

TUM: Junge Akademie

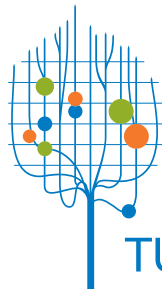
Project Reports 2015/2016



TUM: Junge Akademie

Project Reports 2015/2016

Partner of



TUM Universitätsstiftung



Welcome to the TUM: Junge Akademie!



In this booklet the results of the 2015/16 project groups are presented. Bright students, each of them equipped with specific talents, formed teams to work on future issues. The success of their work is not just the outcome of a systematic work-flow, starting with a well-defined task and ending with a final review of how effectively everyone has fulfilled his or her clearly ascribed duties. The underlying processes at the TUM: Junge Akademie are much more complex and involved than this. They start with an individual *reflection* as a basis for the *perception* of societal needs or deficiencies. They continue with the *projection* of the observation onto an individual project idea, onto a *hypothesis*. This is followed by a collaborative *plan* which results from a process of discussion, questioning, synchronization and feasibility evaluation in teams. Thus, the “talk the talk” of the previous steps is slowly shifted to the “walk the walk” of the following steps. However, some iterations in the sense of *do-check-act* are necessary before the group moves from the plan to the final consecutive *actions*. The fuel of this process is scientific analysis, creativity, craziness, open criticism, commitment, and good communication, putting “established truths” and paradigms into question.

Why do we invest such a lot of time and energy into our TUM: Junge Akademie? We do this as professors and external professionals, mentoring the teams with our expertise; as scientists and alumni, offering our experience to the projects as tutors; as TUM Board of Management in our continuous search for new formats of education and support that will help to cope with the future challenges of our society. We do this as we know that our excellent graduates will have the responsibility and power to shape the future. They will have to distinguish and proactively steer disruptive and evolutionary processes, to understand, analyze and balance conflicts of interests, and to act as moderators and communicators. The project

work evolving at the TUM: Junge Akademie catalyzes the acquisition of the necessary corresponding competences and attitudes and exercises spirit, heart and brain together. Uniting enthusiasm, reflection and optimal deployment of the individual strengths of team members, the projects engage with the prerequisites for fruitful processes in the societies our graduates will be responsible for.

This year’s theme, “Transformation Processes,” is an ideal basis for the dispute with societal challenges. Are pending processes ignored to avoid leaving our comfort zone? Are processes well steered or are they anarchic? And, where are the great and still hidden potentials for new developments?

In this book, you can also read about the further development of the projects of previous years, about the projects in prospect for the coming year under the new theme of “Decision Processes,” as well as about other activities unfolding at the TUM: Junge Akademie.

My sincere thanks to all the mentors, 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 the continuous support of the format, to the managing director Herr Finger, to Frau Hannecker and their team for their invaluable and highly professional guidance, and to the members of the task forces and the Board of Members for their creativity, devotion and enthusiasm.

Enjoy reading this book and exploring the projects!

Yours,

Gerhard Müller
Senior Vice President Academic and Student Affairs



Dear members, friends and supporters of the TUM: *Junge Akademie*,



The TUM: *Junge Akademie* represents a key commitment by the Technical University of Munich to support the early promotion of highly qualified students who demonstrate particular engagement above and beyond their specialist areas of professional study. The funding for the Academy comes from the resources of the university and its closest sponsors. More than other universities, we want to create a forum for the collaborative interaction of our students, to stimulate the alumni spirit, and to contribute to the expansion of horizons for all involved.

The current Academy Year, which will soon come to an end, has worked under the umbrella-theme of “Transformation processes” in order to spread scientific knowledge throughout society, to establish new connections between different branches of science, and to test new forms of knowledge transfer. To achieve such things, the Academy needs young talents who can break through the barriers of prejudice and habitual thought. Therein lies the deeper significance and true mission of the TUM: *Junge Akademie*. The Academy has previously concerned itself with the modernization of different disciplines at TUM, with themes to do with our future vision for excellence initiatives, and, not least, with the topic of “Agenda Teaching”, which related to the core area of student life. The results were in every respect commendable and bore the unmistakable stamp of youthful vigor.

Living transformation requires a willingness to change and that is the very trademark of the TUM: *Junge Akademie*! Indeed, we have a very special initiative that I would like to introduce you to: Germany’s one and only program for students who have left their countries because of political reasons – the Auditor Program for Refugees. Our donor, Ingeborg Pohl, has provided 500,000 euros for the program to enable it to make a rapid and efficient start. Refugees will gain a unique opportunity to secure a real future for themselves, while at the same time, through their mentorship of the refugees, Academy members and more than two hundred students and staff members from different disciplines will gain a range of invaluable intercultural competencies.

I would like to thank all those who have personally committed themselves to thus acting as role models, for this will certainly contribute to the international standing of TUM no less than the scientific advances that we are making here every day in our successful university.

TUM: *Junge Akademie*: vivat, erescat, floreat!

Cordially yours,



Wolfgang Herrmann
President

„Anyone who lives within their means
suffers from a lack of imagination.“

Oscar Wilde

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Projects 2015/2016



Project Report **Foodture**

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Watching the clock: It is already past 9 pm. Five people are sitting in the kitchen. Everyone is exhausted and hungry. Everyone is full of hope and excited for what happens next. On that day we attended classes, worked hard, learned extensively, studied productively; headed home to pack leftovers found in our fridges we knew exactly we would not process on daily basis anymore and hurried to the meeting point. We met at a team member's kitchen starting to prepare a nice dinner. As we are sitting here, three hours have passed since we met; three hours of washing and chopping ingredients, discussing the most different issues and – incidentally once in a while – enjoying the fact that no food was wasted. Eventually we conjured up a fantastic three course menu – just for us – and now we are finally ready to enjoy it.

Our project-group “Foodture” is based on the ideas that we discussed at the very beginning of the Project Year 2015, last summer. As we tried to examine food wastage as a problem, we realized that we could also focus on our own attitudes in the first place rather than pointing at others. Many discounters sell fresh vegetables insizes that a sole student would not be able to finish them in time. The two-kilogram bag of potatoes is an outstanding example, as the likelihood that more than half of it will remain unconsumed and finally be forgotten is very high – just until a moldy smell reminds one of its existence, and suddenly one is confronted with the cheerful sight of primary fine potatoes presenting themselves littered with sprouts over their former immaculate skin. Does this sound familiar to you? After experiencing such a scenario repeatedly, it is not surprising that the majority of people decides to take the more convenient option of choosing food which is always available, quick and cheap: Fastfood. Two thirds of men and 50 percent of women are already overweight. Should we just stand back and keep watching this happen? Or should we seek for alternatives?

That evening, our group began with a starter dish of mixed salad and fruity toppings made of banana and apple. “I never would have made a salad like this for myself”, said one of the group members. “This is something completely new for me – combining salad and fruits. What a great idea!”, another one added. The salad made us strive for more. In this case, more costs actually less, because the only thing we had to buy additionally for the salad was fresh lettuce. Total costs: 75 Cents. More people cutting salad made it faster and easier for everyone. On top of that, giving each other

advice about different cutting techniques, the kitchen might quickly become a healthy, simple and social environment for everyone.

In Korea, a survey among students indicates that students who live alone tend to eat fast and easily prepared food, while the ones who share a flat are more likely to cook fresh food as a ritual of coming together. If you consider your daily train ride to work or school for a second, one of the first images entering your mind might be people eating their croissants and sipping their take-away cappuccinos being somewhere lost in their own thoughts. Obviously, spending some time together while eating is not a popular trend anymore. In today's fast-paced world, it is simply not possible anymore to have three-hour brunches with your beloved ones every day. Everybody knows the challenge of having enough to eat while time is lacking once more and then we also are grateful for having the opportunity to grab some food along the way. Importantly, one must not forget the social aspects doubtlessly inherent in traditional food consumption. As an alternative to fast food, emphasizing on the old forgotten social aspect, we thought about starting frequent social-cooking events. As the German philosopher Georg Simmel once said: “The thing that people have in common most is the most obvious thing: the need to eat and drink.”

Talking of common things, during our cooking event it was the joy glistening in everyone's eyes when the dessert was served: Kaiserschmarrn with an apple-pear mousse, followed by a main course which took all of us on a undiscovered, gustatory journey. Swedish potatoes and turkey schnitzel scalloped with tomato and gorgonzola cheese. Both baked in the oven. Both untried before. Both dishes we never would have prepared on our own, we all agreed.

We, of course, also agreed on the fact that such cooking evenings cannot be enjoyed every day. But is that really our main concern? We want to focus on cooking fresh meals together in a warm-hearted social environment, on the idea that everyone contributes leftover ingredients saving money and reducing wastage. Having fun and cooking together, inspiring each other and enjoying the whole event.

Abstract

In today's society, health and efficiency have a higher priority than ever before, since people are increasingly falling back on unhealthy and expensive nutritional solutions. We, as the members of "Foodture", set ourselves the mission to challenge this trend by organizing social-cooking events, so that the participant's body and soul benefit from this unique experience.

1. Background

Every year, 11 million tons of still consumable food gets wasted. Each and every individual can be part in changing this since 61% of that food ends up in the household's garbage. The fact that a huge amount of our food is discarded should be concerning to everyone – not only for ethical, but also for financial reasons. The yearly costs per citizen buying food which is never consumed is worth of 235 euros. [1]

At the same time, while eating together has become old-fashioned, eating alone has become a general new trend. This tendency has developed especially among students, because most of them either do not live with their parents or do not have their own family yet.

"[Sharing meals] hints at commensalism being valued as a universal cross-cultural human trait. Rapid changes of lifestyles and food environment now make eating commensally more difficult (...)" [3]

A study led by Korean scientists covering 250 male students has shown that the ones who eat alone choose unhealthier food. They prepare less fresh meals for themselves, eat less fruit, but instead buy more ready-to-eat meals or soup. Surprisingly, they gain 400 kcal less than the ones who eat together. However, no subject exceeded the recommended daily amount of calories. [2] An eight-year study covering about 40,000 Thai people has shown that eating alone and being unhappy are related to each other. [3]

Nowadays, it is not that easy to influence the eating behaviors in a positive way since our environment limits us in our own freedom of decision-making stronger than we might notice. The social and cultural norms, the supply from the food industry or the availabil-

ity of food in our environment play an important role such as the influence of our family and friends. Our decision matters only after considering all these influences. [4]

A study of the Federal Ministry for Food, Agriculture and Consumer Protection stated that women see themselves as better cooks than men, can do it, but the difference is far less distinct between students (19-34 years) than in the older population. [5]

The project group "Foodture" combined its awareness of this important topic with a mission, which aims to reduce the waste of food and build a common sense to consume meals in a social environment.

2. Goals and methods

The initial goal of the project was to encourage a reduction in wasting food. In parallel to this we also aim to support healthy nutrition whilst raising awareness of the social aspects inherent in consuming food. We decided to organize "Cooking Events" approaching our goals after a thorough discussion about the security of food supply, which was considered mainly under the topic "Transformational process." Organizing cooking events comes along with abandoning other promising ideas such as the placement of "ugly fruits" on local marketplaces or the establishment of shelves or fridges allowing an exchange of unconsumed food.

To realize our goals we considered a variety of solution strategies in the beginning which can be split into three categories. The first category focuses on the process of food production. Here, it is important to focus future food production processes, because our concern is to find healthier and more efficient means of nutrition and food production for future generations. Urban farming and the implementation of underwater green houses are some examples of possible future developments within this category.

The second category is focusing more on the food-wastage caused by a growing throwaway society. Here, we developed the concept of a special storage rack in supermarkets to redirect the unwanted "ugly food" into the value chain. The term "ugly food" refers to those vegetables and fruits that cannot be sold in the shops because they seem unattractive. A related idea in this category might be the establishment of commonly accessible fridges

in public areas. These fridges would allow for the exchange of food by people, who for example go on holiday and are not able to finish a product before it expires.

The idea of a common fridge led us to our third and final category: Enlightening society about nutritional facts. Here, we dealt with the challenges facing our society and the social aspects of nutrition, which brought us to the main block of our project.

To test the influence of society on nutrition we decided to develop a strategy of “Social-cooking-events”. We aim to examine the positive effects of social-eating on our habits.

Our website www.designyourfoodture.de serves as a contact point for people who want to have access to additional information or to register themselves for scheduled events. These events are intended not only to bring people together but also to help them overcome their individual challenges in the kitchen by cooking together. For every event, we covered different topics or tasks such as picking a specific international cuisine or buying groceries only with a given budget.

A huge advantage of these events is that one can automatically fight against food wastage. The participants can bring their leftover food. By leftover food we mean unused ingredients that are unlikely to be finished by a single person, but whose unnecessary disposal can be avoided by pooling them to create a shared with others.

An experimental event was conducted by our group members to calculate the costs and development expenses of such events.



The aim of this evening was to produce a three-course menu for a total of five euros per person. Participants were free to use their own unconsumed products as ingredients.

At the beginning of our event-experiment, every participant brought something from their own kitchen, which they would not have used their own.

At this point the question arises how to use the collected food and how to combine it to create a nice meal. As the variety and quantity of ingredients increases, it becomes harder and more time-consuming to make a final decision about what to cook. Therefore it has to be noted that it would be helpful to provide a clear framework of ideas for specific meals for future events.

For the event-experiment, the project team finally agreed to prepare the following menu:

- 1. Appetizer:** A basic mixed salad with apple and banana slices
- 2. Main course:** Oven-baked chicken breast fillet with tomato and Gorgonzola cheese Swedish potatoes (side dish)
- 3. Dessert:** Kaiserschmarrn



Only a small amount of extra ingredients had to be bought for this menu, such as the meat and Gorgonzola cheese for the main course. However, after dividing the total worth of additionally bought groceries between the number of participants, we figured out that none of us paid more than 2.20 € additionally, which fulfilled our expectations to not exceed five euros per participant.

"That is totally a new thing for me! I never thought of putting fruits into a salad."

The most important success of our evening was the fun we experienced from cooking together. After deciding on the menu, we quickly distributed the tasks evenly so the plates were soon filled with the first dish.

Cooking as a team did not take very long, but when it came to eating, we certainly took our time and discussed about different things concerning the meal.

We ate delicious food, laughed a lot and enjoyed the self-brewed beer of one of our team members. This evening was a great success for all of us.



Recipe for the main course:

Baked chicken breast fillet with tomato and gorgonzola

Ingredients for main course

| Amount | Ingredient |
|---------------|-----------------------|
| 600g | Chicken breast fillet |
| 1 Tablespoon | Salt |
| 1 Tablespoon | Pepper |
| 2 Tablespoons | Olive oil |
| 4 | Tomatoes |
| 150g | Gorgonzola cheese |

Swedish potatoes

Ingredients for Swedish potatoes

| Amount | Ingredient |
|--------------|--------------------------|
| 200g | Crème fraiche |
| 200g | Sour cream |
| 400ml | Meat broth (Very strong) |
| 1kg | Potatoes |
| 50g | Butter |
| 75g | Smoked ham |
| 5 slices | Toast bread |
| 1 Tablespoon | Rosemary (Fresh needles) |

Preparation

1. Cut the chicken breast into slices, season them with salt and pepper and sear both sides in oil, then put them in a baking tray
2. Cut the tomatoes in slices, season them with salt and pepper and spread them on the chicken slices.
3. Cut the cheese in thick slices and spread them on the tomato slices
4. Bake the pieces in a preheated oven (200 °C) for 15–20 mins, until the cheese melts

Preparation

1. Mix sour cream and Crème fraiche with the meat broth and fill a big oven dish with the mixture.
2. Cut the washed potatoes many times into thin slices so that the potatoes have deep cuts but stay as one piece. The distance between the cuts should be as long as the cuts made by an egg-slicer.
3. Put the potatoes in the oven dish so that their open-side is on the top and stand next to each other, but not on each other so that they can all be bedded in the sauce mixture.
4. Bake them for 45–60 mins, until the potatoes are almost cooked.
5. Melt the butter in between. Add smoked ham and rosemary in the melted butter and mix it with the bread dices. Spread the mix on the potatoes and put them back in the oven. Bake them until the bread dices are finely brown and potatoes are cooked.

After our successfully conducted experiment, we evaluated the results internally and decided to carry out the same experiment with other participants. We sent an invitation e-mail to all members of the TUM: Junge Akademie and also to some of the student associations and faculties. The event was analyzed and evaluated by a questionnaire. The results of the evaluation are discussed below intensively.

3. Outcome and discussion

A questionnaire has been designed for the assessment. The form is divided into three categories:

1. Personal questions
2. Nutrition habits
3. Evaluation of the Cooking Events

A questionnaire serves to check the hypotheses:

1. Cooking together encourages people to eat healthier.
2. Cooking together saves food resources.

Asking the participants questions about their nutritional habits helps us to understand the participant's daily nutrition and to see if the event changed anything concerning their eating behaviors. As we send the event's invitation through the Academy we had to find another way to collect the answers of our participants in order to keep their answers anonymously. Hence we created an evasys-account sending all participants an e-mail with the online interview right after the second event. Nine forms were completed, which represents a participation of 81.82%.

Of course, a random sample of nine participants is not enough to make a statistically meaningful statement about the tendencies of the population as a whole. Therefore, we used the data only to specify and improve the questionnaire for further events. The questionnaire thus serves as a baseline study.

A total of seven women and four men have participated in the event. All participants were aged below 30. We assumed that the youngest participant was at least 18 years old, because all participants were students. (Fig. 1)

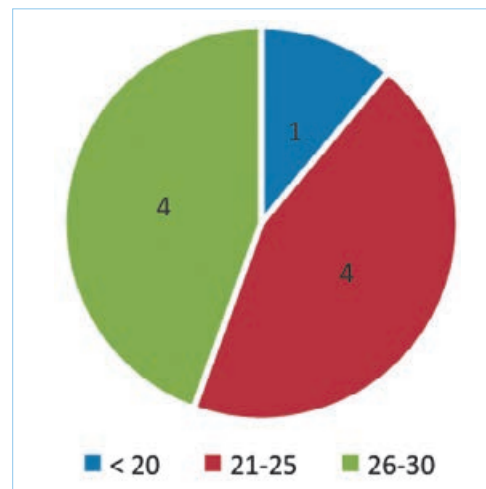


Figure 1: Age distribution of all participants in the social-cooking-event

There were students from six different study programs (Fig. 2).

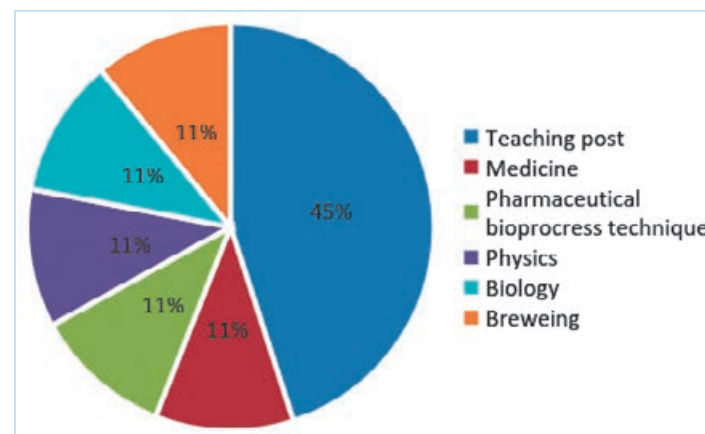


Figure 2: Distribution in study programs of all social-cooking-event participants

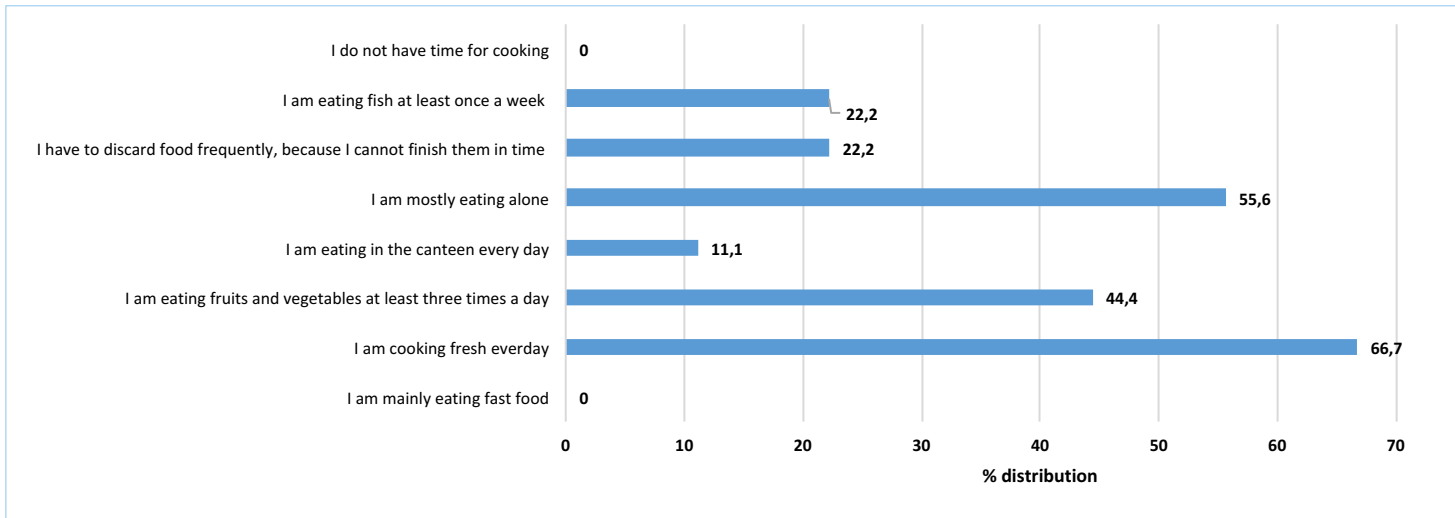


Figure 3: Results of the questionnaire on daily nutritional behavior

The results on daily nutrition habits show that a majority of participants (66.7%) cook one meal per day, but many of them eat on their own (55.6%). 44 percent of the participants indicate that they eat fruits and vegetables at least three times a day, while just 22 percent of them eat fish once a week. 11.4 percent of the participants eat either at the cafeteria or in the food hall every day, although no one stated that they are out of time to cook fresh. In

addition, none of the participants indicated that they mainly eat fast food. 22 percent of the participants have to discard food because the food is uneatable on regular basis. (Fig. 3)

Within this social-cooking-experiment, four participants spent less money than they would have spent on a regular dinner. At the same time many claimed that more leftovers and “remnants” were turned into something useful through the cooking event. Therefore, the hypothesis that “cooking together saves food resources” cannot be discarded. Of course, there is a need of further evaluation to confirm this hypothesis. All participants agreed on the fact that they had a lot of fun while cooking together whilst no one found it tiring. (Fig. 4)

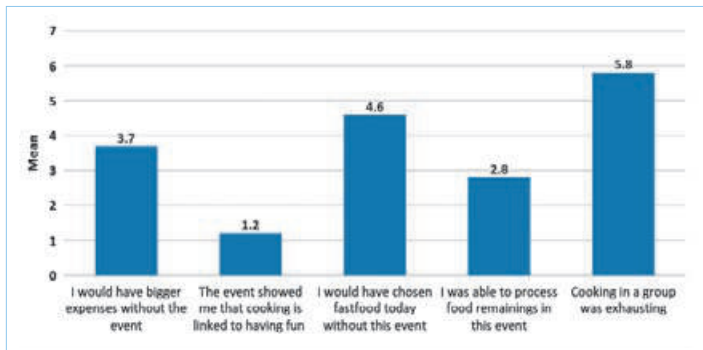


Figure 4: Results of the event questionnaire

The hypothesis that “Cooking together encourages people to eat healthier” can be verified not only by the questionnaire but also by the recipes that we received from the participants. Six participants mention in their forms that they would never choose fast food over a cooking event. In addition, none of the participants indicated that they would have eaten fast food if it wasn’t for the cooking event. The evaluation also showed that the participants’ food habits were already healthy before the cooking events.

