Project Report **SciCom**

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SciCom

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 so-cial 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 Sci-Com 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 non-sensical – they yield the most truthful depiction of the status quo. Thus, looking at the influence of scientific insights on policy mak-

ing 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 re-

viewing 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).
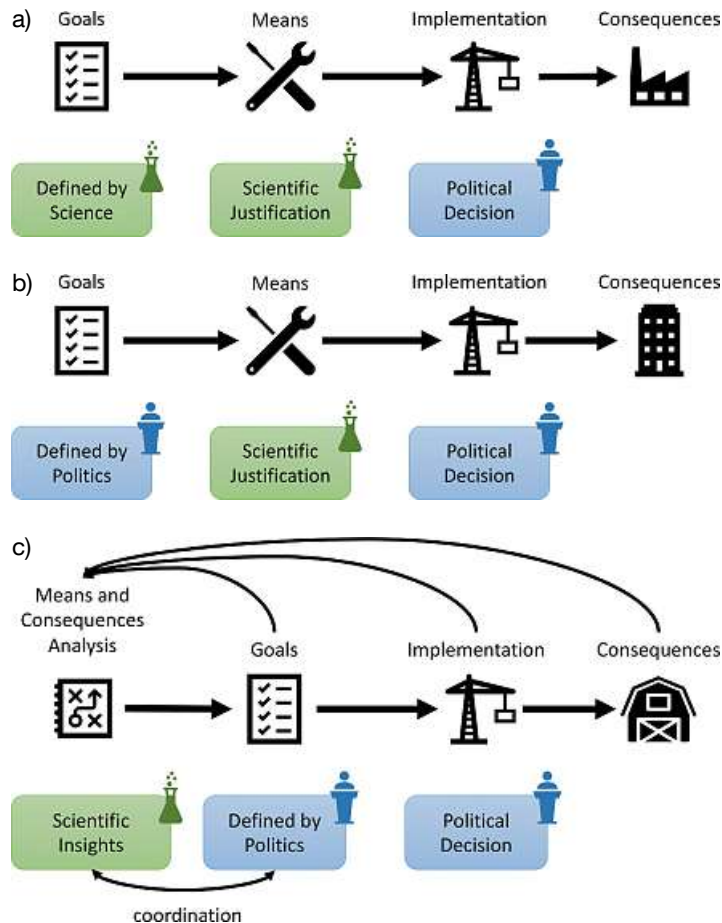

Figure 1: The (a) Technocratic, (b) Decisionist and (c) Pragmatic Model of Interaction between science and politics in political decision-making processes (Edenhofer 2011; Kevenhörster 2013)

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 non-existent (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
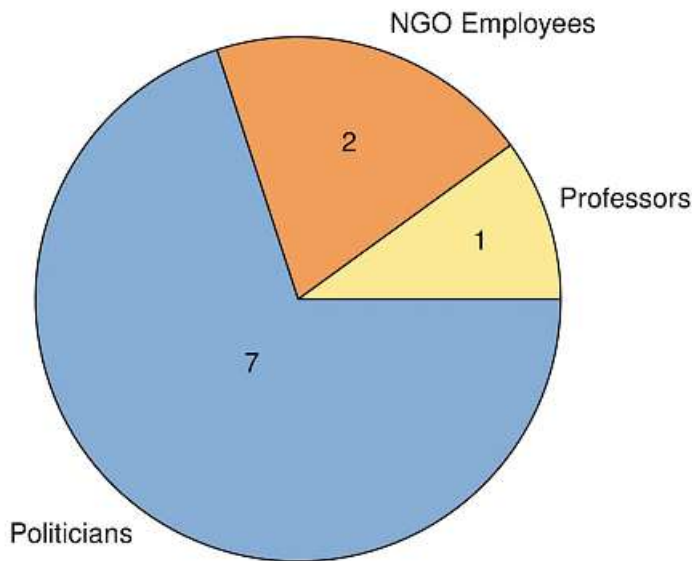
Figure 2: Background of interviewees

