in a project depends not only on grades but also on personal talents.

We are also responsible for organizing the program’s selection days in order to support potential scholarship holders and facilitate their initial period within the program. Over two days, applicants are asked to participate in various tasks – for instance presenting their project idea to other students and having an interview with a supervisor. Based on their performance, about forty students are then chosen to join the TUM: Junge Akademie.

Another part of our work is that we conduct and analyze several evaluations – for instance, regarding seminar weekends – in order to improve the scholarship program and to ensure the well-being of our active members. This enables us to tackle any challenges immediately, to raise awareness of relevant issues and to propose appropriate improvements. At the same time, we help to guarantee that the program operates to the entire satisfaction of everybody involved – active members, supervisors and tutors.

One of our initiatives has been to establish an interview series in cooperation with the Taskforce “Marketing,” in which we contact alumni of the TUM: Junge Akademie and invite them to share their experiences in relation to both project insights and their own career development. This gives active members the opportunity to benefit from the alumni’s life experiences and the interviews also demonstrate how a stronger relationship between alumni and active members can be formed beyond the scholarship program itself. For the future, we intend to intensify this contact with our alumni and to establish regular meetings where current scholarship holders and alumni can meet each other, share their experiences and actively benefit from the network offered by the TUM: Junge Akademie.

We warmly invite you to send us any feedback, further suggestions or questions you may have. Do not hesitate to contact us via members@jungeakademie.tum.de or to talk to us directly. ■

Taskforce Members
Veronika Bauer, Head of the Taskforce
Sophie Seier, Head of the Taskforce
Stefan Engels
Dennis Huber
Lea John
Stefan Lehner
Beate Neu
Judith Paripovic
Jonas Papazoglou-Hennig
Pascal Resch
Paul Sieber
Michael Würth
Katharina Wagner

Taskforce Mentoring

The taskforce "Mentoring" designs a mentoring program for current scholars of the TUM: Junge Akademie. We strongly believe that mentoring offers great benefits for both parties and is a valuable part of the curriculum of the TUM: Junge Akademie. Our program provides a means of initiating one-on-one contact between scholars and alumni of the TUM: Junge Akademie. Thus, individual advice and inspiration can be passed on from experienced alumni to younger scholars. At the same time, mentors get a chance to keep in active contact with their alma mater and can benefit from the next generation's knowledge and enthusiasm.

We are proud that our planning phase of last year has led to the program becoming a reality this year. More than 20 alumni of the TUM: Junge Akademie offered to engage in our mentoring program while interested scholars of the year 2019 were the first to have the opportunity to participate. Six scholarship holders signed up and reviewed a list of possible mentors, including their study background, LinkedIn or XING profile and other personal information. We thought that it might be best to let the mentees choose their mentors on their own as they know best who they would like to exchange ideas with. Hence, they ranked the mentors in their preferred order and the matching tool computed all the rest. In May 2019 we organised a kickoff event in a restaurant to introduce tandem partners to each other, to explain the process of the mentoring program and, most importantly, to spend a fantastic evening together.

In general, tandems can organise their interaction very individually: While mentor and mentee should meet at least four times during one year, the frequency as well as location and topics discussed are set individually. Academic questions, as well as personal topics, are encouraged as potential subjects to be discussed. At the end of the program, there will be a closing event, which will also be the kickoff event for the next year of mentor/mentee tandems. For now, our focus is limited to alumni, but we will be extending the group of potential mentors by inviting TUM professors and Emeriti of Excellence to participate in the future.

We are looking forward to performing the next steps. Stay tuned!

Your Mentoring Taskforce

Taskforce Members
Marina Able
Thomas Just
Sebastian Mair
Marius Merkle
Jessica Neußer
Janna Nikonov
Kerstin Pfister
Simon Rehwald, Head of the Taskforce
Sebastian Siegel
Florian Tichy
Youssef Walha
Robin Weiß

Tutors

To be tutor at TUM: Junge Akademie means to volunteer during twenty months and give support to one of the student research groups of the specific year. The tutors assist and advise the teams in the team building process, the development of the hypothesis and the respective investigation about, as well the research question as the elaboration of the method.

As mainly all tutors participated as scholarship holders in one of the cohorts before, they know very well the Academy´s approach, the strengths and weaknesses of the project realization and implementation. In this context, the tutors draw on experiences from their own student research project work. When searching for and approaching experts and other contacts, they represent important interfaces for the teams due to their already existing networks.