4. Summary and future goals

The evaluation of our event showed that eating together is fun for all participants and can contribute to the saving of food resources. However, we could not prove that participants in a community eat healthier together than alone. The actual organization of further events will now be our highest priority. We also realized that we need to focus on improving our advertising skills in order to make events like this happen more frequently in the future.

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Project Report **Foodtrust**

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“Is ham also considered meat?” The man who asked me this might be well into his forties. He has a strong Bavarian accent, which is not surprising because we are in the centre of Freising, a small city twenty miles north of Munich. We are doing a survey on nutrition and randomly asking people to fill out two pages containing questions about food. The man was asked: “On how many days of the week do you eat meat?” With this and other questions, we wanted to find out what concerns people the most when it comes to groceries. The initial idea was to investigate the food industry and how management and certification ensure the quality of food products. Instead of asking the experts first, we were interested in what consumers know about these procedures and how they feel about them.

Initially, our project was aimed at a totally different goal. We wanted to travel to Kenya, to tackle the problem of food security in developing countries. But we found out soon enough that this was actually a lot harder than we thought. After weeks of research and talking to people who have been working on this particular problem, we were crushed by the magnitude of factors involved. We could not find a precise topic which we could use to develop a project. For instance, we found that The Farming Handbook of Kenya provides all the information one needs to grow profitable crops on virtually any site in Kenya. It was published years ago, but nobody seems to be using it – why? This, and similar dead ends, led us to the decision to reorient the project.

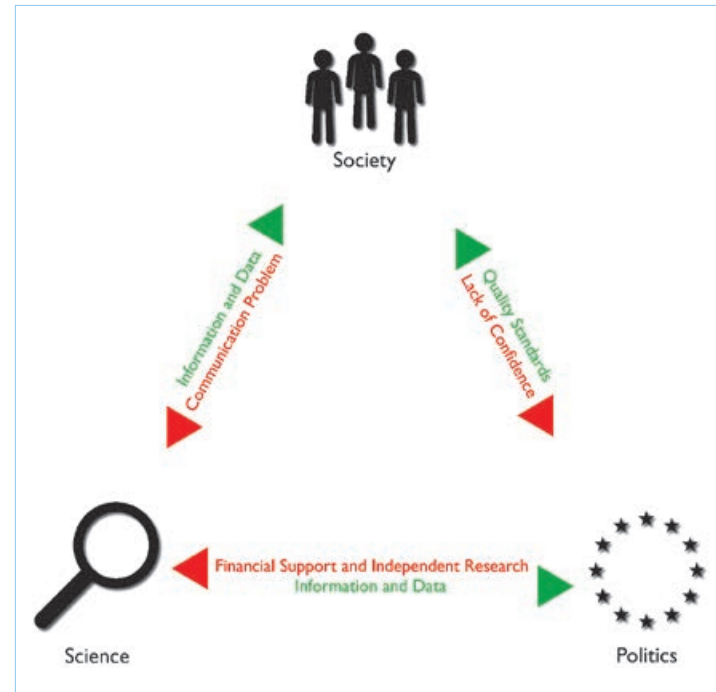


With our new project we achieved a great response in Freising. We had some vivid discussions with passers-by and we noted that there are lots of different opinions among the people. Most of them seem to rely more on “gut feeling” than on actual facts. The people were very interested in what we were doing and asked us about our project.

However, the results of the survey were inconclusive. Probably, our questions were not precise enough and we took previous knowledge for granted. With a second survey we wanted to dig a little deeper and to focus on what people actually know about food production and the origin of the food products they buy. We wanted to know whether they trust science and the policies involved with food safety and hygiene and if they believe that national and international law-making is in their best interests. We also revised our questions. For example, instead of just asking if people care about the ingredients of a product, we asked if they actually read the ingredients list which is printed on the packaging. This gave us more detailed information on how consumers actually behave when they are shopping for groceries.

Furthermore, we felt the need not only to portray the view of consumers but also of people dealing professionally with understanding and regulating the food sector. Therefore, we conducted a few interviews with scientists at TUM, politicians, and Bavarian government officials about their roles in food legislation. We asked them about their work and what they feel is necessary to ensure the provision of healthy and tasty food in our country.

Currently, we are working on a way to introduce a new method of placing consumers, scientists and decision-makers in dialogue with one another. We wish to increase transparency and the flow of information within this triangle of key players. Consumers have to demand what they want, scientist have to find out and communicate what we actually need, and politicians will have to listen carefully and decide how this can be translated into law. Our whole society could benefit from this simple exchange and in the end we can all enjoy a wonderful meal. And by the way, after all this research, we are pretty sure that the answer to the initial question is: “Yes, ham is also considered meat.”



Interactions between society, science and politics

Abstract

To address the issue of food security we sought to evaluate the knowledge of consumers about production processes and to find out about their food-buying habits and their opinions on food policies and quality control. For these purposes, we distributed two consecutive surveys to students and passers-by in Freising and via the internet. Among other findings, we discovered that people wish for more transparency in decision making. In the future, we intend to explore new models of communication that will facilitate dialogue among scientists, politicians and consumers and that will help to ensure a satisfactory level of food security.

Background

In order to tackle the problem of food security, we felt the necessity to expand the reach of the project across our borders. In Europe, provision of food and water is basically secure but in other parts of the world 795 million people suffer from malnutrition. In Sub-Saharan Africa one person in four is undernourished.¹

We wanted to take advantage of the fact that TUM is operating a research facility in Malindi, Kenya, to make a small contribution to the global effort to reduce world hunger.

During our extensive research we were not able to identify a single problem for which we could find a simple solution that could be developed into a project. We discovered that the current situation in Kenya is the product of processes that have been going on for many years and of complex factors that cannot be easily disentangled. We felt unequipped to match the work of people who have dedicated their life to the fight against hunger. Therefore, we cancelled our plan to travel to Kenya.

However, we were still intrigued by the idea of talking to ordinary people and hearing how they feel about their situation concerning nutrition and food in general. So we decided that we might as well do it here in our own environment. We observed that in our soci-

ety there is a cultural shift going on in the attitude of the people towards food. “You are what you eat” is no longer just a proverb.

In Germany, the sales of organic products were over eight billion euros in 2014, which is an increase of 11 percent from the year before.² Approximately 7–10 percent of the people in Germany claim to be vegetarians (numbers from 2015). This represents nearly a tenfold increase since 1983.³ We wonder if this is a product of increasing wealth in society?

Is it because of the recent food scandals that have focused a lot of media attention on how food is produced nowadays, particularly in connection with the production of meat?

After gathering so much data on Kenya and talking to experts in the field, we felt compelled to do our own research on the attitudes of consumers towards nutrition, buying habits and food safety. Therefore, we chose to do a survey among students and in the town-center of Freising. While this first attempt was rather a general evaluation of the status quo, we developed a second questionnaire which would go into more detail.

Goals and methods

The main objective of this study was to investigate the processes in science and politics which are intended to ensure a reasonable and reliable monitoring of the quality of food. We especially focused on the consumer's view of quality management in the food sector. Therefore, we did two surveys.

With the first survey, we wanted to investigate general consumer behavior in relation to the purchase and consumption of food and the levels of basic trust that people have in food security. Furthermore, we wanted to know to what extent the consumers trust the institutions that make laws in the food sector (the government/politicians) and the institutions that monitor or regulate the laws (food science/scientists and the food inspectorate/inspectors).

¹ <https://www.wfp.org/hunger/stats> (viewed on September 21st 2016)

² <https://www.foodwatch.org/de/informieren/bio-lebensmittel/mehr-zum-thema/zahlen-daten-fakten/> (viewed on September 21st 2016)

³ <https://vebu.de/veggie-fakten/entwicklung-in-zahlen/anzahl-veganer-und-vegetarier-in-deutschland/> (viewed on September 21st 2016)

With the second survey we focused on what people actually know about food production and the origin of food products. Moreover, we wanted to find out the most important decision criterion for consumers when buying food. We especially focused on the general scientific interest of the people and the impact of scientific findings in the food sector for buying decisions. Furthermore, we wanted to find out people's opinions on the current food laws in Germany and on the ways in which scientific findings are translated into legislation.

Both surveys were created, conducted and analyzed online with the evaluation software EvaSys (Electric Paper Evaluationssysteme GmbH, Lüneburg, Germany) and Microsoft Excel (Microsoft Corporation, Redmond, USA). For the first survey, we also interviewed people in the inner city of Freising and students of the TUM School of Life Sciences Weihenstephan. The sample size was 323 in the first survey and 41 in the second survey. The median age of the participants was 24.86 years in the first survey and 23.17 years in the second survey. The vast majority of respondents were students.

Results

The results from the first survey were, in part, quite surprising. One important result was that the participants oriented their buying decisions mostly according to the price of the products, which was not surprising as we interviewed mostly students. On the question of the sources of food, this was important for the students, but even more important for the people we interviewed in Freising. Quality seals, however, were not of high importance either for the students, or for the passers-by.

Furthermore, we found that the people trust food security in Germany and think that they can consume food without any health risks. But this trust does not seem to be well-informed, as respondents appeared to know little about the processes of food production and even less about the backgrounds of regulations in the food sector. Therefore, such trust would appear to result, rather, from the lack of negative experiences.

In order to differentiate the trustworthiness of different quality seals, we asked the people to rate ten different seals. It was especially noteworthy that seals of regional quality (like the "Staatliches

Biosiegel" or "Geprüfte Qualität – Bayern") and the Fairtrade seal received better ratings compared to EU and world-wide seals.

Finally, we asked people to indicate the importance for them of transparency in nine different fields. Food hygiene was ranked in top position, drinkable water in second and food security in general in third.

Another important and not less interesting finding on the matter of food security was that most people trust the executive that deals with complaints more than the political legislative authorities.

The results from the second survey confirmed some of the previous findings. Most of the respondents stated that they are interested in the source of their food and they inform themselves about it. On the other hand, they do not read up about the sources of the ingredients contained in their food.

Most likely due to the importance of the source of their products, people give more weight to the quality of a product than to the price. However, lower quality is accepted when it is less convenient to acquire a high quality, more expensive product. But still, one half of the participants would choose the high quality product.

According to our research, the respondents are sure that enough research into questions of food security is carried out but the results are too difficult for most of them to understand so they cannot use them as the basis for their buying decisions.

Finally, we were able to confirm another result of our first survey for, once again, people criticized the lack of transparency, especially within decision making processes.

| | | |
|--------------------------------|--------------------------------|--|
| EvaSys | [Copy] | |
| Technische Universität München | Philipp Rinner | |
| TUM: Junge Akademie | Umfrage Lebensmittelsicherheit | |

Bitte so markieren: Bitte verwenden Sie einen Kugelschreiber oder nicht zu starken Filzstift. Dieser Fragebogen wird maschinell erfasst.
 Korrektur: Bitte beachten Sie im Interesse einer optimalen Datenerfassung die links gegebenen Hinweise beim Ausfüllen.

1. Verhalten/ Routinen/ Kauf und Verzehr von Lebensmitteln

1.1 An wie vielen Tagen pro Woche essen Sie Fleisch? 0 1-2 3-4
 5-6 7

1.2 An wie vielen Tagen pro Woche essen Sie Fertiggerichte/ Fastfood (z.B. Tiefkühlpizza, Burger, Pommes, etc.)? 0 1-2 3-4
 5-6 7

1.3 An wie vielen Tagen pro Woche verzehren Sie frisch zuhause zubereitete Mahlzeiten? 0 1-2 3-4
 5-6 7

1.4 Worauf achten Sie beim Kauf von Lebensmitteln hauptsächlich? (Mehrfachauswahl)
 Preis Herkunft Inhaltsstoffe
 Lebensmittelsiegel Optik

1.5 Hier können Sie weitere Punkte angeben, die unter 1.4. nicht aufgeführt wurden.

2. Lebensmittelqualität/ Standards

2.1 Denken Sie, dass in Deutschland verkaufte Lebensmittel im Allgemeinen gesundheitlich unbedenklich sind? Ja, vollkommen Nein, keines falls
 Denken Sie, dass Lebensmittel in Deutschland unter höheren Qualitätsstandards hergestellt werden, als...
 2.2 ...in anderen europäischen Staaten? Ja Nein
 2.3 ...in nordamerikanischen Staaten? Ja Nein

2.4 Wie gut würden Sie Ihr Wissen über den Prozess der Lebensmittelerzeugung einschätzen? Gut Schlecht

2.5 Wie schätzen Sie die Überwachung der Lebensmittelerzeugung in Deutschland ein? Gut Schlecht

2.6 Wie beurteilen Sie die Transparenz bei der Erstellung von Lebensmittelvorschriften in Deutschland? Gut Schlecht Kann ich nicht beurteilen

2.7 Falls Sie "Kann ich nicht beurteilen" angekreuzt haben, begründen Sie bitte Ihre Wahl (Mehrfachauswahl)
 Fehlende Verfügbarkeit von Informationen Zu komplex Fehlendes Interesse

2.8 Wie sehr vertrauen Sie der Arbeit von Gutachtern und Vollkommen Sachverständigen im Lebensmittelbereich in Deutschland? Überhaupt nicht

2.9 Denken Sie, dass Gutachten unabhängig von Geldgebern und Interessenverbänden erstellt werden? Vollkommen Überhaupt nicht

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Questionary of the first survey

| | | |
|--------|--------|--|
| EvaSys | [Copy] | |
|--------|--------|--|

2. Lebensmittelqualität/ Standards [Fortsetzung]

Wie hoch beurteilen Sie die Vertrauenswürdigkeit folgender Lebensmittelsiegel?

2.10 Staatliches Biosiegel Hoch Niedrig Kenne ich nicht

2.11 Biosiegel der EU

2.12 FAIRTRADE

2.13 FSC - Forest Stewardship Council

2.14 EU-Herkunftszeichen

2.15 Geprüfte Qualität - Bayern

2.16 MSC - Marine Stewardship Council

2.17 Pro Planet

2.18 Qualitätssiegel der deutschen Landwirtschaft

2.19 Rainforest Alliance Certified

In welchem der Bereiche erachten Sie die Transparenz der Qualitätssicherung und hochwertige Gutachten für besonders wichtig?

2.20 Lebensmittelsicherheit Sehr wichtig Unwichtig

2.21 Lebensmittelhygiene

2.22 Lebensmittelverpackung

2.23 Lebensmittelkennzeichnung

2.24 Futtermittel

2.25 Trinkwasser

2.26 Nahrungsergänzungsmittel

2.27 Tierhaltung

2.28 Tierschutzanforderungen

3. Demografische Daten

3.1 Alter

3.2 Geschlecht Weiblich Männlich

3.3 Welche Erwerbssituation trifft am besten auf Sie zu?
 Vollzeit-erwerbstätig Teilzeiterwerbstätig Geringfügig erwerbstätig
 In einer beruflichen Ausbildung Nicht erwerbstätig

3.4 Wenn Sie nicht vollzeit- oder teilzeiterwerbstätig (bzw. in einer beruflichen Ausbildung) sind: Präzisieren Sie bitte, zu welcher Gruppe aus der Liste Sie gehören
 Schüler/-in an einer allgemeinbildenden Schule Student/-in Rentner/-in
 Arbeitslose Dauerhaft Erwerbsunfähige

Vielen Dank für Ihre Teilnahme und Ihre Unterstützung

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Summary and future directions

The results of the last survey show the opinions and views of society on questions of food security in scientific research and political decision-making. Most of the people trust the food inspectorate more than the politicians making regulations. In their eyes, scientists are doing enough research on food security. The consumers in general inform themselves about ingredients and the place of manufacture but they usually do not know anything about the origins of the raw materials or ingredients.

From the results of the surveys, we created a triangulation model for describing the interrelations between science, politics and society as far as food security is concerned. The views of science and politics are necessary to complete this model and therefore interviews with scientists and politicians seem to be essential. Scientists might be asked if they believe enough research has been done into questions of food security and at what levels of independence it was carried out. It might also be interesting to enquire into what scientists think about the relationship of society and science in food security.

We have scheduled interviews with scientists at the TUM research campus Weihenstephan in Freising and the LGL (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit). Within the political sector we plan to speak with people at the ministry of consumer protection or the ministry of agriculture.

After analysing the data from surveys and interviews, a realistic triangulation model of relationship between science, politics and society can be set up to properly address the question of food security. We hypothesize that there may be large discrepancies in views of food security among these three parties, as has already been suggested by our earlier surveys. In anticipation of this problem, our team is working on a new format for discussion that can bring together the three parties of “science,” “politics” and “society.”

The final aim of the project is to analyze the relationships between these parties in more detail and to use this analysis to promote improved communications and clearer information on food security so that consumers have a solid basis for trusting the legislative and executive food authorities.



Project Report #quasivegan

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“What? You have stopped eating meat! Why? Do you want to live healthier?” Almost all of my friends reacted like that when they heard that I had stopped eating meat. “Are you crazy?” was also a frequent comment. But the crazy thing is, they all got the reason at once. This suggests that everyone knows that living a vegetarian lifestyle might be the better alternative. So why do only a few people adopt such a lifestyle?

Almost eighteen months ago I started at the TUM: Junge Akademie. At the kick-off weekend, around twenty young students, including me, agreed to launch a project with the topic “nutrition”. Everyone came up with great ideas – but that was the problem! Finding a project all of us were happy with was more than challenging and the result was a break-up of the group into three smaller but still linked project groups.

I grew up in a classic middle-class family. It was and still is normal for my parents to eat meat every day and so did I. Starting my student life, I moved out. It’s not surprising that I cooked and ate as I had learned to do at home – meat almost every day. I knew, as well as my mentioned friends, that eating less meat would be good for me. Retrospectively, I can see I was just being lazy – too lazy to change my lifestyle. Many times since I moved out, I tried to diminish my meat consumption. The outcome was always the same: I reverted to old patterns, because it was easier to cook food I was familiar with and because of a lack of alluring alternatives. During the discussions in our project, I discovered that many other students evince the same behavior. To tackle this issue we decided to publish a brochure with vegetarian and vegan recipes. This will be distributed to first-semester students in order to help to reduce the consumption of meat and animal products. To counter some people’s concerns that they cannot get all essential nutrients, we post some of the micro- and macro-nutrients for each recipe. These are based on research as well as the insight that nutrition based on reduced consumption of animal products¹ is healthier.

In my case, only a radical solution was effective: I renounced meat completely. Therefore, I was forced to have my eating behavior always on my mind. Now I have a broader repertoire of meals I can cook easily and eating vegetarian does not mean any more expense for me. This hard work – changing lifestyle – can be facilitated with our new cooking brochure.

At the beginning of my vegetarian phase, I promised myself not to eat tofu. I somehow had, and still have, a prejudice against meat-replacement products. Anyway, after twenty-four days of “abstinence”, my flat-mate gushed over spaghetti bolognese and my promise was broken. I never thought tofu bolognese would taste so delicious. That led us to the second reason why many people eat so much meat: It is tasty, at least for many. Nevertheless, we want to persuade people, and especially students, to eat less meat and animal products and to give them free support with our brochure.

We named our group QuasiVegan. This name is intended to suggest that it is not the strict vegan or vegetarian lifestyle of a few that will change the world, but the small steps of the large mass of people. If every German citizen skipped one meal with chicken, approximately $(81,000,000 \cdot 0.2\text{kg}) / (1.8\text{kg} \cdot 2/3)$ 13,000,000 animals would be saved. Eating meat and animal products now and then is still OK and so all of us can be QuasiVegan.