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
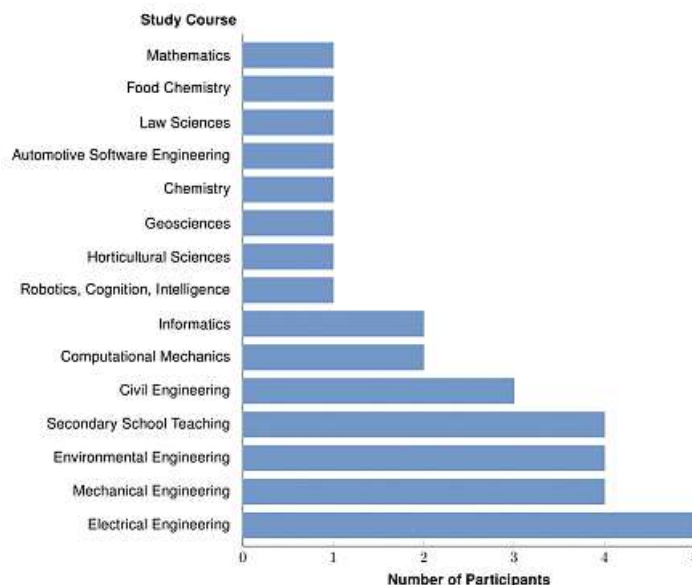
Figure 4: Study courses of the participants of the survey

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))
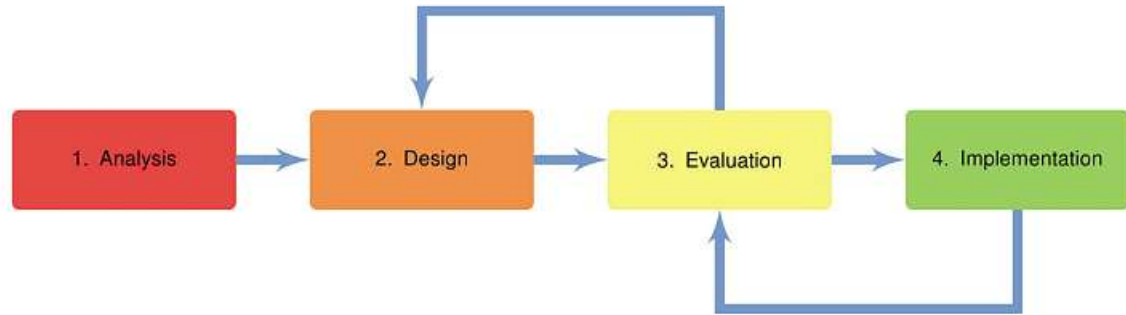
design process shown in Fig. 5 was followed in the development of the collaborative platform. The prototyping, interface design, and implementation of this website is covered in detail in Sections 4.2.1, 4.2.2 and 4.2.3, respectively. The development process was iterative and the first working prototype 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.
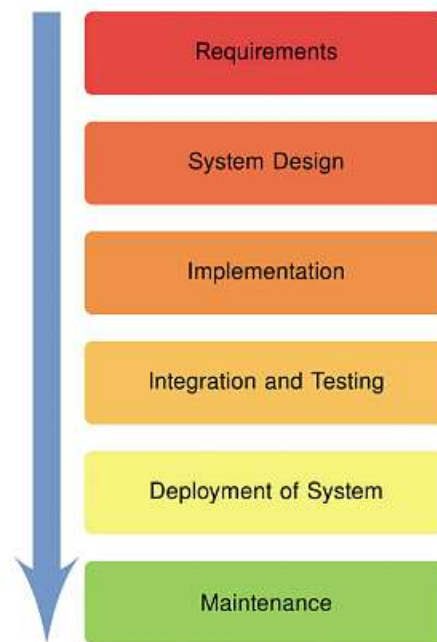
Figure 6: Waterfall model (Modified, taken from Sharma (2016))