They are also role models for the young bachelor and master students of their teams, giving them the opportunity to get insights in the doctorate career path, as almost 80 % of all TUM:JA alumni are realizing or have already concluded their doctorate studies at TUM or another university in Germany our abroad.

The tutors do not only give and contribute as volunteers but also benefit from their commitment as well, as they gain important experiences that strengthen their skills by taking over management tasks, motivating the team, giving feedback and moderating conflicts, without interfering with the team's own freedom of decision.

See List of Tutors Year 2017/II, p. 12

Supervisors

The supervisors who become involved at TUM: Junge Akademie are mainly personalities from the group of active and retired professors of the Technical University of Munich and our partners. A few, by exception, could also be science managers or TUM alumni with specific expertise who, in the context of the project's questioning, fit in perfectly with the teams.

As supervisors they support their respective student research teams throughout the period of twenty months. Due to their years of experience they are ideally prepared for this task: They advise their groups regarding the orientation of their research question and with creativity.

They critically but constructively question the aims and methods, bring in expertise in scientific topics and keep quality standards in mind. Due to their work inside and outside TUM they are also part of a large network that can often be used to support and promote the projects.

It might also happen that one of the supervisors becomes a personal mentor of an individual team member, and this therefore represents a profitable factor for all sides. In the course of project work, they get to know each other, build trust and individual commitment to their protégée, open doors, recommend further and support the young scientific talent on his or her personal career path.

See List of Supervisors Year 2017/II, p. 10

Office

The office of TUM: Junge Akademie is the hub of the scholarship program. It is the meeting place for the student research groups, serving not only during official business hours for the exchange and networking of scholarship holders, their tutors and supervisors, but it's also used extensively during the late evening and weekend. Not infrequently, several teams and Taskforce groups as well as the board members use the rooms at the same time.

In this mood of creativity and enthusiasm, the office team, Maria Hannecker (Team Assistant) and Peter Finger (Managing Director) work day in, day out, week after week with their student assistants. They are the heart of the Academy and ensure that the decisions taken by the Advisory Board are successfully incorporated into the overall strategy of the program.

That includes, amongst other things, the proper management of finances, the development and implementation of attractive training opportunities and communication with external and internal partners. The office team acts as specified by the Advisory Board and ensures that current and former scholarship holders of the TUM: Junge Akademie perceive and experience themselves as a network.

They are the ones that encourage fellows to think about the basics in order to achieve an overall attractive project goal. They link the scholarship holders with the administrative units of TUM, but also point out the limits of what is possible and feasible and, in many cases, are a great source of contact for the small and big things in the life of the scholarship holders.

The TUM: Junge Akademie is managed by the Senior Vice President for Academic and Student Affairs of the Technical University of Munich, Prof. Dr.-Ing. Gerhard Müller. In this regard, he is operatively supported by the office team that currently consists of the Managing Director, the Team Assistant and Student Assistants, what is a great pleasure to do.

We love to facilitate your time at TUM: Junge Akademie!

The Office Team
Peter Finger, Maria Hannecker, Lisa Hamm, Nicola John ■

Highlights – photo gallery of Year 2017/II

In addition to the invaluable experiences, learning and networking directly associated with the student research projects, the scholarship holders benefit of an attractive supporting program of training with varied opportunities for personal and professional development. In this context, they are able to participate in a wide range of events such as discussions and workshops, and cultural events such as concerts.

Kick off

First Futurelab

November | December | January | February

Alumni2Newbies

TUM running group

Visit MunichRe-Art Collection

First Intermediate Evaluation

Information event

Second Intermediate Evaluation

March | April | May | June | July | August | September | October

MatchBox Workshop

Day of Initiatives

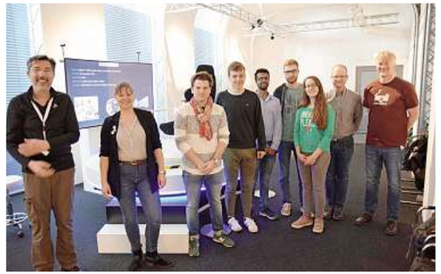
Visit VRlab@Deutsches Museum

Symposium "What is your creative spark?"

Project ending weekend Year 2017/I

Second Futurelab

Visit VRlab@Deutsches Museum



Third Intermediate Evaluation

November | December | January | February | March | April | May | June

Science Hack

PIXIDA Workshop

Photo Workshop with Dominik Irber

Campus Run

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Prof. Dr. Dr. h.c. mult. Wolfgang A. Herrmann

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Audimax, TUM Main Campus
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