There are also ethical arguments for not eating meat, but it was not the aim of our project to focus on these (though for those interested in this subject, I would recommend the book *Eating Animals* by Jonathan Safran Foer).

Finally, I can only hope that you try our recipes and enjoy them – and that you are inspired by our ideas. I can at least assure you that one person has already been sustainably changed: me!

¹ Compared to the normal German citizen



This meal is:

vegan



I need:

nothing special



Preparation time:

30 minutes



Food value:

Copper 61 % RDA, Manganese 75 % RDA, Folic acid 50 % RDA

Penne pasta on spinach-peanut-sauce

For two persons:

1 onion
1 garlic clove
20 g ginger
200 g penne pasta
salt
1 EL oil
125 g frozen leaf spinach
(defrosted)
100 ml unsweetened
coconut milk
50 ml vegetable broth
2 EL peanut butter
1 TL sambal oelek
2 EL lime juice
2 EL peanuts
(roasted and salted)

Preparation:

1. Peel onion and slice into small pieces, squeeze garlic clove. Slice ginger into small pieces. Cook the pasta in boiling salt water.
2. Heat 1 EL oil in a pan and steam onion, garlic and ginger 2 minutes in the oil. Squash the spinach, add it to the pan and steam it for a moment with the other ingredients
3. Add the coconut milk and boil everything up. Add the peanut butter and boil at low heat for five minutes. If necessary, add up to 50 ml vegetable broth. Flavour with salt, sambal oelek and lime juice. Drain off the pasta and mix with the spinach-peanut-sauce. Chop the peanuts and sprinkle over the pasta.

Abstract

#QuasiVegan offers information about a partially vegetarian and vegan diet, refutes the prejudice of exotic and expensive ingredients and provides specific recipes for a balanced and healthy diet in the form of a brochure.

Background

Micronutrients

Overview

Nutrients form the foundation of our lives. Besides the macronutrients, our body needs 33 micronutrients as the word implies in doses of micrograms. Amongst these there are 14 trace elements, 13 vitamins and 6 minerals. These substances are indispensable for our body and enable all vital functions of our organs (Jopp 2010).

“Micronutrients are able to advance as far as to the cell nucleus, where they have direct impact on the scanning of our gene sequences. In this way they activate and modulate our immune system. Thus a deficiency of these biocatalysts makes direct impact on metabolism and immune system.” (translated from Jopp 2010, p.13).

The Max Rubner-Institute gives an overview of the most important micronutrients (Max Rubner Institut 2008):

Vitamins:

- vitamin A, C, D, E
- vitamin B1, B2, B6, B12
- niacin
- folacin

Minerals and trace elements:

- sodium
- potassium
- calcium
- magnesium
- iron
- iodine
- zinc

Deficient supply

There are various deficiency symptoms, indicating the body suffering from malnutrition. Jopp describes six stages of the consequences of a shortage in micronutrient supply (Jopp 2010):

- stadium 1 and 2: depletion of histoid and osseous reservoir
- stadium 3 and 4: deficiency symptoms: lowered metabolism and accumulation of damages
- stadium 5: malfunction symptoms requiring treatment
- stadium 6: pathological malfunctions: irreversible damages

Deficient supply of micronutrients begins at toddler age and is a worldwide problem (Hilger 2015). Numerous studies prove this fact.

Kennedy et al. describe, for instance, the essential significance of all the 8 B vitamins for the brain functions. Higher doses than the recommended ones are reasonable. (Kennedy 2016). Jopp concurs and names numbers for potential “overdose” from one and a half the dose of folacin up to 166-times of vitamin B12 in comparison to the recommendations of the German Nutrition Society. He says that the RDA (recommended daily allowance) is only the bottommost limit which shouldn’t be reduced under any circumstances (Jopp 2010).

Migliozzi et al. adduce reasons for higher risks of diabetes, obesity, cancer and cardiac diseases due to deficient supply of micronutrients (Migliozzi 2015).

Especially for the increasing part of the world population living in megacities, the problem of “particulate matters” in polluted air plays an important role in human health, because they are respirable. Peter et al. state that a sufficient supply of micronutrients has a big chance of responding to this problem without drug-treatment. B vitamins as well as vitamin C, D and E lower the risk for pulmonary and cardiovascular diseases (Peter 2015).

Where to get those micronutrients?

The extent to which foods contain those life-sustaining micronutrients cannot be answered easily. Storage duration or methods of preparation play an important role.

There is an abundance of scholarly literature about this topic (see, for example, Dunkelberg et al. 2012). For a quick and convenient guide to what micronutrients your meal includes, we recommend an online search for “tracking nutrition”.

Reducing meat consumption

In 2008, 1.6 % of the German population lived as vegetarians and numbers are steadily increasing. Whereas in the past, nutritionists primarily focused on nutrition deficiency going along with vegetarianism, today’s discussion has shifted towards the preventive potential of a nutrition with reduced meat consumption (Ströhle 2006).

The German nutrition society (DGE) stated, in conformity to recent research results, ten rules for a healthy and balanced diet. One of the most important of these rules warns against an excessive consumption of meat, sausage products and eggs. According to the DGE, an amount of 300 to 600 g meat per week should not be exceeded. This includes a maximum of three portions (150 g) of meat and three portions (30 g) of sausage per week. Another of the ten rules calls for a reduction of fat and fat-laden food. A high uptake of fat may cause overweight due to the considerable energy content of fat. Disorders of the fat metabolism can often be traced back to the undue consumption of saturated fatty acids and may lead to cardiovascular disease. According to the DGE, 60 to 80 g fat per day should not be exceeded. It is recommended to buy special low-fat meat and sausage sorts. Additionally, fat-reduced ways of preparation like steaming should be preferred.

Although meat contains valuable mineral substances like iron and zinc, as well as B vitamins like B6, B12 and niacin, it also contains health-damaging substances like fat, cholesterol and purines. The latter increase the risk of contracting gout (DGE 2016a). There is scientific evidence that an exceeding consumption of red meat raises the risk of colorectal cancer and deadly cardiovascular diseases (DGE 2016b). A vegetarian diet minimizes these risks.

Every vital substance contained in meat products can also be ingested by eating non-meat products (Ströhle 2006). Vitamin B6 for example can be found in fish, vegetables and wholegrain products, as well as niacin in fish and wholegrain products. Iron can be found in spinach, peas and legumes (DGE 2016c).

The “Nationale Verzehrsstudie II” (national eating survey II) from 2008 is the most comprehensive survey on eating habits and food consumption in Germany. Its results reveal that men consume approximately twice as much meat and sausage products as women. On average, men consume 103 g meat per day, which exceeds the recommended value of 300-600 g per week considerably. Both men and women at every age exceed the recommended fat consumption amount according to DGE (Max Rubner Institut 2008). The DGE’s recommendations suggest a percentage of 30 % of an adult’s overall energy consumption to be ingested as fat. Furthermore, both men and women at all ages exceeded the recommended amount of protein consumption. A reduction of meat consumption could decrease those noticeably high values. This would diminish the risk of disease.

It is scientifically proved that people with a meatless diet suffer less frequently from overweight and high blood pressure, have better blood cholesterol values and consume less saturated fatty acids. Another important aspect of meatless (but balanced) nutrition is the substitution of meat with groceries containing healthy nutritional components like complex carbohydrates, roughage and secondary plant substances. Healthier nutrition, reduces the risk of contracting nutrition-related diseases like heart attacks, strokes, diabetes mellitus and cancer. The consequence is an increasing life expectancy (Leitzmann 2001).

Goals and methods

There are several main goals which form the objectives of our project. The most important goal was changing the perception of a quasi-vegan diet and removing the almost religious undertone attached to it. We are focussing our efforts on addressing TUM freshers with support for an easy transition into all day university life and getting a feel for a healthy diet. For these young students we want to provide an easy access to a balanced and meat-reduced diet.

Many prejudices come along with the vegan diet. It is supposed to be very expensive and difficult to maintain without suffering from various deficiencies. Our objective was to refute these prejudices by showing that vegetarian and vegan recipes are simple, cheap and healthy.

Overall, we intended to lower people’s resistance to trying vegetarian and vegan recipes. This way we wanted to support our freshers in the cooking of their own balanced meals and to make a

transition to an overall healthy lifestyle while beginning this new chapter at university.

We had a clear idea in mind of how we did not want to present our content and what goal we did not want to pursue. Our goal was not to turn our target audience into vegetarians overnight, nor did we intend to include the various ethical aspects that are often linked to this subject. We wanted to avoid a preaching, pseudo-religious approach and to focus on health and lifestyle advantages. Our main objective was giving incentives for reducing the consumption of meat and other animal products as part of a healthy lifestyle. Vegetarians and vegans have a variety of healthy dietary habits, which we wanted to condense and present to our TUM freshers. Reducing animal products is part of the task, but this measure alone won't turn a diet rich in prepared meals and other junk food into a healthy one.

In summary we wanted to motivate young students to take better care of their nutrition and maintain a balanced diet during the crucial period of entering university and organising housekeeping in a new city for the first time.

To reach out to the TUM freshers we decided to conceptualise and design a brochure, which was added to the package they receive on their very first day at TUM. This brochure includes 20 tasty and balanced vegetarian and vegan recipes. These meals are easy to cook with cheap basic ingredients which can be found at any regular supermarket. Furthermore, it includes some guidelines and tips on how to acquire the same habits that make vegetarians healthier than their meat-eating peers, without forcing a lifestyle decision on them.

We conducted an interview with Professor Daniel, head of the chair for nutritional physiology at the TUM School of Life Sciences. She stated that besides possible deficiencies in vitamin B12 or iron, which can be easily avoided with the necessary awareness, a vegetarian or vegan diet is perfectly healthy. However, the lack of comprehensive studies, with a sufficient number of participants over a long observation period, makes it difficult to make definitive and well-documented statements. Various sources indicate the health-promoting properties of vegan and especially well-examined vegetarian diets and a number of other healthy habits like avoiding alcohol and cigarettes, as well as taking regular exercise,

are more likely to be found among vegans and vegetarians – but otherwise it is difficult to make categorical statements. In conclusion, Professor Daniel disclosed her favourite vegan recipe: go to the supermarket, buy all the vegetables you like, get a wok and a sharp knife, fry everything with a little oil, use spices and a bit of coconut oil and serve with rice. These results are also part of the brochure.

In order to evaluate the impact our efforts had, we conducted a survey amongst current young students at TUM, asking them for their opinions on vegetarian and vegan diets. After the start of the new semester, we will conduct a second survey to compare differences in the perception of these types of diets and health-related lifestyle choices.

Outcome and discussion

The outcome of our scientific research including the detailed reflection about the consequences of a partially vegetarian and vegan nutrition, including the survey and the interview with an expert is a brochure, which intends to give some insights from the scientific point of view regarding vegetarianism or veganism. This brochure contains the mentioned research outcomes and provides 20 recipes which are low in costs, easy to cook and healthier than the average student meal. Each recipe contains specifications about high dosages of certain micronutrients in the respective meal. For better understanding we add an exemplary recipe at this point.

Summary and future goals

The summary for this project is split into two parts, one presenting the result of the project itself and one reflecting on our personal development while carrying out the project.

Our overall goal was to give positive incentives for change in a difficult and emotion-ridden sphere of life. We intended to sensitise TUM freshers for an important, but often overlooked matter. Normally nutrition is not a topic young students, especially at technical universities, are particularly keen on thinking about. At the time of writing this report we cannot give any feedback from students on our brochure, simply because it has not been printed yet. All steps in the project were completed according to plan and at this moment it is the designer's task to bring our content into its final form. On the other hand, we have found partners for the distribution of

the booklets and we attracted wide interest among several student representatives from various departments. We managed to find recipients for the entire circulation of 2500 leaflets.

From a personal standpoint, I can only state that we have learnt a lot! First of all we had an incentive to think about dietary questions intensively, which changed our perception about our very own diets. We had to find a way of negotiating such an emotion-ridden topic and presenting it in an interesting way. The main lessons with regard to project management were about gathering and processing the required information, conducting an interview with an expert, editing information in a legible and comprehensible way,

as well as working with editors and graphic designers in compiling the final booklet.

The main future priority for this project is to evaluate the students' reactions as well as gathering feedback from them. To do so we will repeat our survey with the new freshers and compare the results. Furthermore, we want to keep our contacts with the student council and establish the brochure as a permanent and long-term part of the information package of TUM freshers. After analysing the feedback we will consider changes and increase the number of participating departments in order to distribute an improved version to an even greater number of students.

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Project Report **Future of Mobility**

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From *the mobility of the future*
through *the future of mobility*
to *immobility*



What exactly does one imagine under the vibrant picture of “the mobility of the future”? A public brainstorming at last year’s Annual Conference of the Academy suggested that the idea of the “mobility of the future” is associated with sports cars, alternative power units, jet-packs or flying vehicles. Stuff we are dreaming off, things we have seen in science fiction. The common denominator was the expectation that in the future a more creative, individual and efficient locomotion will be designed.

We intended to achieve something for the future which could be developed to improve physical mobility. Innovative and even visionary ideas – like cable cars in cities, jetpacks working with water power or a “level” model, which can foresee different traffic levels and helps to efficiently enable and leverage mobility – were put forward. The conclusions we arrived at were much more surprising: instead of speeding up mobility, we found ourselves offering an alternative which is more static. *Immobility as mobility of the future.*

Before describing our image of future mobility, we briefly define what mobility means for us.

Mobility is an action which might be possible in many different forms – on our own or using an external power-source, fast or slow, submarine, through the air, above or below ground. In particular, the motivation to take such action might vary strongly: There are many different purposes lying behind daily actions such as shopping, going to work, vacation or a small walk in the neighbourhood. The only thing which is certain is that people have to move to satisfy their needs. Obviously, mobility is a means to an end. A physical distance between two points, A and B, is travelled to fulfil a necessity, which cannot be fulfilled at point A. The satisfaction at point B should first be spatially possible, in other words accessible. In this case, the distance to B is just an

obstacle and mobility is the instrument by which to overcome that obstacle. When someone goes to the supermarket, it is for the grocery shopping and not for the ride itself.

If the need actually lies in experiencing the distance that is traversed, for example when hiking or driving through a mountain pass with a roadster, then it is totally irrelevant where the application of mobility starts or ends. People aim for the experience they gain on the road, looking for a change of scene, the thrill of speed, physical exercise or a renewed perception of nature. In that case, the trip itself is actually the goal and mobility is an end to itself.

“The world is a spaceship with unlimited resources, which are depleted by a crew called ‘humankind’.”

– Prof. Dr.-Ing. Gernot Spiegelberg

“Mobility forgot what staying is.”

– Prof. Dipl.-Ing. (em.) Peter Latz

The factor of time defines the separation of mobility into two categories: If it comes to experience or entertainment, travel time might be assumed as a quantitative measurement of conversational amusement values. If mobility is only an instrument, then travel time depicts a measurement of inefficiency. This separation can be illustrated in the distinction between “grocery shopping” and “shopping.” Buying food is something that needs to be done regularly, while “shopping” is more of a leisure activity.

To sum it up briefly: Mobility describes a spatial action and also an instrument to fulfil needs.



We carried out extensive research to be able to break down the huge topic of “mobility” into manageable proportions in relation to its principal stakeholders. We also researched and discussed the term “mobility” in relation to various backgrounds. We highlighted five different aspects of mobility:

1. Locomotion instrument & mobility user (What does locomotion concretely look like? Why does a person have to move?)
2. Technology & innovation (How is the need of moving fulfilled?)
3. Infrastructure, traffic & traffic jams (How can we manage movement?)
4. City characteristics & demography (Where does movement take place and how do we change the environment?)
5. Utopia & visions (How does the future of movement look like?)

The results of our research were extraordinarily wide and complicated: mobility of the future can be associated with so many social, socio-economic, technical and ecological claims that it might lead to a significant conflict of objectives. We give an example for such a conflict: the demand of an individual to travel from A to B quickly competes with the demand of a society that all individuals should be able to travel successfully from A to B.

Because of the immense complexity of the topic, our project does not deal with the many technically and financially problematic cases which are more concerned with driving-assistance systems, new powertrain systems and new mobility services. Our project regards “mobility of the future” from a totally different perspective. It was not our concern to define the instruments that could help our organisation to move along in the future (“mobility of the future”). But instead, we were concerned with the question “If our society could make a movement in the future, how efficient would it be?” The term “future of mobility” can be described much better with that initial question.

The main question of many current debates is how a person can move more individually, more efficiently and in a more environment-friendly way. Unfortunately, we concluded that recent studies are not enough to answer our question.

Beside the actual forms of mobility such as cars, trains or airplanes, we decided also to look at challenges in physical mobility flow. An individual’s mobility-related opportunities are ever growing, space is a scarce resource and urbanisation continues. At the same time society becomes more dynamic and needs more individual movement. By requiring mobility, all of these factors limit mobility and make it inefficient.



Consequently, there is an increasing physical complexity expected, which counteracts an efficient physical movement in terms of time and space. This complexity and inefficiency would not arise if people could fulfil their needs without moving. It is absolutely in our hands to develop new forms of organisation and ways of life that could promote such a conversion. For example, an efficient home office would be a simple solution. Instead of driving to work every single day as a commuter, we could virtually integrate into the world of work by working at home for different companies. It is clear for us that physical mobility is not always a must to reach the maximum mobility level. And this is exactly the point from which our hypothesis of the future of mobility derives:

The future of mobility lies in immobility

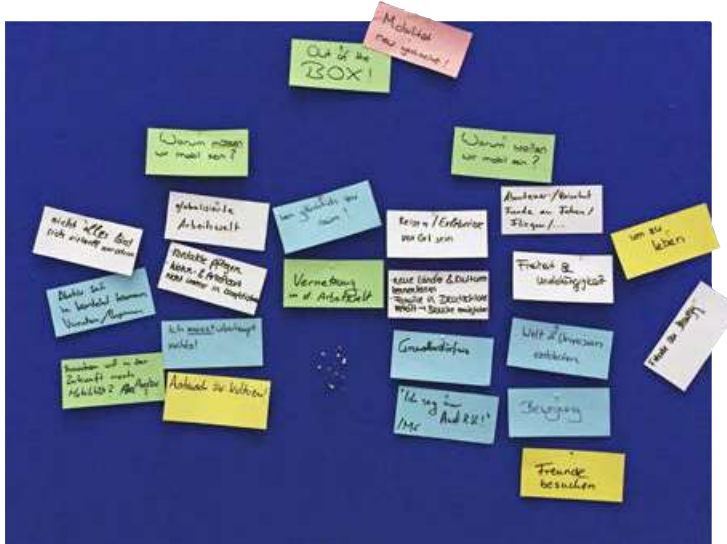
What we understand by immobility is a reduction of physical streams of movement, while the level of need satisfaction remains the same. That means a satisfaction of needs without travelling a physical distance. Ideally, an individual should not have to move physically to fulfil his/her needs.

In order to achieve this, a paradigm shift or a redevelopment of ideas about mobility is necessary. A wide network of mobility carriers, infrastructure and mobility users or mobility concepts derived from ideas of sharing could influence the consumer to go shopping several times a week. And the daily car driving could be replaced by an intelligent network of vehicles.

In that vision, the future of mobility should focus less on physical actions and much more on virtual, digitally possible mobility and an increased physical mobility of goods and other things, which can be easily controlled and optimised. The efficiency of the overall system and the burden on the environment and people will decrease. An individual will not move when he/she has to, but only when he/she wants to.

The outcome is a change in the range of services around mobility and new alternatives for urban planning. We take a look at the future of mobility. For us, it is certain that with future forms of mobility, we will move along less under pressure and stress and much more under positive need fulfilment.





Abstract

Today, mobility is generally examined from a commercial point of view that focuses on how future means of transport will satisfy contemporary concerns such as sustainability and efficiency. From a non-commercial point of view, we can tackle a completely different question: Is physical locomotion in fact always necessary? Mobility may well be regarded merely as a means to an end.

Thus, we formulated the hypothesis: *the future of mobility lies in immobility*.

The question, therefore, is not how locomotion takes place, but whether locomotion takes place in order to satisfy individual needs.

Background

Mobility – A Definition

According to AHREND et al. (2013:2), mobility is the potential to change one's spatial location. We expand the definition, as, nowadays, we see mobility also happening during a phone call: A caller's body may stay at a certain location, but his or her mind is actually at a different place.

Therefore, a person's opportunity to change his physical or mental standpoint – that is what we call *mobility*.

Mobility – Nothing but Satisfaction

Before the Neolithic Revolution, mobility was a mere need; since then, it has been a need for mankind (SCHINKEL:2;9-11). Any kind of need requires a change of location, i.e. a locomotion. Be it hunger that pulls man to the refrigerator, a trip to the countryside or just going to the lavatory: Ultimately, you have to change your location, if you want to satisfy a need. The change of location is not necessarily taken in terms of space: Even when reading a novel one is mentally at a different place, namely in the events happening in the novel.

As described above, a person's opportunity to change his physical or mental standpoint is *mobility*, not the change of location itself; but the possibility of relocation is mobility (cf. AHREND et al. 2013:2). The access to spatial relocation we call *physical mobility*, the access to information movement we call *intangible mobility*.

Every relocation relies on a need. Consequently, mobility, to man, is a tool. People use *mobility* to satisfy their needs (faster). A special form of mobility is when the process of relocation itself is the need; this happens for instance when it comes to hiking.