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).
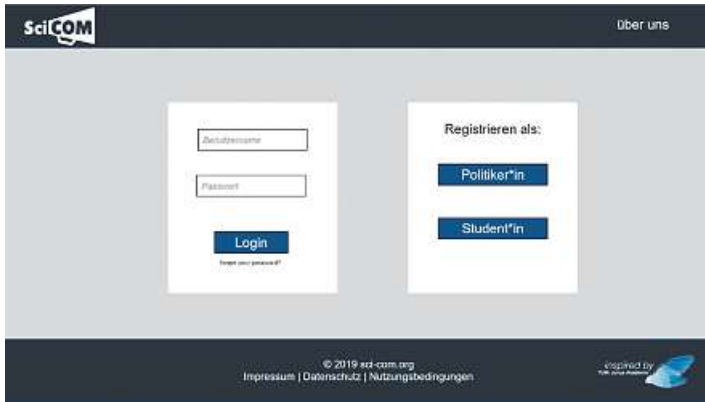
Figure 7: Login/registration

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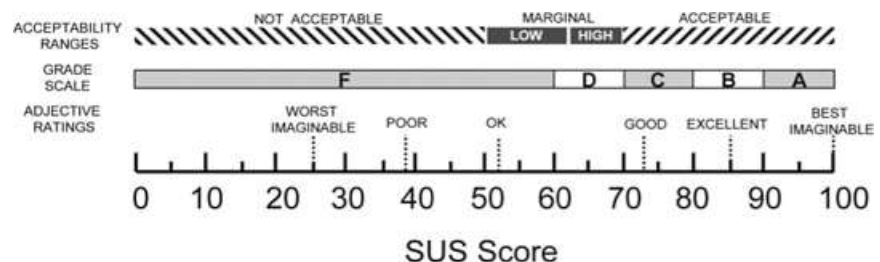
Figure 11: Classification of SUS scores on an acceptability scale, a grade scale, and an adjective rating scale. Reprinted from "Determining what individual SUS scores mean: adding an adjective rating scale," by Bangor, A., Kortum, P., Miller, J., 2009, Journal of Usability Studies, 4 (3): 114–123.

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 distri-bution 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 web-site, 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. ■

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ABSTRACT
We study the influence of communication of scientific insights on political decision-making processes, focusing on the interaction between scientists and politicians on the matter of public policy. After analyzing the interaction process, we aim to propose ideas for improvements and implement them practically.

RESEARCH QUESTION
How does scientific advice influence decision processes in politics?

SIDE GOALS
- What are criteria for choosing scientific advisors?
- Which factors influence the decision making-process of the politicians?
- What are the levels of influence of the different types of advisory boards?
- What is the influence of public opinion on the scientific advice process?
- To what extent is the advisory process bias-free?
- How does policy advising differ from lobbyism?
- Which checks and balances preclude premature, inaccurate, biased reporting?
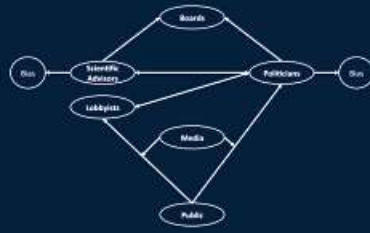
TEAM STRUCTURE AND PROCESS
We are an interdisciplinary team with nine members with very different scientific and cultural backgrounds. Tasks are assigned equitably in order to generate similar workloads for all team members. Work is done both individually and in smaller task-forces. We meet twice a month to discuss progress and decide on future plans. A hierarchy does not exist; all members are equal, but we have a project speaker and two persons in charge of the website and the TUM wiki. Responsibilities of moderation and writing the minutes during meetings are taken up on a rotating basis. Our tutors and mentors are a very important part of the team as they provide us with timely and valuable feedback.