There is also a need to experience *mobility*. This experience we call *mobility as perception* and is not a means of transport (cf. AHREND et al. (2013:15). It is divided into *physical training* and *speed per-*

ception. *Speed perception* includes all forms of mobility in which man controls a machine or a vehicle in movement. *Physical training* includes all forms of exercise aimed at the experience of the body. *Mobility* can thus be divided in two different ways: On the one hand, there is *physical* and *intangible mobility*, on the other hand, there is *mobility as a tool* and *mobility perception* (see figure 1). SCHINKEL (6-9) criticises the fact that nowadays *mobility as a tool* constrains human interaction, which emerges, in our opinion, from *mobility as perception*.

Figure 1: Mobility can be structured in two ways: I) Satisfaction is achieved at the arrival of the journey – mobility is a tool. II) If the satisfaction is achieved by the process of transportation – mobility is a need. In a) intangible forms of mobility, information and thoughts are transported, in b) physical mobility, mundane things are transported.

| | | Reason for mobility | |
|------------------|---|---|---|
| | | mobility as perception (satisfaction lies in transportation) | mobility as a tool (satisfaction lies in arrival) |
| Form of mobility | physical mobility (a body or thing is moving) | <i>physical training</i> <i>e.g. running</i> | <i>speed perception</i> <i>e.g. going for a walk</i> |
| | intangible mobility (a piece of information is moving) | <i>e.g. watching a film</i> | <i>e.g. e-mail</i> |

Future – Potential for Mobility

In general, to address the future’s mobility, needs of our society have to be taken into account (FOLLMER & SCHOLZ). Be it animal domestication, railroad, bicycle, smartphone or smoke signals, technological progress makes mobility more efficient. Meanwhile, huge amounts of data are collected and analysed, nonetheless the breakthrough in automated analysis of large amounts of data has had unpredictable consequences. Technological development has increasingly united more functions in ever-smaller digital devices, which integrate seamlessly into one’s

daily life and can now be always at one’s side. New opportunities like *augmented reality* or *virtual reality* and quicker data transmission can change people’s daily lives fundamentally. Thus, new consumer and working models do not necessarily require *physical mobility* anymore for the core population. As access to a full range of infrastructural services can be obtained from points outside urban areas, infrastructure for *physical mobility* is not required as before.

Resources – Restrictions for Mobility

HARDIN (1968) explains why benefit for individuals does not automatically lead to benefit for the society: If individuals act only according to their own needs, the satisfaction of the people’s needs, generally, will be more difficult. Traffic jams, for example, would appear more seldom if individuals took group vehicles like buses and trains instead of personal vehicles like cars. When it comes to mobility, the two most important resources which cut potentials for mobility are fuel and space. Research and development are both focusing on the fuel issue. Consumption of space because of mobility, by contrast, is not as often discussed.

Detailed Hypotheses

Based on preparatory research and the derived information, we arrived at three detailed hypotheses in terms of immobility, as follows:

Hypothesis 1:

The future of mobility is immobility, the decrease of physical movement of humans.

Hypothesis 2:

Physical immobility for humans requires a high mobility of goods.

Hypothesis 3:

Mobility as perception, the experience of movement and speed, cannot be replaced by immobility.

Goals and Methods

As mobility is a broad topic it has to be carefully addressed so as not to overwhelm the investigation. The first step within the project was to carry out research on how the future’s mobility is seen by various other parties. The solutions that are discussed by industry

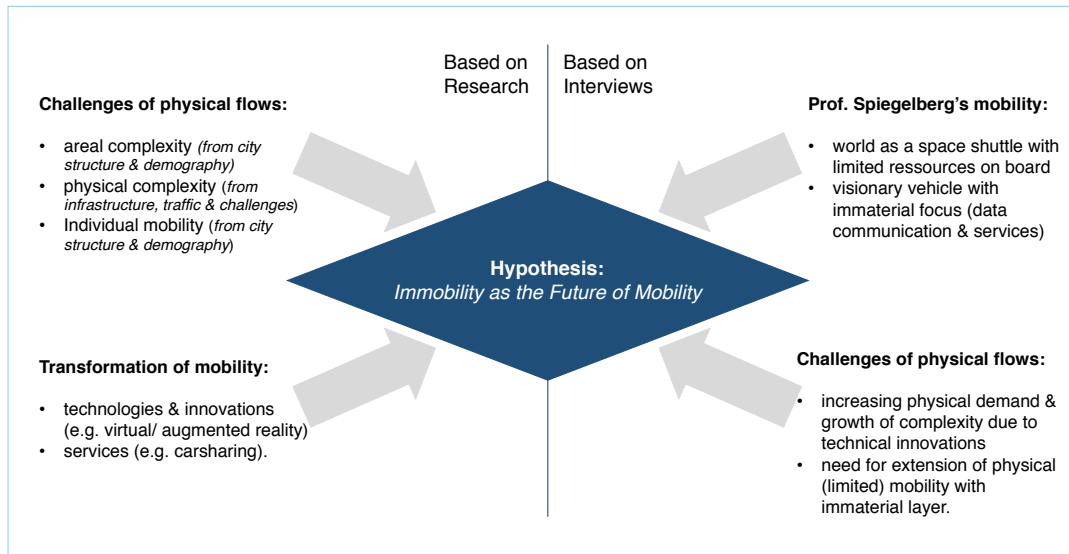


Figure 2: Inputs leading into our central hypothesis

mostly focus on improving existing technologies, rather than developing new ideas and principles. Thus, improving existing car concepts is more likely to happen than the development of new car technologies. Instead of changing mobility as a whole, existing mobility principles are enhanced.

In the first iteration of the project, the team was facing exactly this challenge and tended to think only in terms of existing principles. Only after intensive discussions with our mentors did we open our minds to radically new ideas. This also led to a renaming of our team into “Future of Mobility.” Based on this first iteration of the project, the following central hypothesis was derived [compare with the above section, “Background”]:

**The future of mobility is immobility,
the decrease of physical movement of humans.**

To address and analyse this view and understanding of the future of mobility systematically, the topic was split into six categories: environment, society, politics, technology, economy and polity, as shown in figure 3.

The environment influences and limits all other actions: We live on one earth and are limited in every aspect by the resources that are available. The second field, society, is shaped by the environment and dictates all of our needs. Technology, economy, polity and politics then try to fulfil these needs.

Each topic was analysed in the following three steps: First, the current situation was examined in detail. For technology, this included, e.g., a review of the latest achievements and innovations. Second, the expected situation in the next twenty years was analysed, as for instance, politics might adjust to new scenarios like self-driving cars. Third and last, the challenges and possibilities for achieving intangible mobility were extracted and discussed. To give another example, the patterns of work in society might change to an almost completely remote model of working.

Due to the lack of space in this paper, the assessment of each of the 6 fields cannot be shown in detail. But the following three part visions are based on the arguments and knowledge from the assessments of each field in terms of an immobility as future mobility. Based on the six individual areas, three part visions and three hypotheses were extracted from the view of each main field (technology, economics, society). These hypotheses were critically dis-

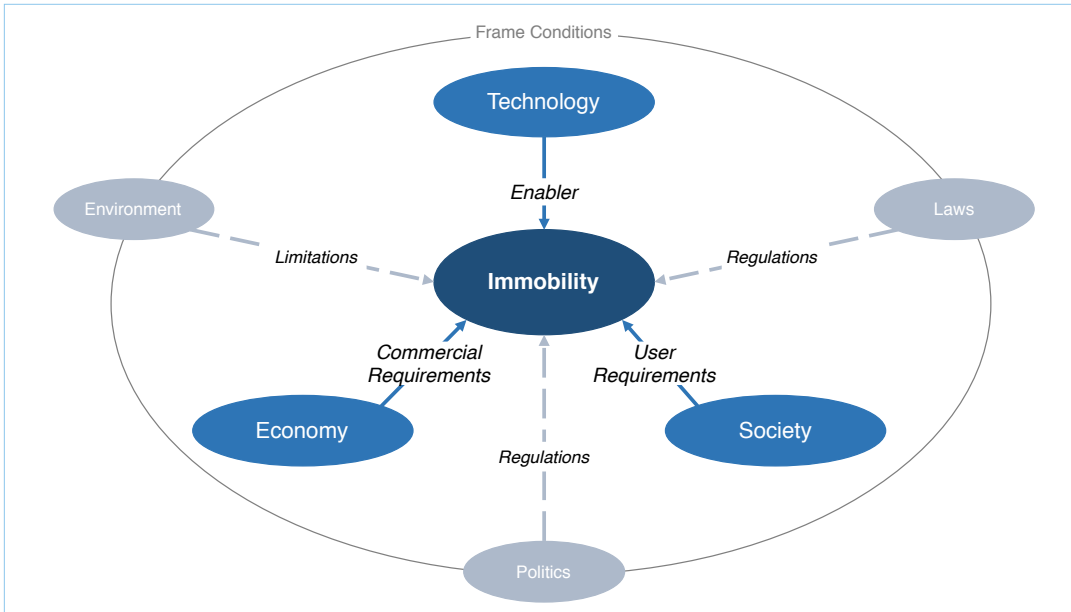


Figure 3: Division of the topic "mobility" into six categories. In each category, the possibilities for an intangible mobility are analysed. The shape of the individual fields do not indicate their importances, they only show the connections between each other.

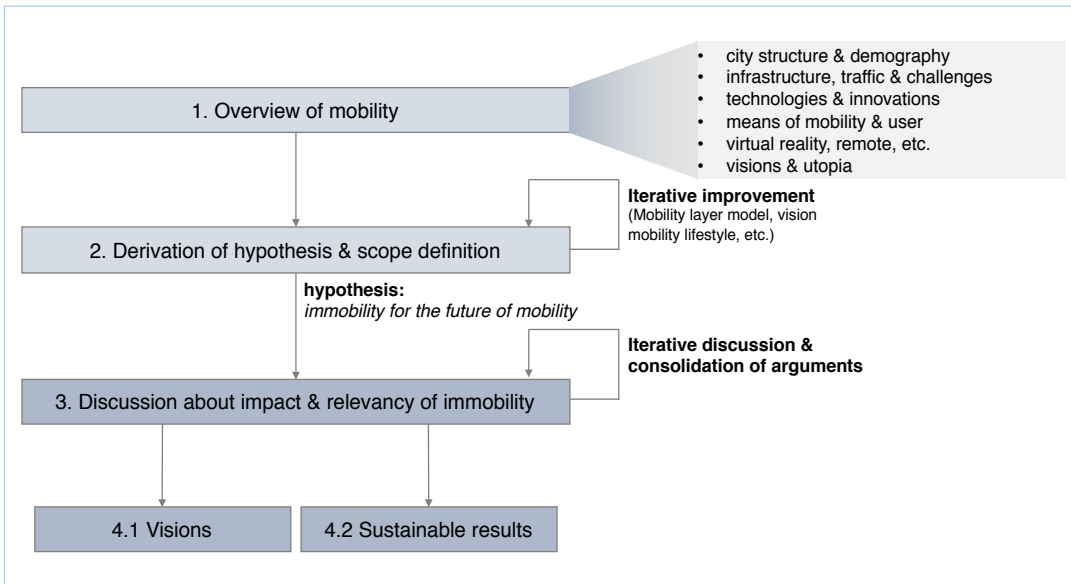


Figure 4: Overall approach and structure in the project

cussed from the different points of view of each category within the framework shown above. Each field connected to the central hypothesis was checked on whether its single interest and task within the framework would support or impede the vision of an intangible mobility. Based on this holistic discussion the core visions and results on a sustainable immobility lifestyle were derived. These are shown in the following chapter “outcome and discussion”. In conclusion the overall approach and structure within the project is visually summarised in figure 4.

Outcome and Discussion

Part Vision from the view of Economics: 3D-Printing Supply

Main ideas:

1. Immobility ideas as enablers of increasing efficiency & flexibility in provision of products for three different branches of trade
2. Immobility ideas and its advantages leads to new products, services and business models in the market
3. Decrease of physical mobility undermines the importance of classic mobility industries, e.g. automobile industry

Prerequisite: material supply

Especially in the industrial sector, procurement plays an important role in meeting the needs of a customer.

The wide *supply chain network* includes physical transport flows between suppliers and the *OEM (original equipment manufacturer)*. The reasons for outsourcing the individual parts are high costs, an existing product complexity, low flexibility of components and high financial risk, because all investment and expertise are held in-house.

To offer the final customer various products, a huge amount of physical flows – transports – are essential in the industrial sector.

The physical mobility of acquisition – transports – brings huge economic inefficiencies. For companies, there are some transportation costs and procurement time to factor in within the production development as well. Also some economic, negative external effects might exist, such as polluting emissions or traffic jams. Ideally, as long as there is a demand for production, the supply parts should be made available right at the *OEM* without depleting the flows of goods or storage capacity.

Beaming would be a utopian solution to reach our goal. But technological developments in the last decade allow options such as

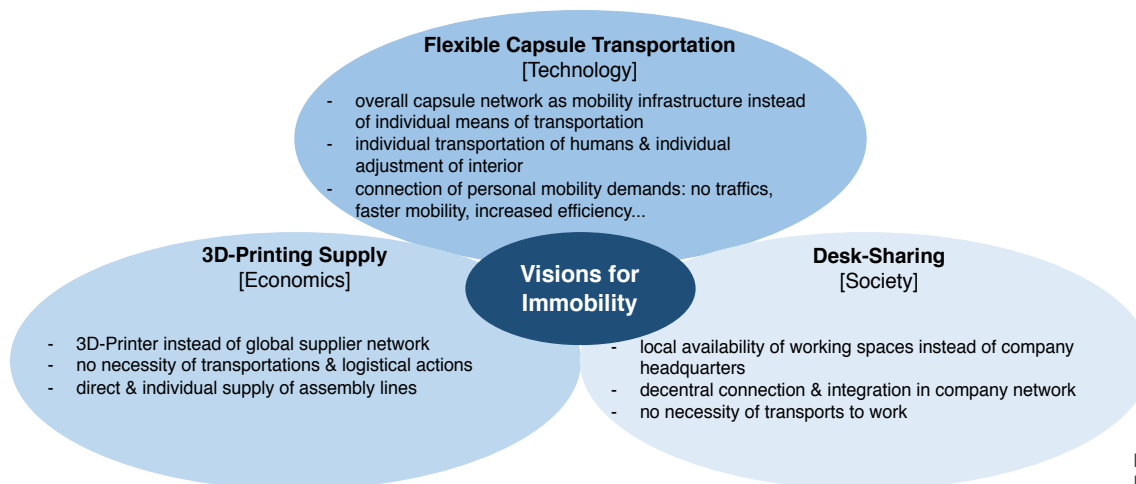


Figure 5: Summary of our vision for Immobility

additive assembly or 3D printing. Through that means, separate parts based on CAD data could be manufactured on site.

Manufactures with 3D printers, which build a link between customer demand and production need, make an acquisition on site possible. There are some additional advantages such as high flexibility and quick availability of the product components. Taking the idea one step further, a customer could even get his or her desired products fabricated just-in-time and on-site. That means complex physical flows of distribution logistics would be reduced and the customer would receive his/her own product more efficiently. Thereby, new technologies and mobility of data are the main enablers of an immobility concept in the industrial sector.

Physical immobility: The physical immobility of people and goods is only possible through immaterial immobility and new technologies. The transport volume in product development process reduces, because 3D-technology makes the acquisition from suppliers superfluous. 3D printers replace all suppliers. The outcomes are faster availability of pieces and no transportation costs.

Physical mobility: This scenario is still a vision; it is not realistic yet to expect that all delivery could be replaced by a 3D printer because of the complexity of all the separate parts. Especially, separate parts with electronic components or components with special design and requirement could not be simply manufactured with a 3D-printer. Investment costs and cycle time are big challenges. To make progress towards this scenario, individually and precisely manufactured forms should be produced out of plastic or metal.

The critical question is “when is it financially profitable to implement 3D printing?” 3D-printing technology is still in its infancy and will have a much higher potential in the future. This potential is the foundation of immobility in material supply.

Society: Physical immobility in material supply could have a big influence on society in the long term. Suppliers would lose importance. 3D-printers would need to be integrated and installed into the production environment and also maintained regularly. A bigger IT and mechanical engineering competency will be necessary. Consequently, there are some advantages for the consumer side: the direct accessibility of products on site will enable a faster delivery of customised products.

Technology: When it comes to the implantation of 3D-technologies, we speak about a vision. To replace the physical mobility of material supply in the future, 3D-printers should be able to satisfy the same product requirements, in terms of cost and performance, as the current suppliers do. To achieve this, there needs to be more research and development aimed at the successful integration of 3D-printers with suitable additive materials into the production environment. Putting the focus more on new additive technologies brings the relevance of other production machines, e.g. CNC-machines.

Part Vision from the view of society: Desk Sharing

Main ideas:

1. An ageing society with extra requirements for mobility
2. A more dynamic society with the need for greater flexibility and increased efficiency in everyday life
3. A more open society, which, for example, moves in social-media-platforms or is ready to share vehicles and flats through sharing-platforms

Pre-requisite: work activities

Each person needs to finance his own living by an income. The daily travel to work is essential for the working class. In this regard, physical mobility is only a means to an end. A living space in working places is mostly limited, expensive or not even possible. That is why large, physical mobility expenditures are necessary. A place in which employees of a company are united to create added value is necessary. This place could also be virtual: if people could do their work locally, all daily travel would be gone. It would be a massive relief for the transport system.

New technologies and future technological advancements enable a similar solution. In fact, creating a virtual work environment like this at home or at nearby *Desk-Sharing* localities is imaginable. The necessary work environment could be displayed virtually through screen technologies. Meetings or visits at the development department could be done this way. Camera and sensor technology would assist in displaying the real environment virtually with all necessary real-time information. A personal RFID-Chip could serve the standardised cells to create an individual work environment after an employee enters. A permanent data exchange could happen between employees through mail, messenger or video functions.

The mobility of the relevant data which is essential to accomplish tasks, and also new technologies which enable an efficient network of competencies and depiction of reality, can thereby serve to establish a decentralised work organisation with reduced levels of physical mobility.

Physical Immobility: The physical immobility of people is enabled through mobility of data and the application of new technologies. In other words, the need of physical movement would be reduced, if a central stationary work organisation could be replaced by decentralised, individually localised and connectable work environments.

Decentralised work environments could be created by data exchange in real-time, an efficient network of different interfaces and an individual, virtual depiction of the real world without physical travel to actual company premises. Buildings that do not belong to the company anymore but to service providers, who offer an infrastructure with screens, sensors, cameras or RFID-interfaces to virtually create a personal work environment everywhere, could be suggested as well.

Physical mobility: Of course, not all the activities that lead to the creation of a product or an offer for service, could be virtually depicted. For instance, the initial production or assembly and machine maintenances could not be conducted virtually.

Technology: To depict a workplace virtually there are some technological requirements needed. Other than the information exchange through voicemails and text messages, emotions, images and gestures are also transferable. Also for design and development activities, real surroundings like production lines could possibly be best built as a *Virtual Twin*. Thereby, decentralised and simple development in a flexible, quickly adaptable virtual environment could be enabled.

Economy: a decentralised organisation makes the company more efficient: first of all there are no huge investments in big corporate head offices needed; secondly, employees are not fatigued by long journeys anymore.

To guarantee the maximal efficiency of a final product or service, new, decentralised work organisations should be controlled and

guided centrally. This might cause some risks in the workplace. But maximal efficiency could possibly be guaranteed through an efficient network in the future. The question is whether strict labour hierarchies are always needed or whether new organisational forms should be developed.

Part vision from the view of technology: Flexible Capsule Transport

Main ideas:

1. Technology enables mobility of goods and data, by which physical mobility of people could be replaced partially.
2. Technology supports physical mobility of people.
3. Personal, direct contact and interaction between people cannot be replaced by technology.

A basic and daily requirement for people is moving. Nowadays, this is possible by car, bicycle or public transportation, which provide a large amount of individual physical mobility options.

At the heart of our future vision, progressive technology would enable an extensive physical immobility for people but would support physical mobility adequately. Technological advance, which is foreseeable nowadays, unites more and more functions in small, digital terminals that integrate seamlessly into the daily lives of people and thereby does not so over daily life. A huge amount of data is transferred and processed, which is analysed with the expectations of an increasingly liberal dealing. The impacts would be various and barely predictable if a breakthrough in automated analysis of large data sets (“big data,” “smart data”) could be achieved. It is a fact that opportunities that are created by a combination of new visual technologies (AR, VR), (b) fast data transfer and (c) artificial intelligence through neuronal networks and so called “Deep Learning” algorithms could basically change the everyday life of people. Based on new service packages (apps/software), new consuming and working models could emerge that essentially do not require physical mobility to people anymore. Theoretically a large urban infrastructure could access a full range of infrastructural opportunities, if these are held out virtually or digitally transported. In that case, the physical mobility of products (consumption) and the mobility of data and information (content) enable extensive immobility for people.

Physical immobility: The physical immobility of people could be enabled by goods and data (information). This would mean that people's need for physical movement could be reduced by technology, which helps people to satisfy their needs without actually moving. Especially daily tasks such as grocery shopping, delivering or picking up deliveries could be significantly reduced. Furthermore, digitalisation of work places enables an extensive shift of work rhythm towards daytimes when clenched traffic are unlikely to happen. New working hour models which offer less presence at the office but more flexibly used time could be built by a strong relationship with decentralised employees. The basis of this development: technological advances in the field of virtual and augmented reality.

Physical mobility: Humankind tends to do physical activities because of its biology. This form of mobility represents an obvious contrast to an immobility approach that could easily bring the degeneration of the human body as in the futuristic scenario in the film Wall-E. The question is which mobility concepts will satisfy the remaining necessities of people at the end of the day. Due to the possible reduction of daily movement needs (travel to work, shopping...), there could be a greater emphasis on pure physical mobility, in which "the path is the aim" and joy and experience will substitute the pure necessity of moving.

This transition could lead to significant, solid and flexible mobility concepts. For instance, small capsules, which dynamically connect each other to big fleets and are provided with inductive power through electrical cables in roadway surface. The fully automatic control is made possible through the information contained in the infrastructure and replaces complex sensors on the board of the vehicle. In addition, the appearance in internal space and the offered functions of the vehicle could be user-specifically adapted through the personal digital terminal device and the core problem of the sharing idea could be solved. With regard to the demand, these vehicles are charged flexibly and controlled at the service centre, driven either to the cleaning service or to the next – database calculated – operating site.

The individual traffic is controlled centrally. Multi-modal travelling could easily become real, if the best possible, centrally controlled network could be given to various mobility carriers. Our vision for future mobility is that people move physically without interfaces.

With automated vehicles, troublesome issues such as looking for a parking place or charging stations could be avoided, because these could be automatically found by vehicles without the driver even being bothered. In this way, workload could be optimised and sharing ideas would be lifted up to the next level.

Economy: Subsequent to the alterations mentioned above, there should be some fundamental changes in the economic structure of Germany. While automotive industry builds its main business on selling vehicles to companies and individual customers, in the above mentioned future, mobility carriers will only be a small part of the mobility on offer. And in this future model, only consumption will be essential, not the actual possession of a vehicle. The trade of the future will therefore presumably take place in the division of mobility and integration services and the mobility carrier as a customisable mobility concept will not play a prominent part.

Society: An important question that needs to be answered in the future is how people will compensate for losing the experience of mobility if it dwindles away due to the distinctive development of the technology. While a great deal of physical mobility that is known to us nowadays could be replaced through progressive technology, a fundamental need to experience mobility still dwells within every human being. This experience merges into an interaction with other people and can also be categorised into two dimensions; A, physical activity B, speed perception. Physical activity is essential for the wellbeing of all humans. It includes a wide range of activities from walking or running activities to those that allow us to enjoy and experience our bodies. To the second dimension of the speed perception belong all forms of mobility in which one person puts a machine or some sport equipment into movement and controls it. People want and need to control both their bodies and machines. They like to control and also enjoy speed. These are needs that will persist even in an age of immobility and are tremendously important for people's health. Even for interaction with family, friends and co-workers, residual mobility will remain essential to our basic needs. For mobility is the core element of those needs. It is not only a matter of coming from place A to place B, but also of experiencing and enjoying time and space. The connection may be from A to B; but the path is the aim. Mobility will be practiced as an end in itself and won't be replaceable by the immobility approach.

Summary and future work

In conclusion, we propose that the future of mobility is based on a **decreasing mobility** of humans. To achieve that goal, mobility of goods and information must increase.

In order to analyse whether this vision can or will be achieved, we looked at six different areas and checked if they would support or impede the vision of an intangible mobility. The economy is divided into two groups: one part would greatly benefit from an increasing immobility and will therefore support it; the other part fears great losses with the new model and will try to stop the change. Technology and society support the intangible mobility because it will lead to an improved lifestyle. Furthermore, the environment benefits from a reduced resource usage due to the optimised logistic processes. Politics and policy both are induced by the needs of the economy and society and therefore will follow their decision. In sum, we see the future of mobility in a decrease of personal mobility and increased mobility of goods and information.

However, some questions remain unanswered. One question is what actual life would look like in the proposed society. Detailed scenarios should be developed. Furthermore, our vision lacks evidence. This could be remedied by the gathering of information through the use of questionnaires. What reasons might speak against that development? And lastly, what would an opposite scenario look like?

One possibility is that the mobility of humans might even grow in the future. This leads to questions such as what that sort of scenario would look like, how the finite resources of our earth are to be managed, how the society and economy will be structured and what conditions must be fulfilled in order to achieve that opposite vision? These questions shall be addressed in future research.

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Project Report **Picturise**

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Picturise: A picture is worth more than a thousand words!

September 2015 – Eighteen-year-old refugee Hamedullah¹ has lived in Germany for two months. He still has difficulties in understanding the German language and many things are new to him. One day, he felt a pounding, throbbing pain in his head as, from time to time, he suffers from headaches. This time the pain was overwhelming, so he tried to seek help. Other refugees told him to call 112 for medical-related issues. Thus he called the emergency line. Although he sought only for painkillers, he found himself hospitalized a few minutes later. The next day, volunteers from Hamedullah's refugee shelter in Neufahrn reviewed the events with him. They tried to explain that he should only call the emergency line in case of a genuine emergency and that, in non-emergency cases, he should call the physician on duty. But the language barrier made things complicated. They gesticulated. They sketched. They called for other refugees, who helped to translate. Eventually Hamedullah understood, but it had taken a long time². Since misunderstandings like this arise regularly, how could such a topic be best explained to refugees? Or, rather, how could such a misunderstanding be prevented right from the beginning?

Ask Picturise for help!

Picturise is a project, established by a group of students, which develops high quality information material to support the everyday life of refugees like Hamedullah in Germany. The approach is simple: The information material focuses on easily understandable pictograms and contains only a minimum of text. The explanations should help refugees from various backgrounds to avoid obstacles in their new home country and show them how Germany works.

When Hamedullah arrived in Germany and the project began, the Germans faced the refugee crisis with mixed feelings. At the central train station in Munich, for example, people welcomed the newly arrived refugees euphorically. Several meters further away, provisional emergency tents showed the sheer futility of the at-

tempt to provide essential things to the huge number of refugees. Federal chancellor Angela Merkel repeatedly stressed: "We can do it!" – but many German citizens did not feel as confident as she did. This topic did not lose topicality over time and the question popping up more and more is: Can we really do it? Can we really cope with the high number of refugees who have to find their way in everyday life in Germany?

The case of Hamedullah is an example how difficult this can be. He is literate in his native language, but learning German is very challenging. The language barrier can cause problems in everyday life and misunderstandings easily arise if the common regulations are unknown. Hamedullah's experiences in dealing with medical issues are proof enough of this. "Many things are new in the beginning and one has to inform oneself", confirmed Faris, another refugee, who originally came from Sudan and now studies construction engineering at TUM. Germany offers a vast amount of flyers and information websites in an attempt to address the most pressing issues for refugees and their most frequently asked questions. But these written information resources are hardly used, since they often work with long texts that many refugees do not understand. Therefore, refugees prefer oral information given directly by the social workers and volunteers who support them in everyday life situations. But according to a statement of the Caritas organization, one social worker in Munich has to care for 100–150 refugees – a task that is almost impossible. Immediate help when a problem occurs, like in Hamedullah's case, is rare.

Picturise wants to change that!

The student group first conducted a survey of refugees and helpers to establish the precise areas of life where problems for refugees typically arise and where they would most benefit from appropriate information material. Based on this research, the project group started to develop pictogram-based posters that were iteratively

¹ This name has been altered and does not relate to any real person.

² Although the happenings presented here are based on real events, the actual setting and course of happenings have been altered.

improved together with refugees themselves. Up to now, Picturise has produced posters on the topics *Basic hygiene rules*, *Principles of solidarity*, *Emergencies*, *Opening and Use of a bank account* that can either stand alone or be used in workshops

Based on the proverb: “A picture is worth 1000 words!”, meaningful pictograms and reduced text on the developed information material helps many refugees to understand even complex topics. Picturise is now testing its posters in a pilot project in cooperation with several refugee shelters – with success! All participating partners have appreciated the information materials and have readily used them for their own particular needs. At the end of the pilot project, anybody will be able to order the information materials!

Since understanding is the first step toward successful integration, the work of Picturise does not only support refugees in their orientation within Germany, but also helps them to find their place in society; just like Hamedullah who will soon complete his schooling in Germany. What he wants to do afterwards, he still does not know. But a future information poster of Picturise, dealing with the education system, could probably help him with his decision.

Finally, it is important to stress that the main aim of the project group is to explain to refugees the range of possibilities they have in Germany – and not to force the same norms on everybody. During the project every member of the project group was able to learn at least as much from refugees as they will learn from the information posters in the future. A colorful society – as the colorful faces on the group photo symbolize – in which people treat others with respect and tolerance, is an enrichment for us all. To say it in the words of António Guterres, the UN commissioner for refugees: “Diversity is richness, not a problem.”.

Abstract

Refugees arriving in Germany have to master various problems of everyday life. Currently, suitable information material that supports them is either not available or not fully comprehensible to them. To close this information gap, we identified the information demand of refugees and developed pictogram-based information material that was quickly adopted by refugee shelters and other related support groups.

1. Background

In August 2015 the German chancellor Angela Merkel stated: “The migration crisis will define this decade.”¹ In that year, more than one million migrants and asylum seekers arrived in Europe by crossing the Mediterranean Sea – more than a fourfold increase compared to previous years.² This many people and other migrants crossing the border to Europe on the land route caused a “European refugee crisis.” European countries struggled with the high influx of migrants and politically argued about the resettlement of refugees within Europe.

During the crisis, Germany was the main destination of refugees.³ The number of asylum applications in Germany in the years 2015 and 2016 reached the highest level since the beginning of documentation in 1950.⁴ All in all, 1.1 million refugees were recorded in Germany in 2015.⁵

To interpret data of the refugee crisis correctly, it is important to distinguish between the term *refugee* and *migrant*. According to the UN Refugee Agency, a *refugee* flees from armed conflicts or persecution and therefore cannot return home safely. In contrast to that, *migrants* choose to leave their home country voluntarily to improve their life and can return without safety risks.⁶

Despite a common definition for the word *refugee*, refugees are not a homogeneous group, as was underlined by studies of the Federal Office for Migration and Refugees (BAMF) in 2016. They come, for example, from different countries like Syria (42 %), Afghanistan (17 %) and Iraq (14 %) and have various reasons for their migration.⁴ Furthermore, they differ in terms of their educational background. About 30 % of the refugees in Germany have only attended school for four years at the most – or not at all. In con-

trast to that, many refugees are highly skilled, since about 40 % attended a high school or a university.⁷ Nevertheless, according to another educational study in 2015, many pupils from the main origin countries like Syria and Albania are classified as functional illiterates. This indicates that they are able to read and write but fail to understand simple texts.⁸

Differences in education and other factors – like the knowledge of foreign languages, the individual open-mindedness, emotional constitution, individual initiative or availability of technical support – can impede information transfer to refugees.⁵ According to the BAMF, knowledge of social, cultural and economic life is essential to find one’s bearings in a new surrounding.⁹ Furthermore, positive experiences with the understanding of information can motivate people to search actively for information by themselves. Frustration in this process, on the other hand, can cause isolation.⁵ Access to understandable information, therefore, is crucial for a successful social inclusion of refugees.¹⁰ Although there is a high availability of written information, refugees mainly use oral information resources such as persons of the same origin or social workers. Posters and brochures are only used if they are easy to understand⁵. Since one social worker in Munich has to support up to 100 persons¹¹ and other refugees sometimes translate information incorrectly, it is not always possible for refugees to obtain high quality information. Therefore, it is crucial to develop effective ways to transfer information to this special target group.

2. Goal and Methods

Goal

The main goal of Picturise is the development of pictogram-based information material explaining relevant aspects of everyday life to refugees in Germany. In contrast to existing information material, we aim to use mainly pictograms and to avoid text. Thereby, our posters should be able to overcome linguistic, cultural and educational barriers and as a result address the whole heterogeneous group of refugees.

Methods

First, it was important to analyze the situation of refugees. By doing an extensive literature search, we collected information about the political situation, the legal basics and existing refugee projects in Munich. Subsequently, semi-structured qualitative interviews

with 25 persons and institutions, who support refugees in different ways, were performed. Our interview partners were asked standardized questions concerning their personal experience in working with refugees. The composition of the respondents is listed below.

- Refugee Shelters (Bayernkaserne, Mc Graw Kaserne, shelter in Neufahrn and five shelters run by Caritas)
- Ebru Turgut (Hochschule München)
- Hilfe von Mensch zu Mensch e.V.
- Munich Law School
- Caritas
- Innere Mission
- Buddies for Refugees
- Bayerischer Flüchtlingsrat
- Flüchtlingshilfe e.V.
- Münchner Volkshochschule
- Prof. Brenner (TUM)
- Campus for Change e.V
- Münchner Flüchtlingsrat
- A.I.D.A
- Pastinaken
- Lighthouse Center
- SchlaU Schule
- Vocational School

In a second step, we analyzed the content of our interviews and identified relevant problems of refugees in their everyday life. In order to get a better overview, the detected problems were grouped according to their complexity and time of appearance during the integration process.

The relevance of the problem areas for the target group was evaluated by conducting a quantitative survey with 32 migrants of seven different nations in cooperation with a shelter run by Caritas. The composition of the sample group of this survey is represented in table 1. In order to gain results of high quality, questions on the same problem area were asked multiple times to determine the need of information.

Considering the new insights of the survey, we started to develop posters on the most urgent problems. To improve their compre-

| | |
|------------------------------------|--|
| Origin countries | Eritrea (12), Pakistan (3), Afghanistan (2), Nigeria (2), Somalia (3), Senegal (2), Mali (1), no statement (7) |
| Age | 17-71 (mean: 25) |
| Duration of stay in Germany | 4-9 months (mean: 7 months) |

Table 1: Sample composition (n =32) of the evaluation of everyday problems

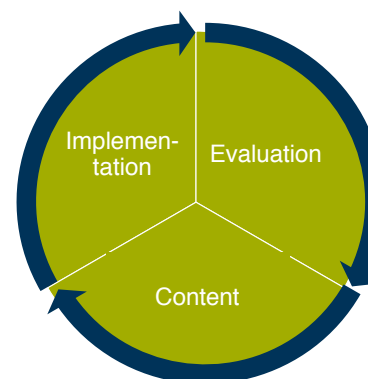


Figure 1:
Iterative process
of improvement

hensibility, we used an iterative process as shown in figure 1. As a first improvement, all members of Picturise evaluated the drafts. In a second step, a participant of Buddies for Refugees who was born in Sudan, helped us to optimize the posters – especially regarding the Arabic language and possible misunderstandings due to cultural differences. In the end the posters were tested in refugee shelters. Afterwards we collected feedback in semi-structured qualitative interviews with social workers, who used the information material together with refugees, to further improve the comprehensibility. For our first poster, on the topic *emergencies*, an additional survey was carried out with 16 refugees from five different nations (Syria, Afghanistan, Mali, Nigeria, Eritrea) living in two separate refugee shelters.. In doing this, we tried to get an insight into what kind of symbols might be well understood by them.

The sample group was asked about their general impression as well as their understanding of pictograms, symbols and colors. Two different posters on the same topic were presented each time in order to validate various representations of the same content.

The last step of the project included a pilot phase to further optimize the information material and to get insight into how it would be used under real-world conditions (suitable sizes for the posters, frequency of usage, manner of usage). In order to assure the high quality of our material, a portfolio, with all posters printed in a suitable size, was created. Additionally, accompanying texts with extra information were included to support the personnel who would use our materials in workshops. The portfolio was handed over to five different refugee shelters each of which then gave us feedback on their usage of the posters.

3. Outcome and Discussion

3.1 Problems of Refugees

24 semi-structured qualitative interviews with institutions and persons working with refugees as well as literature research identified a need for high-quality information in relation to the following topics:

- Household
- Basic hygienic rules
- Public transport
- Social system
- Emergencies
- Shopping
- Healthcare
- Postal service
- Educational system
- Asylum process
- Bank accounts
- Mobile phone contracts
- Food and water
- Job search, professions
- Public institutions
- Rules and authorities
- Apartment search
- Contact to Germans
- Waste separation
- Language courses
- Free time activities

We were able to confirm the relevance of the topics detected for the target group by conducting a quantitative survey among 32 refugees. Respondents rated questions concerning all problem areas on a scale from 1 (no problem/ no need for information) to 5 (big problem/ great need of information). On average, the sample group showed a high interest in information about all topics detected (see figure 2). However, large standard deviations indicate a high level of disagreement among the heterogeneous refugee group on some topics. Therefore, we identified an urgent need for action where there were high interest values but low standard deviations. Topics conforming to this kind of specification are represented by green bars in figure 2. Furthermore, frequent recommendations for information material by social workers were also taken into account and highlighted in light blue.

3.2 Clustering of Problems

In order to structure the various identified problems, we defined clusters that can describe the diversity of problems concerning refugees and their mutual dependencies. Depending on the educational background, language skills, duration of stay in Germany, country of origin, age and the cultural background, refugees face

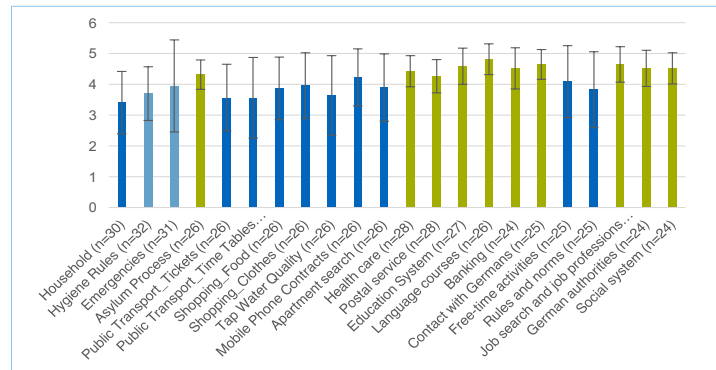


Figure 2: Information needs for refugees. Number of questions in total: 34. The figure depicts a subset of 22 questions. The number of refugees who answered the questions on the topics, shown above, is indicated in brackets.

problems of differing complexity. Five clusters could be distinguished: *Personal needs*, *Surroundings*, *Social Space*, *Rules & Norms* and *Culture* (see figure 3).

Dealing with *Personal needs* is important in order to orientate oneself in a refugee shelter – one's new residence. Possible information material for this problem area deals with basic hygiene rules, acting in emergency situations or with the use of household appliances. A person who has been accommodated in such a shelter will participate in the everyday life around his or her residence as a second step. This problem field, labelled *Surroundings*, includes, for example, using public transport or visiting a doctor. If the per-

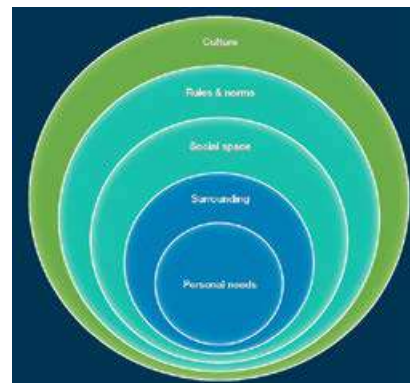


Figure 3: Problem areas of refugees

son gets along in everyday life, free-time activities and interaction with other people will become more and more important, which are topics of the cluster *Social Space*. A further crucial element for the integration process is the understanding of *Rules & Norms* like the education system or the principle of solidarity. Finally, a refugee should learn about German *Culture*, including customs or habits, to be able to fully integrate in Germany.

Apart from the linear pattern described above, the problem areas also overlap with one another and, problems categorized in less basic clusters like the asylum process in *Rules & Norms* can affect persons in more basic clusters. This is implied by the visualization of clusters in overlapping circles.

3.3 Development of Information Material

Overview

Interviews with social workers and brain-storming in our group confirmed posters as a suitable and versatile tool to convey information to refugees. For instance, posters can be hung up at the place where they are needed and thereby communicate information instantly, or they can be used as a support for personal consultation. Moreover, they can address the whole refugee group because they do not need technical devices.

Based on the need for information determined through our survey, we developed posters on five different topics (see table 2, figure 4). The posters depict certain sub-aspects of problem fields proved to be interesting for refugees (see section 3.1). Depending on the complexity of the topic, some posters can stand alone, whereas others have to be used in workshops.

Design

In the design process, many decisions had to be made – on, for instance, the general structure and design of pictograms, colors, language of the texts, depiction of humans, simplicity and neutrality of the posters.

In this context, the design features that most refugees were found to understand well were initially identified by conducting a survey concerning our first poster on the topic of *emergencies*. The following figures exemplify the design specifications that were derived from this survey and that were similarly reused in subsequent pos-

| Topic | Aim of the poster(s) | Means of information transfer |
|---------------------|--|---|
| Emergencies | <ul style="list-style-type: none"> • Information about emergency numbers (112, 110) • Distinction between emergencies and other health problems | Can stand alone Workshops are possible |
| Basic Hygiene Rules | <ul style="list-style-type: none"> • Instructions for showering, hand washing, dental hygiene and toilet use • Reminder to keep the bathroom clean | |
| Social System | <ul style="list-style-type: none"> • Explanation about the principle of solidarity | Workshop |
| Banking | <ul style="list-style-type: none"> • Explanation of how to open a bank account • Explanation of why a bank account is needed • Information about how to use the bank account • Warning of possible dangers | |

Table 2: Overview over posters (Topic, aim and means of information transfer)

ters. All examples are taken from the *emergencies* poster since this was used during the survey.