OUTCOME
Our most important accomplishment to this day is having decided on a research question. On our way to this we first tried to get an exhaustive view on communication involving science and scientific matters. Next, we decided that a question dealing with the relationship of politics and science was most interesting to the team. With this in mind, we worked out the basic structure of communication between politics and science, especially in policy advice, and identified the relevant stakeholders. Having understood the basic outline of the communication process we then decided on our research question.

SUMMARY AND FUTURE GOALS
In technoscientific societies, science and technology are intertwined with societal and political issues. In this context, the interaction between the scientific and political institutions impacts citizens' lives in the present and directs society's developments in the future. The line of research that we have chosen is "How does scientific advice influence decision processes in politics?" Aspects like the criteria to choose scientific advisors, the level of impact of different advisory structures, influence of public opinion and the bias in the process have to be considered.

To finalize our research question, we have had several rounds of discussions and brainstorming to narrow down our ideas and set goals regarding our team's topic i.e. "Communication of Scientific Insights" and further subtopics. An early overview of relevant literature in addition to legal and general guidelines has been made. We have involved our mentors and tutors in the process and asked them for feedback.

Our next steps include a deeper look into the literature, preliminary data collection, building contacts, conducting interviews with scientists and politicians, and investigating agents, actors and stakeholders in the network.

MAY 2018

FURTHER READING

MEMBERS Barbara Gleißl, Sebastian Leicher, Himanshu Parandikar, Sabrina Schwarzmeier, Sebastian Siegel, Patrick Strobl, Maryam Tatari, Victoria Treßel, Paul Vollrath

TUTORS Alexander Biederer, Matthias Lehner, Xenia Priebe

MENTORS Prof. Dr.-Ing. Martin Buss, Prof. Dr. Klaus Mainzer, Dr. Florian Röhrbein

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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 ■

SciCom

TUM

I.] RESEARCH TOPIC

Team SciCom studies the influence of communication of scientific insights on political decision-making processes, focusing on the interaction between scientists and politicians on the matter of public policy. After analyzing the interaction process via interviews and a questionnaire, we are developing a web-tool/app to improve the process on the local level by connecting politicians and students/scientists for giving advice.

II.] SIGNIFICANT RESULTS

1. In local politics, the scientific advice process is less formalized and plays a less significant role than on higher levels. Reasons for the lack of involvement of scientific findings include money and time constraints, combined with the reduced specialization of some local politicians due to their volunteer status.

2. Local politicians have a high interest in ideas and input from students. Help in the form of internships or theses on the topic is especially appreciated on long projects which should lead to a proposal.

3. Students overall feel confident to provide policy advice, mostly if they are already advanced in their studies. They overwhelmingly believe, that scientific advice by students can lead to better political decision-making.

4. The strongest motivator for students is altruism, while career advancements such as internships and CV achievements are ranked low.

5. Students prefer to use the tool on the smartphone versus other devices. Nonetheless, they would rather give advice in person compared to only digitally.

6. Due to the need for data protection, the app should only connect the two sides directly. As politicians prefer students who have a personal connection to the projects because they live in the area, the local aspect will be another category to filter.

7. The web-tool/app should be started at a kick-off event with local politicians and students. This will give the possibility to reach a critical amount of users for the start of the app. All of the interview partners showed interest in participating at such an event.

III.] ACHIEVED MILESTONES (since the 2nd Poster)

- Finished expert interviews with politicians
- First round of public study via questionnaire
- Project decision on a web-tool facilitating connection
- Definition of specifications and use cases
- Design prototyping
- Hiring of HiWi for implementation

IV.] FURTHER TIMELINE

End of January	Base functions implemented
Early February	Alpha testing with party members and additional testers
End of March	Implementation finished
Early April	Beta testing with local politicians
April & May	Improvement, evaluation, and final report
June	Kick-off event

JANUARY 2019

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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.