Regarding the structuring of information on the posters, flowcharts as used in figure 7 offer a suitable way to describe a decision-making process. Furthermore, the survey gave us a good insight into how to design understandable pictograms. To illustrate time as calendar symbols are advisable. A moon and a sun as pictogram for day and night also function well (see figure 5). Moreover, refugees preferred symbols that they use and see in everyday life. For example, a smartphone as a pictogram was preferred over a corded telephone as it is used on many German brochures. Other examples for such pictograms are a police car or the pharmacy symbol (see figure 6). When it comes to color

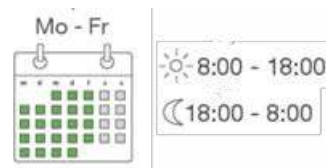


Figure 5: Example for time symbols

Moreover, refugees preferred symbols that they use and see in everyday life. For example, a smartphone as a pictogram was preferred over a corded telephone as it is used on many German brochures. Other examples for such pictograms are a police car or the pharmacy symbol (see figure 6). When it comes to color

Bankkonto eröffnen • open a bank account • ouvrir un compte bancaire • حساب بانكى باز • حساب مصرفى مفتوح

WAS kann ich mit einem Konto machen?
 Was kann ich mit einem Konto machen? • Tuu postin laka
 Tuu postin laka • Tuu postin laka • Tuu postin laka

WARUM brauche ich ein Bankkonto?
 Warum brauche ich ein Bankkonto? • Tuu postin laka
 Warum brauche ich ein Bankkonto? • Tuu postin laka • Tuu postin laka

WIE eröffne ich ein Bankkonto?
 Wie eröffne ich ein Bankkonto? • Tuu postin laka
 Wie eröffne ich ein Bankkonto? • Tuu postin laka • Tuu postin laka

Hygiene • hygiene • hygiène • بهداشت • النظافة

Händewaschen
 Händewaschen • Tuu postin laka • Tuu postin laka

Zähneputzen
 Zähneputzen • Tuu postin laka • Tuu postin laka

Salubrität / PPE
 Salubrität / PPE • Tuu postin laka • Tuu postin laka

Stuhlgang
 Stuhlgang • Tuu postin laka • Tuu postin laka

Hand- und Fußhygiene
 Hand- und Fußhygiene • Tuu postin laka • Tuu postin laka

Bankkonto nutzen • using a bank account • utiliser un compte bancaire • استفاده از يك حساب بانكى • استخدام حساب مصرفى

Wie habe ich Geld ab?
 Wie habe ich Geld ab? • Tuu postin laka • Tuu postin laka

Wie muss ich bezahlen?
 Wie muss ich bezahlen? • Tuu postin laka • Tuu postin laka

Kontostausung lesen
 Kontostausung lesen • Tuu postin laka • Tuu postin laka

Notfälle • emergencies • urgences • شرایط اضطرارى • شرایط اورژانسی

Notfall 112
 Notfall 112 • Tuu postin laka • Tuu postin laka

Notfall 110
 Notfall 110 • Tuu postin laka • Tuu postin laka



Figure 4: Overview over posters

design, colors as they are used in traffic lights can differentiate between aspects of differing importance. According to our survey, the poster *emergencies* transferred information well without much text. For the few texts needed, refugees preferred Arabian, Persian, French, English and German language. Since, according to current numbers of the BAMF for the year 2016, about 50 % of refugees speak Arabic and 7 % Persian as their native language, a large part of the refugee group can be addressed using these languages.⁷ English, French and German are also the mother tongue or a familiar foreign language for numerous refugees (Kenya, Eritrea) – according to social workers. Furthermore, single German words on the posters can support refugees in the language learning process. During our interviews our sample group could also choose between two possible alternatives of the *emergencies* poster each of which



Figure 6: Example for everyday symbols

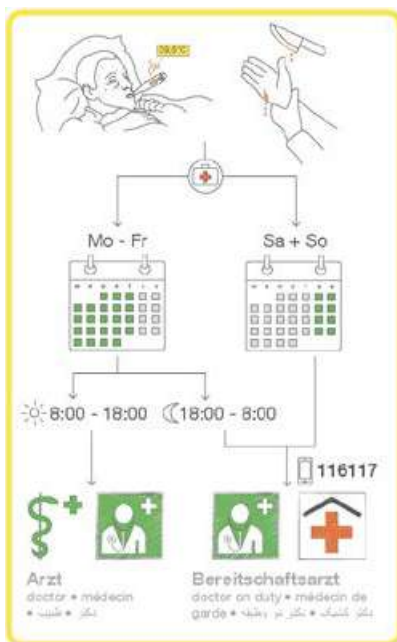


Figure 7: Impression from the poster “emergencies”

differed in the amount of information presented on the poster. About 80 % preferred the alternative with more information. This underlines that in the design of posters it is important to achieve an appropriate balance in the amount of information presented according to one’s aims and intended target audience. In this example, it became clear that oversimplified material would not be effective.

In addition to the results of our survey, we defined other requirements for the information material that we or social workers considered to be important.

According to these specifications, we established that the pictorial language should be very calm and that only important aspects should be stressed with color. This provides several advantages: everybody can see what is important at first glance and less ink is needed so that printing is cheap. Furthermore, our information material is designed as neutrally as possible. Advertisements as well as stereotypes are avoided. Humans mostly are depicted genderless as simple silhouettes unless a more precise illustration of humans was needed. A balanced mixture of male and female depictions was used if gender is depicted at all. Both genders are equally shown in disadvantageous situations as well as in typical and untypical professions. Thereby, implicit messages can also be conveyed – for example: “Both genders have the same rights, possibilities, and status in Germany” (see figure 8). Concerning the structure of our posters, we chose a vertical orientation for the information presented (for example see figure 7, figure 9, figure 10) since reading from left to right is not common in every refugee’s country of origin and therefore some people might orientate themselves differently when looking at posters. Furthermore, sub-aspects of certain topics are organized in building blocks. Every block can also be used alone and information can be adapted to special needs of refugee shelters (see figure 7, figure 9, figure 10).



Figure 8: Human depiction

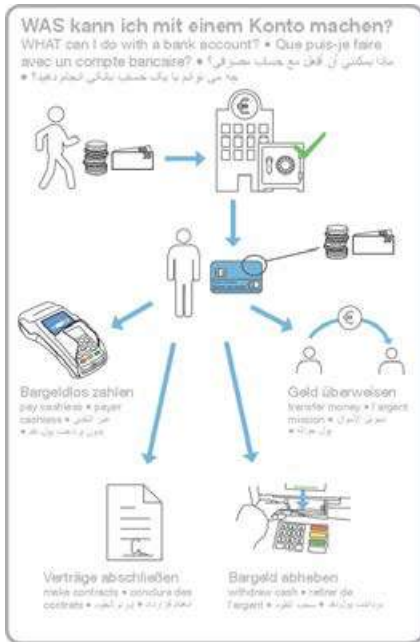


Figure 9: Impression of the poster “How to use a bank account”

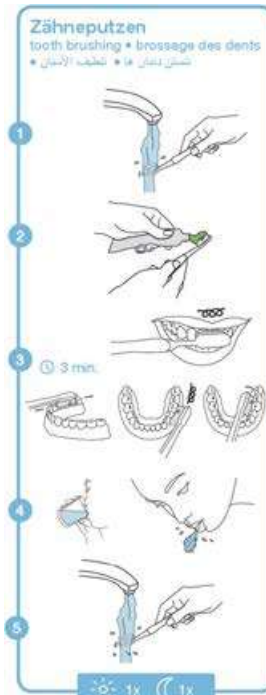


Figure 10: Impression of the poster „Basic Hygiene Rules“

4. Summary and future goals

Our project demonstrates that information transfer to refugees can be realized efficiently with pictograms as they offer a suitable way to overcome linguistic and cultural barriers. All in all, we determined a high need for understandable information among the group of refugees and developed information material on topics of differing complexity – hygiene rules, emergencies, banking, and the social system. Since our posters deal with a broad ran-

ge of different information, our experiences in creating them can be useful for many institutions to develop understandable information material. Furthermore, all the refugee shelters with whom we collaborated successfully used our posters and consistently gave us positive feedback. Since access to relevant and easily comprehensible information is essential for successful social inclusion,¹⁰ Picturise effectively contributed to the integration process.

Many interesting topics for refugees could not be considered during the short time of our project. Therefore, official bodies or volunteers should be encouraged to do further work on these topics. For us, it is crucial to achieve a wide distribution of the information material that we developed in order to address as many refugees as possible. This is why our main goals for the near future include the analysis of the feedback of our pilot project as well as the development of effective marketing strategies.

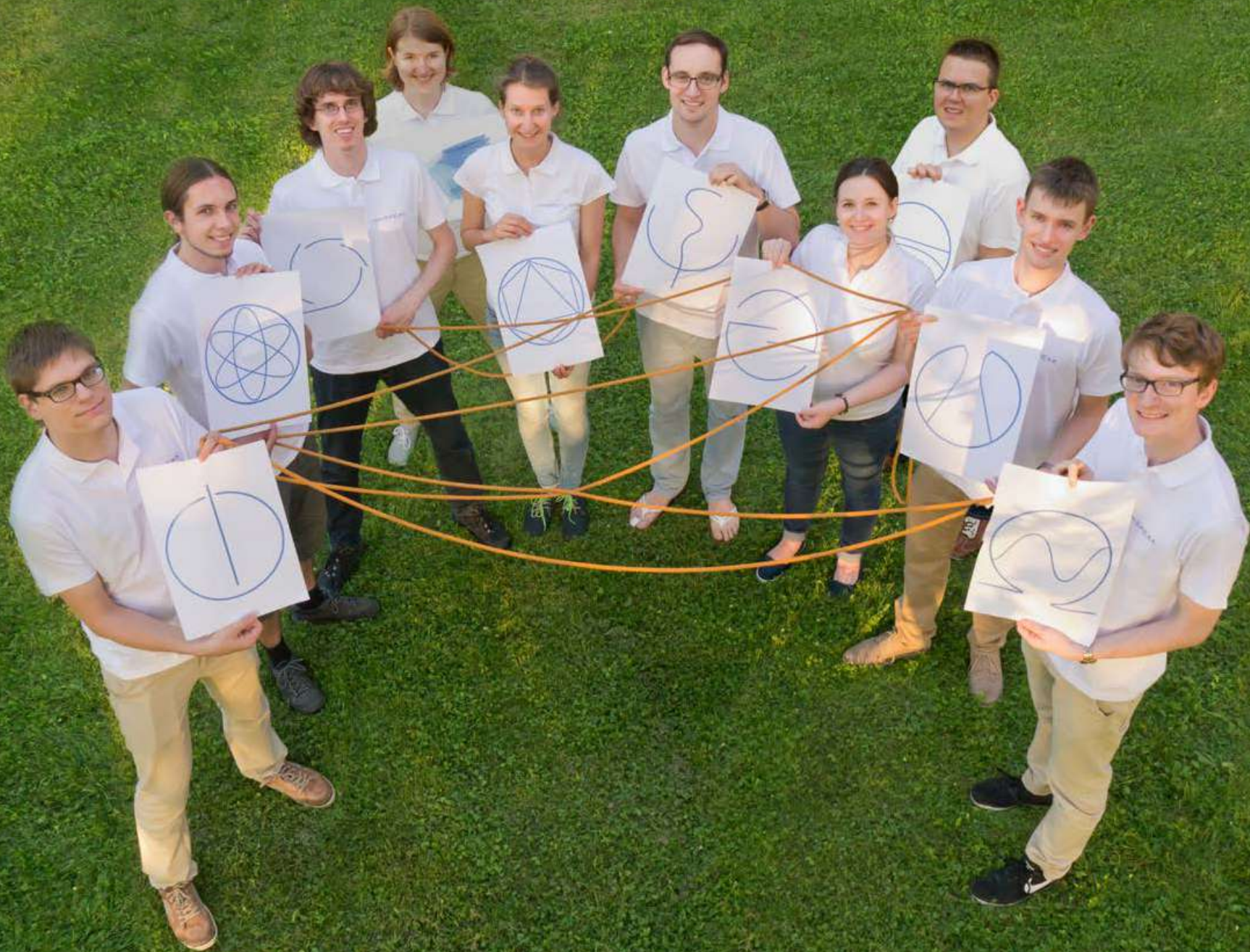
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- All refugee institutions supporting us during our project

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Project Report uniSPEAK

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Turns out it wouldn't. Still too poorly defined, and, perhaps more significantly, we were suddenly facing the daunting task of investigating the way professional researchers interact – as a student project.

So a setback it was – but this notion of examining interdisciplinary communication, once kindled, was not easily quenched. In fact, this quandary spawned our most iconic symbol: the Faculty Wheel of Fortune, bedecked with the logos of all TUM faculties (see page 63). In springing the question of their faculty symbol on unsuspecting students passing by at the city campus, we tried to find out about connections between different research fields, considering the results to be a rough first indicator.

Thus our ideas matured – and finally, our thoughts turned to that other thing universities do besides research: educating students. Why? If the goal is to improve interdisciplinary communication – that is, a dimension of knowledge transfer – it is only logical to start with students and professors. We began asking ourselves: Do universities in general, and TUM specifically, do a good job in preparing their protégés for working in an interdisciplinary research context – keeping in mind that this is implied in TUM's mission statement? And behold: Our project was born!

Once upon a time – that is, little more than a year ago – our project started out with the pretty, but fairly nondescript name “knowledge transfer.” Since then, we – now the uniSPEAK team – have come a long way. Have you ever considered that social (or even pseudo!) interdisciplinarity might be a thing?

No?

But let's slow down a bit. At the very beginning, we chose our topic perfectly aware of how unspecific it was, and it was a conscious decision: we were quickly stumped by just how vague and multifaceted the topic was. Then, after much research and debate, the brainwave: transfer within interdisciplinary research teams! Yes, that would work!

As a first step down this path, we interviewed several professors who straddle the borderline between two fields. Our focal point: Which factors are beneficial for effectively communicating with researchers from fields different from one's own? And could possible challenges be overcome by preparing students accordingly?

The general consensus was that different fields may use the same vocabulary to mean different things, confounding any attempts to effectively communicate. However, this hurdle extends beyond the pure linguistic level: What constitutes a “reliable” result is a matter of considerable dispute between most fields. Philosophical differences on the role of science aside, we are left with sheer practical considerations – how much certainty is achievable in each field? Does a particle physics standard of reliability hold up in the social sciences? Effectively cooperating in spite of all this boils down to not only knowing about “the other field,” but also empathizing with its peculiarities and quirks. This very empathy is likely key. How do we come by such empathy? Obvious strategy: social interactions.

We thus realized that social interactions with students of other subjects, especially if they involve discussing academic topics, may be extremely beneficial to one's skills in interdisciplinary cooperation. We decided to find out: Do students of different faculties significantly deviate in how and how often they communicate and exchange knowledge with friends and acquaintances from other fields of study? In other words, does the degree to which the faculty includes interdisciplinary teaching in its curriculum influence how its students interact? Intuition dictates that it should.

Info BOX: uniSPEAK

Our project aims to evaluate the links among different fields of study, students' interactions with students from other disciplines, and students' personality profiles. Even TUM's Mission Statement highlights social competence next to technical expertise. Within the project, we designed a survey to investigate how students of

If this is not the case – well, then we'd be dealing with crossing the boundaries of classic disciplines being a topic liberally expounded by senior faculty members, but not taking root in their students' behavior. We'd be dealing with teaching from other fields, despite being in the curriculum, not effecting any real communication with these fields.

Dare we say it: pseudo-interdisciplinarity?

To determine this, we designed a survey that we piloted with a group of 28 members of other teams in the current cohort of Junge Akademie projects. Our repertoire: questions about social interactions as well as a scientific personality test, since differing interaction patterns between some of the faculties may spring from differing personalities. This phase was marked by feedback over and over again returning to one idea: stereotypes! Which was unintentional but, well, we did ask personality questions.

Eventually, with our finalized questionnaire in hand, we were ready for the real survey. Getting a sufficient number of students to participate in order to make general statements? No big whoop. But what of comparing different faculties to see whether measures they take influence their students' interaction behavior, for which we would require at least 70 to 80 participants from each faculty in question? To achieve this, we needed to focus on a just a few faculties. Which ones? For one, the more they differ with respect to how they handle interdisciplinarity, the better. For another, getting those 70 participants from the smaller faculties with less than 500 students seemed unrealistic, so we could only consider larger ones. Our picks: Chemistry, Economics, Mechanical Engineering, and Medicine.

Students' Personality & Ensuring Across-faculty Knowledge transfer

different fields interact, especially on a social level, and whether this is influenced by factors such as campus or proportion of interdisciplinary coursework within their curricula. We considered both the university as well as leisure activities as major points of contact.

Thus, we put out the bait: a raffle where we gave away TU-film and TU-shop vouchers and, for our paper-based survey, our visually stunning Wheel of Fortune to attract passers-by as well as an on-the-spot gift of gummy bears. Interestingly, the raffle at times appeared far less motivating than the sweets (let alone the pens, of which – sadly – we only had eight and thus had to hold on to). Thus, we successfully distributed the paper-based survey on several occasions in places where students of the economics, mechanical engineering, and chemistry faculties commonly spend their free time between lectures. Even more students followed our call to participate in the online version – many of them from the faculty of medicine, where our project mentor Prof. Berberat advertised us, as well as, surprisingly, from the TUM campus Weihenstephan. Therefore, even though we did not initially plan it, we included the latter as a faculty of interest.

Final tally: over 650 participants!

The detailed results are presented in the second part of this report. In brief, we found few significant differences in students' personalities – it appears that, in this respect, stereotypes about different TUM faculties are not true. We did, however, find that the campus appears to be a large factor in determining inter-faculty connections.

Most importantly, students interacting with a higher diversity of students from other faculties do more often share academic knowledge from their own field – and are also more likely to report learning a lot about their friends' fields. Lastly, contrary to what might be expected, the faculty of interest with the most blatant inclusion of interdisciplinary teaching in its curricula – economics – does not have the students with the most diverse social contacts and who share the most knowledge with students from other fields.

So there we have it: pseudo-interdisciplinarity does seem to be a thing.

Relevance and Influencing Factors of Interdisciplinary Social “Teaching” and “Learning” Among University Students

Abstract

In the light of interdisciplinary communication skills being much sought after in the academic environment, we set out to evaluate whether our university, TUM, is true to its responsibility of promoting these skills and to investigate how much interacting with peers from other fields on a purely social level contributes to honing them. Based on data gathered via a survey, we find that, with the exception of motivation by influence and power, personality traits do not differ significantly between several faculties and thus do not provide a basis for possible stereotypes. Considering contact diversity on each campus, spatial seclusion hinders exchange, but other factors might be in play as well. As evaluated using three self-defined contact diversity scales, we find that a high degree of such diversity is linked to increased knowledge transfer. How relevant TUM is as a locale for forming intra- and interdisciplinary contacts varies between different faculties, but university-related situations appear biased toward establishing own-field rather than other-field contacts. Overall, our study highlights the significance of social interaction for effective interdisciplinary communication and provides a basis for further research in order to facilitate interaction across field borders, particularly for students.

1. Motivation

Interdisciplinary cooperation skills are paramount in future research endeavors and, as such, imparting them to students should be a major concern of any university. Students can easily practice communicating and cooperating with representatives of different fields in interacting with them socially.

Even though including lectures from other courses of study seems to appeal to students, it is unclear whether this appeal reflects the existence of networks among students from different fields.

Past research having revealed significant differences in personality structure among students depending on their college major (cf. Balsamo, Lauriola & Saggino, 2012), we assumed that developing

such networks may be hindered by stereotypes and differences in personality.

Thus, we investigate incidence and influencing factors of informal interdisciplinary interactions. Of particular interest is the degree to which TUM succeeds in providing an environment for students to develop their interdisciplinary skills.

2. Goals and Methods

2.1 Goals

In detail, we look at the following four questions:

Firstly, we consider personality traits in relation to fields of study: Do TUM students from different departments have noticeably deviating personality profiles, as was suggested in the literature? Could these differences be responsible for the development of stereotypes that hinder interdisciplinary communication?

Secondly, we determine the academic diversity of students' social circles: What is the academic background of the people with which TUM students interact? Since TUM focuses strongly on technology, does this leave a mark on its students' networking and everyday interactions?

Thirdly, we investigate the connection between students' social contacts and the extent to which they engage in interdisciplinary transfer of academic knowledge. In the context of this discussion, we interpreted the latter as a bidirectional process that comprises sharing as well as receiving knowledge, extensively and on a regular basis. We hypothesize that having more diverse social contacts is related to increased knowledge transfer.

Lastly, we determine how significant TUM is as a locale in which its students develop social contacts. We are interested in the link between how important this locale is for the individual student and, on the one hand, how diverse their social contacts are and, on the

other hand, how much they engage in interdisciplinary knowledge transfer. Moreover, we investigate what role TUM plays in social interactions between its several spatially separated campuses. Even more significantly, some faculties include interdisciplinary coursework in their curricula more than others, prompting us to attempt an evaluation of whether this engenders increased knowledge transfer and higher diversity of social contacts.

With these questions answered, we can confidently provide an assessment of the status quo at TUM and possibly derive further areas of interest yet uncharted by our study.

2.2 Methods

We designed a survey of 55 questions split into sections on social contacts, personality, and individual background. The first section of 25 self-designed questions concerned the participants' social contact with fellow students from their own and different fields of study, and the extent to which they engage in interdisciplinary knowledge transfer. This section also probed the situations in which respondents have made friends or acquaintances from their own and from other fields of study. The following section posed 20 questions taken from two scientific personality tests: We used all questions from the 10-item BFI-10 described by Rammstedt and John (2006). From the Big Five Personality test by Satow (2012), we chose only those items testing honesty in answering the questionnaire as well as the personality dimension of motivation by power and influence. The last section comprised six items of background variables. Additionally, we incorporated the 4-item identification measure from Doosje et al. (1995).

We piloted our survey with 28 members of the current year of the TUM: Junge Akademie. The initial version contained more questions, notably including the full version of the Big Five Personality test by Satow and the opportunity to leave extensive written feedback. We used this to test our survey and had our survey reviewed multiple times by scientific employees of TUM as well as by two professors in order to cut the questionnaire down to relevant items and to validate the survey.

Next, we distributed the survey among 656 students of TUM. Of these, 408 answered an online version of the survey, while 248 filled in a paper-based version distributed on TUM campuses. We tar-

geted students from the chemistry (CH), mechanical engineering (ME) and economics (ECO) faculties by carrying out the latter paper-based distribution in localities where these students commonly spend their free time between lectures. This ensured a sufficient sample size of these faculties (CH: 83, ME: 84, ECO: 127 participants). Additionally, the online version afforded sufficient sample size of students from the faculties of computer science (CS), medicine (MED), and life sciences (WZW) (59, 134, and 157 participants, respectively). As such, all of TUM's main campuses were represented with sufficient sample size to make reliable statements.

For the evaluation, we defined three measures of social contact diversity. The first dimension was measured by how many different categories of academic background the individuals reported their conversation partners of the last week to have had, used as an approximation of average communication since we expected regular social contacts to be engaged in at least one conversation per week. The second dimension counted the number of situations in which the respondent reported having made friends or acquaintances within their own and within different academic backgrounds, the rationale being that a person who makes friends in manifold situations can be considered to have diverse social contacts. Finally, analyzing the diversity of social communication itself proved most difficult given the survey data. As a metric, we used the average number of reported conversational topic categories out of the list of four provided.

Based on these scales, we defined a "high-diversity" group comprising respondents who reported conversation partners of at least three distinct academic backgrounds, at least three different topics, and having established contacts in at least seven situations. The median values of the respective quantities were chosen as the limit. A complementary "low-diversity" group was defined as the group of respondents who scored less than the above limits in at least two of the three indicators.

3. Outcome and Discussion

3.1 Stereotypes

Regarding most personality dimensions, we did not observe any significant deviations; the exception was the dimension "motivation by influence and power." Since the overall mean of 12.8, on a scale of 6 to 24, and standard deviation of 3.41 obtained in our

survey does not significantly deviate from values given in the B5T reference documentation (12.9 and 3.57, respectively), the average TUM student does not appear to deviate from the average person. That said, the mean/SD values of the examined faculties are: 11.7/2.84 (CH); 11.9/3.3 (MED); 13.9/3.24 (ME); 13.5/3.97 (CS); 14.6/3.3 (ECO); 12.06/3.08 (WZW); the maximum (ECO: 14.6) and minimum (CH: 11.7) deviate significantly by a value of 2.9. That ECO scores highest on this scale concurs with the stereotype of the economist being power-hungry and striving for control. As might be expected if we consider the primary motivation of the doctor to be helping and healing people, MED scored low in this dimension. Interestingly, CH scored slightly lower than even MED. Thus, in our sample group, real-life personality traits do not seem to be responsible for the development of stereotypes, with the possible exception of motivation by influence and power. Assuming that a link between the “motivation by influence and power” stereotype and personality does exist, the question remains whether the personality trait drives the prospective student to choose an according subject or whether the course of studies, once chosen, shapes the student’s personality – or, indeed, whether there is a combination of both factors.

3.2 Networking@TUM

Figures 1 and 2 illustrate the academic background of participants’ interaction partners from different faculties. It is evident that academic fields not offered at TUM are underrepresented. Moreover, the campus appears to be important in terms of whether students establish contacts outside of their own field: Respondents from the Weihenstephan campus, which almost exclusively harbors life science courses of study, interacted with students of an engineering or economics background significantly less than respondents from the Munich or Garching campuses, where the majority of engineering and economics students are located. While these differences may arise from geographic seclusion alone, they might also stem from factors related to the fields of study themselves: For instance, students of the chemistry and economics faculties communicate notably less than those of comparable sets of faculties. As mentioned in the previous section, these two faculties deviated most in terms of motivation by power and influence, which constitutes a possible reason for why these students may find themselves only moderately compatible.

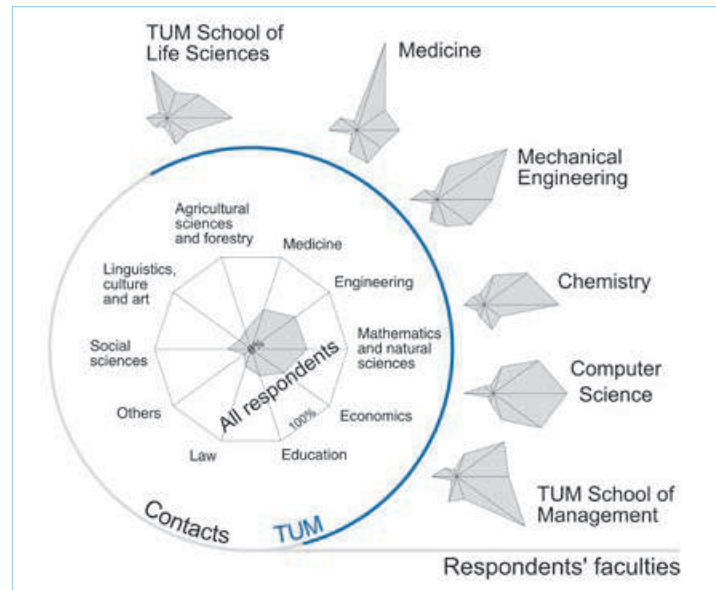


Figure 1: Percentage of respondents reporting conversations with people from different academic backgrounds, by faculty.

3.3 Are Knowledge Transfer and Diversity of Contacts Linked?

A major point of interest revolves around the following question: Is social interaction between friends from different academic backgrounds a setting in which academic knowledge is passed on? With data at hand to support this link between social interaction and knowledge transfer, how does social contact diversity impact the self-reported incidence and effectiveness of informal interdisciplinary teaching and learning?

We asked respondents how much they agreed with the statements “I pass on knowledge from my field to friends and acquaintances from different academic backgrounds” (i. e., teaching) and “I learn much about my friends’ fields of study when interacting with them” (i. e., learning). We consider these two items to be of utmost relevance to our ultimate study goal, that being interdisciplinary knowledge transfer among friends in informal situations.

The results indicate that this informal teaching and learning indeed occurs: 72% of respondents affirmed this about teaching, and a majority (57%) affirmed it about learning. This confirms our hypothesis that social interactions among students do broaden their academic horizons.

Yet these results come with a caveat: Regarding content of conversation, only 42% of respondents reported academic topics as constituting an appreciable proportion of conversations with peers from different academic backgrounds. Apart from this, the considerable difference in the percentages of students who “teach” and of those who “learn” (72% vs. 57%) casts some doubt on how effective such informal interactions are as a vehicle of knowledge transfer.

To further investigate this, we considered the group who reported not learning from peers of different background. Compared to other students, they scored notably lower on all three of our diversity measures, yet did not significantly deviate in terms of personality traits. To elaborate, their contact diversity was lower by 0.53 (no learning/learning: 2.87/3.40 at $SD = 1.8$); the diversity of conversation topics, by 0.72 (4.7/5.42, $SD = 1.68$); and the number of different situations to have made friends and acquaintances, by

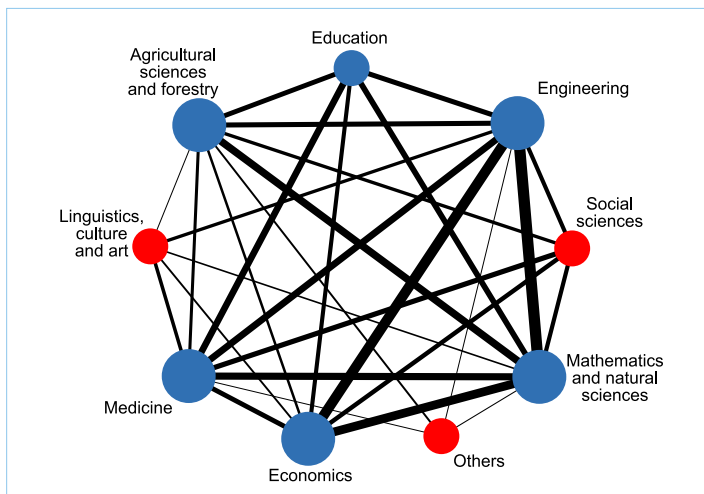


Figure 2: Intensity of interaction between different fields of study as measured by the number of contacts reported by TUM students.

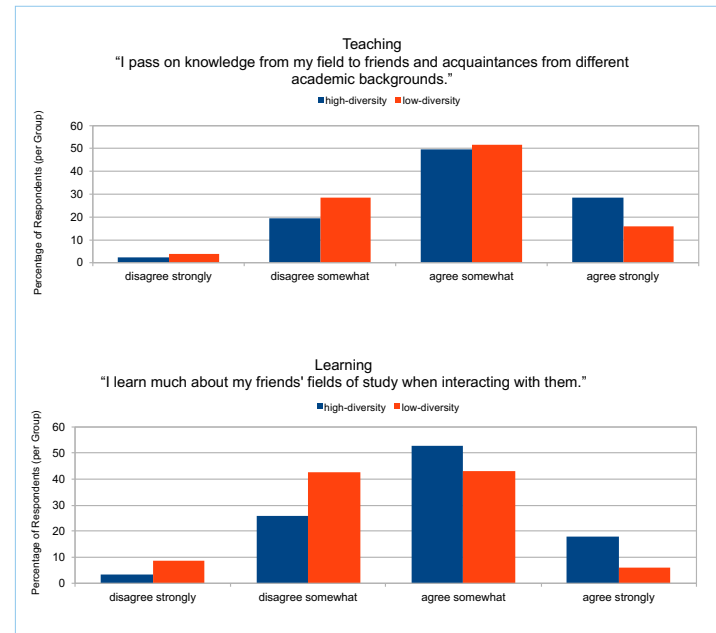
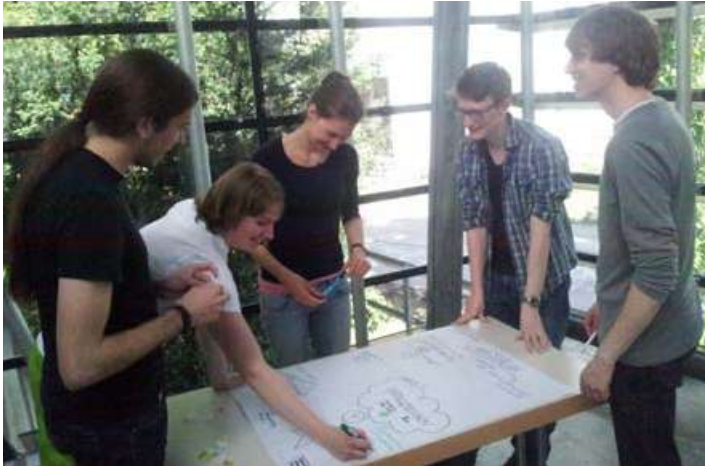


Figure 3: Response pattern to the questions of passing on and acquiring knowledge in interdisciplinary social contact among the high- and the low-diversity group.

0.46 (6.18/6.64, $SD = 1.92$). This difference in diversity is greater than between different departments and indicates that academic diversity of social contacts is an important factor in informal interdisciplinary learning.

Next, we took a closer look at the high- and low-diversity groups defined above in “Methods” to find out whether those students differ notably in their behavior regarding interdisciplinary knowledge transfer. In line with our hypothesis, the high-diversity group of 123 students scored higher in both “teaching” and “learning” than the low-diversity group of 207 (see Figure 3). The difference with regard to “teaching” was apparent in the frequency with which the “agree strongly” answer was given to the question of sharing academic knowledge with interdisciplinary peers. Regarding the “learning” part, the proportion of participants in the low-diversity group who responded with “disagree somewhat” to “I learn a lot from my interdisciplinary peers” (42.5%) is twice as large as in the high-diversity group (26.0%).



Midterm evaluation workshop

3.4 Role of the University

Thus far, one question remains: To what extent does the university environment affect social contact diversity and therefore informal interdisciplinary knowledge transfer as well?

The most direct way to put the university into the picture is to consider how university-associated situations fare when overall situational diversity decreases.

Interestingly, students who report not talking to their interdisciplinary peers about their subject report a situational diversity lower by 0.43 compared to those who do (6.14 vs. 6.57), and we observe a larger difference in diversity of private or non-university-related situations (5.02 vs. 5.53) than university-related ones (4.55 vs. 4.92). On average, the respondents reported having made friends or acquaintances from their own field of study in 2.92 out of the five university-related situations they were asked about. For interdisciplinary contacts, the average was 1.87 out of the five. When offered a pool of five situations not related to university, these figures changed to 2.70 and 2.65 for intradisciplinary and interdisciplinary contacts, respectively.

For intradisciplinary contacts, the mean ratio of the reported number of situations related and not related to university was 1.08 (cal-

culated from the means); for interdisciplinary contacts, 0.7. This indicates that contacts established at university are biased towards the students' own fields. This, of course, is expected given the academic purpose of studying as well as the large proportion of unique compulsory lectures for many courses.

However, subdividing the study's participants revealed differences between the faculties. With regard to intradisciplinary contacts, said ratio lay in the range of 0.96 (medicine) to 1.22 (computer science) for all 6 faculties of interest. For interdisciplinary contacts, however, the faculty of medicine scored a ratio of only 0.41 while the other five ranged from 0.74 (economics) to 0.87 (computer science).

Analysis grouped by campus instead of faculty yielded similar results. The same applied if the ratios were calculated for every single respondent and then averaged over the respective groups.

These findings suggest that the medicine department offers fewer opportunities for students to create contacts with peers from other fields than do other faculties, or they are engaged in such opportunities less often. In contrast, the computer science department seems to be well connected to the other disciplines. This may be due to various applications of information technology as a tool throughout all modern sciences, but note that the numbers may be biased by the faculties of mathematics and computer science sharing one building at the Garching campus, which probably engenders many contacts between these students. The data gathered in the present study does not allow us to quantify this possible effect.

4. Summary and Future Goals

Contrary to our expectations after studying the literature, we find little to no connection between a student's personality and their faculty. Therefore, distinct personality traits cannot be responsible for stereotypes that students may harbor about other faculties. TUM, as a technical university, clearly leaves its mark on students' social circles in the sense that its students have little contact with students from fields not represented at TUM. Moreover, interaction with fields not represented at one's own campus is also less likely. What causes these shortcomings should be further investigated, and if they are related to institutional factors within our university, they should be remedied since discouraging contact with students of other fields negatively impacts educational quality.

We constructed three measures of diversity, all of which were found to be positively related to successful knowledge transfer. This confirms that our approach of investigating the social aspect of interdisciplinarity among students is valid.

We found that, regarding faculties, the university is not equally significant for its students' social contacts. This deviation is larger for social contacts outside the students' own fields.

When investigating whether students learn from their interdisciplinary peers, we asked respondents to self-evaluate the question "do you learn from your them about their fields" – but do students really learn about different fields from informal interaction? A future study could analyze actually retained knowledge of participants who report learning from their peers.

Future research should further take into account the exact number of contacts established at university as opposed to other situations. Additionally, since this study exclusively uses information obtained from TUM students, a comparison between different universities would be interesting to contextualize our findings.

In conclusion, we have established that having diverse social contacts is linked to increased knowledge transfer across the borders of faculties – the university providing ample opportunity for students to interact with students from other fields could thus be a vehicle for interdisciplinary communication skills.

Acknowledgments

No project can be carried out alone. Therefore, we would like to thank all who supported us and our ideas during the challenging working process. We are indebted to our mentors Prof. Dr. Pascal Berberat, Prof. Dr. Christina Raasch and Prof. Dr. Klaus Mainzer, without whose specialized knowledge our project would have been impossible.

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With regard to preparing for our survey, we want to express heartfelt gratitude to our interview partners Prof. Dr. Pascal Berberat, Prof. Dr. Klaus Diepold, Prof. Dr. Klaus Mainzer, Prof. Dr. Gerhard Müller, Prof. Dr. Kristina Reiss and Prof. Dr. Erich Wintermantel.

Moving on to our survey, we thank all mentors and other supporters who advertised our survey to their students and motivated them to participate – not to mention all students who took part and thus afforded us the database that was crucial to our project's success.

Last but not least, we thank the whole team of the TUM: Junge Akademie, especially Prof. Dr. Gerhard Müller, Peter Finger and Maria Hannecker, and all current and former members of the TUM: Junge Akademie who offered help and advice.

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Projects in Flow

inspired by
TUM: Junge Akademie





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TUMCampusrun

On that Wednesday, 15th June 2016, the sky was changing rapidly from dark grey to shiny blue, when warmth of the sunlight was crossing deep clouds. A strong wind was relentlessly moving the artwork of sky, steadily blowing from the west and carrying thick rain drops again and again. Since noon, two dozens of people were moving back and forth in their blue t-shirts between the Food Hall and the buildings of excellence initiatives in Garching. Of course, those people were staff members of the 4th Campus Run of TUM, which received more than 400 registrations this year and was meant to start at 6 pm.

Four hours before the start, the weather forecast reported that a severe storm was coming to that region and announced even a thunderstorm alert. The coordination team decided to wait until 5 pm to see if the warning was still in place at that point, in which case they would have to cancel the event. But, of course, no one wanted the event to end like this, especially given that the team had only just put up the signposting all over the campus in Garching. But then, earlier than expected, the part of the team which had been signposting the route along the Isar floodplain forest came back and reported that a forestry official had told them that the event did not have approval and could not go ahead. The team was so surprised by the announcement that they realized they had no option other than taking the signs back down again. Before the run, all possible risks and complications had been considered twice, but having no approval for the run was a totally unexpected circumstance. Fortunately, after a discussion with the forestry management, it emerged that there had been a tiny misunderstanding and that the appropriate approvals had been given but the information had not been passed onto all the relevant forestry workers. The team breathed a huge sigh of relief and signs were quickly put back in their former positions.

Meanwhile, participants were slowly arriving and picking up their numbers from the registration desk. In between, they were informed that due to numerous construction sites at the campus, the first running path had been extended from 5 to 5.5 km and the second from 10 to 11 km. Runners found it very exciting, because they now had the chance to do 10 percent more fitness training for the same price. More and more runners were meeting in front

of the Mechanical Engineering faculty building, finding their team partners and making themselves ready: changing clothes, warming up, jogging with short sprints or just relaxing.





Organizers refreshed the weather forecast at 5 pm: no clue of a thunderstorm alert, just light showers and partly sunny weather. Thus, the green light was given and one thing was for sure: the run would not be cancelled.

After an hour, the campus run started for the fourth time in TUM history. Runners followed a bike-rider, who helped them to follow the path and acted as a pace-setter to enhance the competitive experience: This was taken seriously by participants. The first ones finished 5.5 km in less than 19 minutes. Almost half of the participants accepted the challenge to go on to the second round, even though this route had also been made longer for the this year for the first time. The fastest runners in this round crossed the finishing line within 38 minutes. In the end, all participants completed the course, exhausted perhaps, but very happy and, above all, without any injuries. Consistently positive feedback about the route and the possibility of offering additional running distances to choose from indicate that the event can expect to attract increasing numbers of enthusiastic “TUMlinge” runners in future years.

The TUM campus run took place on 13th June 2013 for the first time and was organized under the Health Day of Workplace Health Promotion (ABGF) at TUM by the project group “runTUMfit” of The Academy Year 2012. The “runTUMfit” group developed the idea after brief research into comparable events at other universi-

ties and after discussions with the organizers of similar previous events at TUM – i. e., the TUM triathlon and the Weihenstephan mountain jog, The main goal of the team was to improve fitness training opportunities for students and employees at TUM through specific projects and events such as the running event. A distance of 5 km was decided for this, so that untrained people could also participate. Using a range of running paths, participants were able to discover not only the campus, but also forests and boardwalks by the river Isar. Performance ratings were recorded within three categories: women, men and team. The three fastest teams were awarded gift baskets and, in the individual categories, the fastest five women and fastest five men received TUM running vests as prizes.

After this project group’s success in establishing this event, a project group of the following Academy Year, “WachsTUM,” sought to develop the idea further. This team used a new marketing strategy: an advertisement video of the run, which was visited by more than one thousand people on TUM’s YouTube Channel. Since 2015, TUM’s campus run has been defined as a senior project of the academy of talents at TUM and has been planned and shared in by a variety of active and former members. Further important changes in 2015 saw the Department of Mechanical Engineering becoming



a collaborative partner of the event and the campus run being made part of the annual festival of TUM, GARNIX.

Right after the awards ceremony, it was suggested that the 5th campus run should take place under the aegis of the GARNIX festival again. The run will take place on 28th June 2017 at 6 pm. We, the Academy, are delighted to report that every year more and more people are showing an interest in TUM's campus run and after four years this sports event belongs to the official agenda of TUM. Our best prediction for next year is that we will have a total of a thousand runners at the event. For the 150th anniversary of

TUM in 2018, we are already considering a half marathon which could start simultaneously from both Weißenstephan and the main campus in the city and then end together in Garching. But there is still some time to go before then! Let's give it a sporting chance of being a surprise to all of us!

We would like to thank our staff from the TUM: Junge Akademie and the Department of Mechanical Engineering, and especially to the property management of Garching site, because without them this run would be entirely out of the question.





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 Dipl.-Ing. agr. Peter Finger (Managing Director TUMJA)

Mentoring “Buddies for Refugees”

It has been one year since the start of the project “Buddies for Refugees” but, in hindsight, one can clearly state that it has been a great success for all the people who have been party to it. More than 300 Buddy-applications in the first round and 200 in the second show the great commitment of the whole TUM-family and its ambition to help improve society in general and not just within special fields of study.

Background

When the Technical University of Munich established the auditor program for refugees one year ago, the TUM: Junge Akademie aimed at creating an associated program in order to facilitate the integration of refugees into the German education system as well as into wider society. In a very time-consuming process, a group of highly socially-engaged people from all parts of the university designed the program just in time for the start of the winter term. Drawing on a unique mix of expertise from different positions and backgrounds within the university – from students right up to the Senior Vice President Academic and Student Affairs and Director of the TUM: Junge Akademie, Prof. Müller – the group was able to develop an especially sophisticated and well-balanced blueprint for the project.

The mentoring concept

The program consists of the Buddies as mentors and the refugees as mentees. The Buddies are further divided into Junior (students) and Senior Buddies (university staff). Following a successful recruitment procedure (which included a short motivation letter and a CV), the Junior Buddies and the mentees were matched 1:1 according to several criteria. The field of studies, language knowledge, interests and several other factors were considered, in order to reach the best fit. Furthermore, each Senior Buddy is responsible for counseling several Buddy-Tandems and tries to support interaction between the different tandems.

As stated above, the program aims at facilitating the start of studies for refugees at a huge and complex university within an unfamiliar education system. TUM students, who are familiar with life at the university, can therefore draw on their experiences to offer sup-

port and helpful insights in an uncomplicated and direct exchange with refugee students. However, the Buddies have committed themselves to provide not just study-oriented assistance, but also further integrative support relating to student life in general.

Another aim of the program is to prepare TUM students – who, in future, are likely to find themselves in leading positions in a wide range of different fields within science and society – for the opportunities and challenges of integration. Integration will be a defining task of future years and decades, and intercultural understanding and communication will be of great importance.

The mentoring process is accompanied by several formal and informal activities in order to promote better understanding between the buddies and mentees. The formal ones, so far, have consisted, on the one hand, of a lecture series about six important topics concerning different facets of the refugee experience, ranging from “The ‘Refugee Crisis’ – Causes, Challenges, Opportunities” to “Evolutionary living-space.” High-ranking scientists from TUM, LMU, Philipps-University Marburg and the Max Planck Institute for Social Law and Social Policy have presented talks based on the latest state of the art of their studies. On the other hand, the Buddies received an immersion course at the beginning of the semester on the most important things they need to know about intercultural communication, a few linguistic basics and some psychological aspects affiliated to flight and trauma.

The informal activities have consisted, for example, of sports and cooking events. Due to special offers and support from several different institutions, it was possible to reduce the costs of these activities for the auditors. These kinds of events have been especially useful in helping the participants to get to know each other better.

Future directions

As stated in the introduction, the program has been highly successful, as we were able to support almost 300 refugees during their first steps at university. For the future, the biggest challenge will be to keep up the high number of Buddy-applications in order to establish the “Buddies for Refugees” mentoring scheme as one of the most successful TUM: Junge Akademie senior projects.



Team

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Tutor

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Mentor

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zusammen.sammeln

zusammen.sammeln, a project of the year 2014/15, sought to establish a micro-donation-system at TUM with the goal to enable students to make valuable contributions even with a low budget by means of a social crowdfunding system. Our motto was: size doesn't matter, if everyone joins, great can be achieved. First, by conducting a survey amongst students and employees of TUM, we were able to confirm the hitherto unproven hypothesis, that the

willingness to donate at TUM can be harnessed and increased. Furthermore, we queried two possible types of donation and their acceptance rate. The two donation options were gaining wide approval with more than 70 % acceptance rate among all respondents. For this reason, we decided to implement both donation systems on campus.



On the one hand, bottle deposit donations were identified as a possible crowdfunding-option. In May 2015 two successful pilot projects at the city center campus and the campus in Freising showed us its demand and continued to encourage us in our project. The donations were given to the Lebenshilfe Werkstatt with whom we cooperated back then. Based on the pilot project we developed a plan for further implementing bottle deposit donations at all major TUM locations. For the final implementation of this scalable crowdfunding solution we managed to have at one's disposal 12 barrels which are converted into bottle donation containers.

On the other hand, we cooperated with the Studentenwerk München and created the so called "donation meal" where currywurst and strawberry yoghurt are sold for an additional 20 ct and 10 ct, respectively, which are then given to charity. At the very first donation meal in a university canteen in Germany in 2015 1450 € (6134 currywurst, 1988 strawberry yoghurts) were raised and donated to the Studentenhilfe München e.V..

We are keen to stabilize these two donation options. Therefore, we are very pleased that on account of the huge success, the donation meal has been established by Studentenwerk München as a regular event, taking place once every semester. At the most recent donation meal in Mai this year, a small amendment was made. As at the first two donation meals one could donate money by eating the currywurst or strawberry yoghurt in one of 13 canteens and bistros in Munich. For the first time, as a second option, one could also name their desired donation amount at the cash desk. In that manner another 1350 € were raised. Furthermore we are mainly looking for a suitable partner who would be in charge of emptying the provided containers regularly.

Projects in Prospect 2016/2017

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Decision-making processes in Democracy and Asylum Politics

Every day, refugees are arriving in Germany searching for shelter. Most of them flee from their home countries because of conflicts caused by political instability. They often come from countries which are not democracies – the countries they are running from are either ruled by dictators or governed by a small elite and do not allow all of their inhabitants to participate in fair, democratic elections. Here, in Germany, political decisions are based on democratic structures.

But – how does democracy work? Moreover, what defines democracy? How much knowledge about democracy do people seeking asylum in Germany have?

We are motivated to explore this challenging and exciting field of democracy and asylum policy.

The first goal of our project was to learn more about the social and democratic structures of existing refugee asylums. Therefore, we gathered general information about democratic systems, the situation for refugees in Germany, and about asylum politics generally. Based on this knowledge, we designed a set of interview ques-

tions, aimed at both refugees and heads of refugee asylums, which would elicit information about the current situation and in particular about the social and democratic structures of refugee asylums.

In the next step, we are planning to analyze these structures in refugee asylums based on the answers derived from the interviews. From this analysis, we hope to identify the most effective strategies for realizing our project.

Further steps could then be: Establishing or (where they already exist) improving direct democratic committees, such as home councils and boards, in refugee asylums, as well as teaching the inhabitants about the democratic system in Germany, depending on our findings after the analysis of the interviews.

Our vision is to improve and support democratic structures in refugee asylums. By helping refugees to enhance their knowledge about democracy and to understand how to apply such knowledge in everyday life, we are hoping to contribute to a smoother integration of refugees in our society. ■

Team

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Tutor

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Mentor

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Prof. Dr. Elisabeth Wacker

Decision-making processes in Healthcare

Today the Internet is the most important tool by which we buy everything we want and communicate with our friends but it also has a great influence on our attitudes towards healthcare. Due to the open nature of communications offered by the Internet, we now have access to a huge diversity of information which can affect our decision-making on matters relating to our health.

During our first group meetings and brainstorming sessions we identified four interesting topics that we wanted to investigate further:

- self-medication and “Dr. Google”
- Pros and Cons of Vaccination
- Lifestyle and Trends
- Health myths

For many people it is easier to search for possible diagnoses via the Internet and to decide afterwards whether making a time-consuming appointment with a doctor is necessary. However, there are many insincere websites which provide misleading information and these can create unnecessary anxieties if, for example, a person is told that they have an illness which, in fact, they don't have at all. The same problem occurs with the topic of vaccination, which is a sensitive issue nowadays. While renowned studies can be trusted, a lot of untrustworthy theses are widespread throughout the Internet and these make it harder for the layman to identify reliable information.

Team

Felipe Balestero de Assis
Thomas Bickel Haase
Vanessa Buchweitz
Marion Lechler
Michaela Matus
Dennis Röcker

There is also a strong trend towards the use of alternative medicines and household remedies that sometimes cause conflicts with conventional medicines. With such an enormous number of websites claiming to deliver the perfect guidance for a healthy life and good nutrition it becomes ever more difficult to specify a trustworthy advisor.

With our project we want to determine the influence of all this diverse information on the decision-making processes which affect our healthcare. In addition to that we hope to discover which aspects of these information sources have the most impact and to what extent these can be a threat to the public health system.

Through interviews with different target groups (e. g. doctors and patients), we expect to gain data which will help us to understand how people use the obtained information in order to make decisions affecting their healthcare.

As a team we are very enthusiastic about this project and we hope to gain a thorough overview of this important issue. Also, we are inspired by the idea of engaging in systematic scientific analysis and making use of the research tools and methods we have been learning about. ■

Tutor

Maximilian Biebl
Sabine Pircher

Mentor

Prof. Dr. med. Reiner Gradinger
Prof. Dr.-Ing. Liqiu Meng

Decision-making processes in Food Industry

Imagine yourself on a Saturday morning, shopping for groceries for next week. Are you walking through the abundantly packed aisles of a supermarket or do you prefer to visit your local farmers' market? Which criteria are influencing your decisions for a particular product when buying apples, yogurt, eggs or coffee? Which factors are making your decision-making processes difficult or unsuccessful?

These are the key questions our diverse and motivated project team will address during the next academic year. Having started our work by investigating the data and experience already existing in this area, we will test our hypotheses by conducting our own quantitative research. Based on this thorough and systematic groundwork we aim to propose and develop our own solutions to improve decision-making processes concerning the food industry. So far, we have identified two promising and concrete topics, which are to be pursued by one half of the team each to streamline our project work. The first is focused on the ecological footprint of a grocery product, i. e. all the resources consumed during the

making, transport and disposal of a product and its packaging. We will examine the importance of this measure for a consumer's grocery purchases and investigate how the ecological footprint of a food item can be quantified. By making this data available to the customer in the supermarket, we intend to increase transparency and improve his or her decision-making processes. Our ultimate goal is to demonstrate the successful realization of such quantification with a specific product, ideally by developing an easy-to-use smartphone application.

The second topic concerns the in-depth examination of consumers' decision-making processes when purchasing a grocery product. We want to investigate the criteria influencing these decisions, such as pricing, greenhouse gas emissions, nutritional value, marketing, regional origin, organic farming or fair trade certification. Furthermore, we are keen to analyze factors like insufficient transparency, an oversupply of perhaps contradictory information or a lack of alternative choices as barriers for successful decision-making processes. ■

Team

| | |
|-----------------------|-------------------------------|
| Fabio Bove | Sophie Petersen |
| Philip Böhm | Carlos Piedrafita Alvira |
| Max Leon Hechler | Lukas Raith |
| Linus Huss | Paul Thillen |
| Carolin Juliana Klose | Konstantin Matthias Paul Wolf |
| Sebastian Laumer | Johannes Wüllenweber |
| Julia Nieberle | |

Tutor

Dominik Irber
Benedikt Josef Oberndorfer

Mentor

Dr. Hannes Petermeier

Consumption habits of modern society

The relationship between supply and demand is one of the basics of the modern economic system. But not only does it help to determine the price of a product, it can also, on the one hand, give a simple reason for the competition between companies to fulfill consumers' wishes, and, on the other hand, explain why consumers' behavior has such a huge effect on the global market. Having discussed multiple components of the way modern consumers' decision-making has developed over the last decades, our group is now focusing on two major topics in a future scenario of consumption habits.

Already being introduced to a wide audience by companies like Uber, the so-called "sharing economy" has a big potential within our modern lifestyle. By analyzing its present and possible future influence, we're intending to define criteria for a successful realization of this idea regarding different types of products. As an important factor, financial aspects both for customers and companies will have to be considered and existing approaches will be compared and evaluated in order to select specific product groups that we will focus our work on.

One of the most crucial concerns when it comes to our modern way of living is the impact on nature and humanity of our consumption habits. With the climate changing and resources being exploited, the concept of sustainability is becoming more and more pervasive within society. Being part of a generation that will face new challenges in this area, our first goal will be to develop a deeper understanding of contemporary consumption habits – especially with respect to our knowledge of the topic and our willingness to take responsibility for these challenges and to think outside of our personal comfort zones. In following up our analysis we aim to find ways of drawing customers' attention to more sustainable products and services, for example by quantifying and visualizing the footprint a certain product leaves behind. ■

Team

| | |
|--------------------------|-------------------------------|
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| Markus Feuchtinger | Eva-Maria Schmid |
| Katharina Marliese Höfer | Philip Maximilian Teichgräber |
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Mentor

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Alexander Lang, Dipl.-Chem.

Decision-making processes in handling Artificial Intelligence

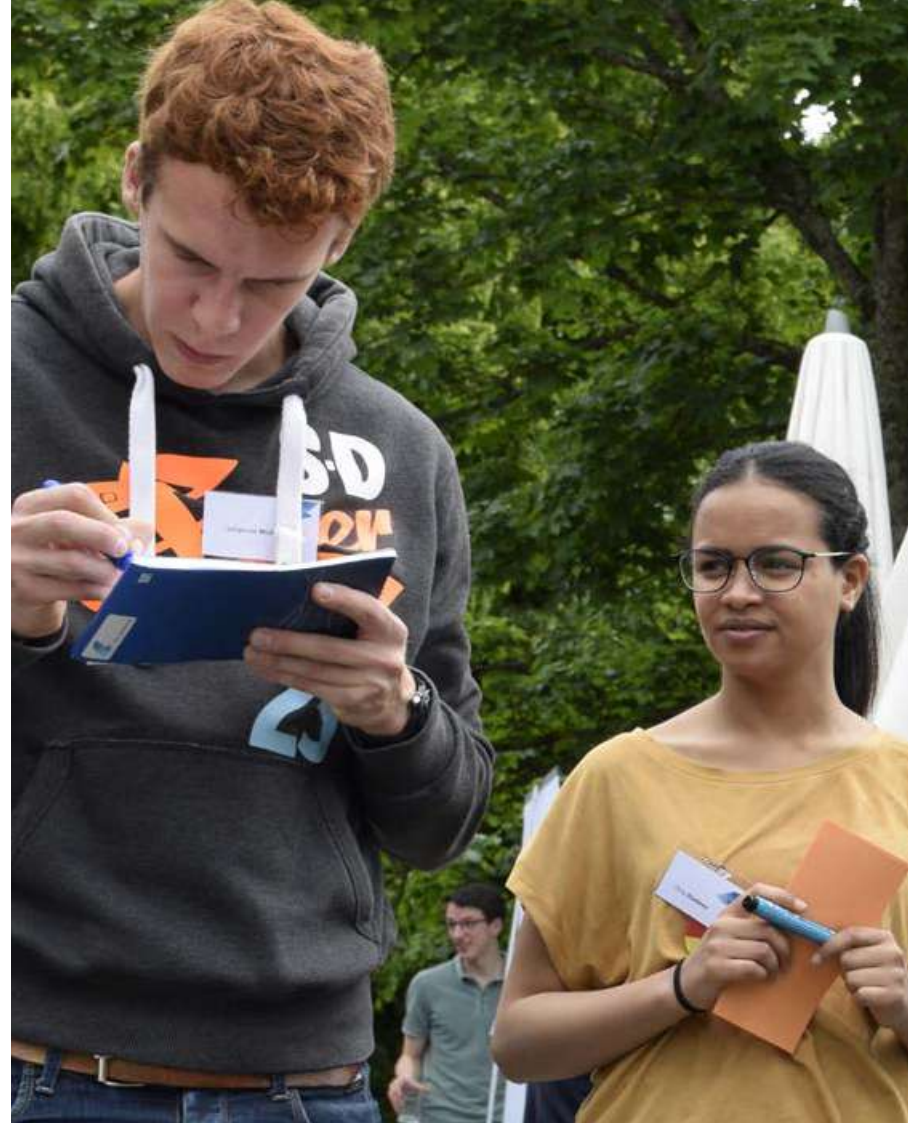
In the past decades, Artificial Intelligence (A.I.) has found its way into many aspects of our modern life. Despite often being seen as science fiction, we already use A.I. – mostly without recognizing it. Computers provide us with powerful search engines or programs that are able to analyze our behavior and respond accordingly. Beyond these applications, there are also many recent developments towards even more “intelligent” machines: in 2015, for the first time, a computer won a game of Go against the human world champion. And self-driving cars are considered to be the future of mobility – vehicles that can handle traffic with ease and are able to take the right decisions, even in dangerous and chaotic situations.

Along with this rapid technological development, various questions arise: How to use and regulate A.I.? What defines the general process of decision-making in research, industry and society. The title of our project is rather universal and reflects on decision-making processes in three different levels of A.I. – the basic level of technical understanding and possible uses of A.I., the effects of A.I. on our personal life and the society, and of making decisions on how to handle and regulate intelligent machines.

Each level makes for an interesting field of research on its own. Our aim is to look into all three levels in a specific area of A.I. and ultimately to try to answer questions like:

- 1) “How can society decide who is to be held responsible if an A.I. system fails, e.g. in medical applications or autonomous driving?”
- 2) “Is society ready for new applications of A.I. considering prejudice and actual knowledge? Can we try to better inform people who are primarily influenced by the representation of A.I. in the media?”
- 3) “Who should regulate where and to what extent the usage of A.I. is acceptable?”

To begin with, we plan to gain an overview on the topic by reviewing scientific papers, news articles and other popular media.



This will enable us to compare the different perceptions of, and opinions on, A.I. in both science and society.

The next step will be to identify and analyze decision-making processes in handling A.I. within the different levels mentioned above. This will eventually lead to our conclusion, e.g. on how to define guidelines for constructing and handling A.I. or designing an App which implements A.I. to assist students with their daily decisions. ■



Team

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Bernhard Häfner

Florian Henkes
Annemarie Hofmann

Tutor

Benedict Biebl
Michael Clormann

Mentor

Prof. Dr. Sabine Maasen
Dr. Florian Röhrbein

TUM: Junge Akademie

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“To me, TUM: Junge Akademie offers a place to encounter competent, great and different people who hold each other in high esteem. It is also a place to develop oneself in an interfaculty setting and to discover new talents.”

Lena Weber, Year of 2012/13,
TUM School of Education,
TUM Bikesharing



“TUM: Junge Akademie enriches my personal and professional development. I get to know extraordinary people with whom it is a pleasure to work with productively as well as participate in joint extracurricular activity.”

Anna Schmidt, Year of 2014/15,
Faculty of Civil, Geo and
Environmental Engineering,
zusammen.sammeln



“As a member of TUM: Junge Akademie I really appreciate both the subject-specific work and the personal exchange. These two components lead to a very productive work climate, whereby there is room for fun as well.”

Philipp Rinner, Year of 2015/16,
TUM School of Management,
Foodtomorrow



The Academy

The TUM: Junge Akademie is TUM's scholarship program for exceptionally talented and dedicated students of all faculties. The Academy – as the talent scholarship program of the Technical University of Munich – 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 members 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.

To build a productive and innovative environment for our young talents, we challenge our members to engage in ambitious and socially relevant projects and initiatives. To empower our members' personal development, we offer them workshops, interdisciplinary exchange and cultural activities. We bring together our new and former members to build a pool in which members from different years can share their ideas or help the younger Academy members by tutoring the project teams. By coaching and supporting the students in challenging situations that might occur within the project development, our team aims to encourage creative freedom, unconventional ideas, analytical thinking and the consideration of scientific insights.

The program fosters a mutually beneficial relationship in which our members are helped to achieve their full intellectual potential while also contributing directly to the shaping of the Academy's future. In this connection, we encourage members to take responsibility for other members by, for example, serving on the Board of Members or the Advisory Board. Those who are more devoted to operational tasks join one of the Taskforces: "Event," "Marketing," "Members & Recruiting" or "Corporation, Alliances and Partners/CAP."



In both cases, they contribute to the Academy's development in terms of successful capacity-building as an organization within the Technical University of Munich.

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 members' 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 six times a year. It primarily decides on the medium to long-term strategic and organisational issues of the TUM: Junge Akademie.

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) or the TUM University Foundation. Furthermore, proposals from the Board of Members are discussed.

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

The Advisory Board is composed of the director, three representatives of the former professors, three representatives of the active professors and six elected members of the TUM: Junge Akademie.

Members of the Advisory Board 2015/16:

Director:

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

Members:

Carl Ebbinghaus
Martin Kaumanns
Tim Lauer
Paul Stursberg
Lena Weber
Sebastian Zäpfel

Active professors:

Prof. Dr. Isabell Welpé
Prof. Dr.-Ing. Klaus Diepold
Prof. Dr. Jürgen Geist

Emiriti of Excellence:

Prof. Dr.-Ing. (em.) Georg Färber
Prof. Dr. (em.) Manfred Kleber
Prof. Dr. (em.) Michael Molls

The Board of Members – The Academy by members for members

The Board of Members synthesizes and represents the members' various interests within the TUM: Junge Akademie. Here, representatives of the current projects, the Taskforces and dedicated members of all years meet regularly and take decisions for the further development of the Academy.

At the meetings current questions regarding the projects and the activities of the Taskforces are discussed. In this connection, also, strategic issues such as opportunities for continuous improvement of the TUM: Junge Akademie or changes within the scholarship program are broached. The members' representatives are appointed to the Advisory Board from among the Board of Members. By this tight integration, a direct flow of information between the Advisory Board and the membership is ensured and the members are able to participate actively in the decision-making process.

All active members are invited to present their opinions and ideas at the meetings of the Board of Members in order to help the TUM: Junge Akademie to evolve into an institution of members for members.

Currently active members in the Board of Members:

| | |
|-------------------|-------------------|
| Benedict Biebl | Matthias Lehner |
| Julian Biendarra | Philipp Marzak |
| Vanessa Buchweitz | Maike Offer |
| Andrei Costinescu | Leonard Przybilla |
| Carl Ebbinghaus | Stefan Röhl |
| Wolfgang Enzi | Anna Schmidt |
| Christiane Frank | Fabian Schmitz |
| Andrea Geipel | Daniel Schwinger |
| Fabian Gura | Daniel Straimer |
| Philipp Hulm | Paul Stursberg |
| Dominik Irber | Paul Thillen |
| Martin Kaumanns | Robin Weiß |
| Josef Kimberger | Sebastian Zäpfel |
| Marlies Köpke | Martin Zirngibl |
| Beate Lang | |
| Tim Lauer | |
| Marvin Lechner | |
| Vivien Lechner | |

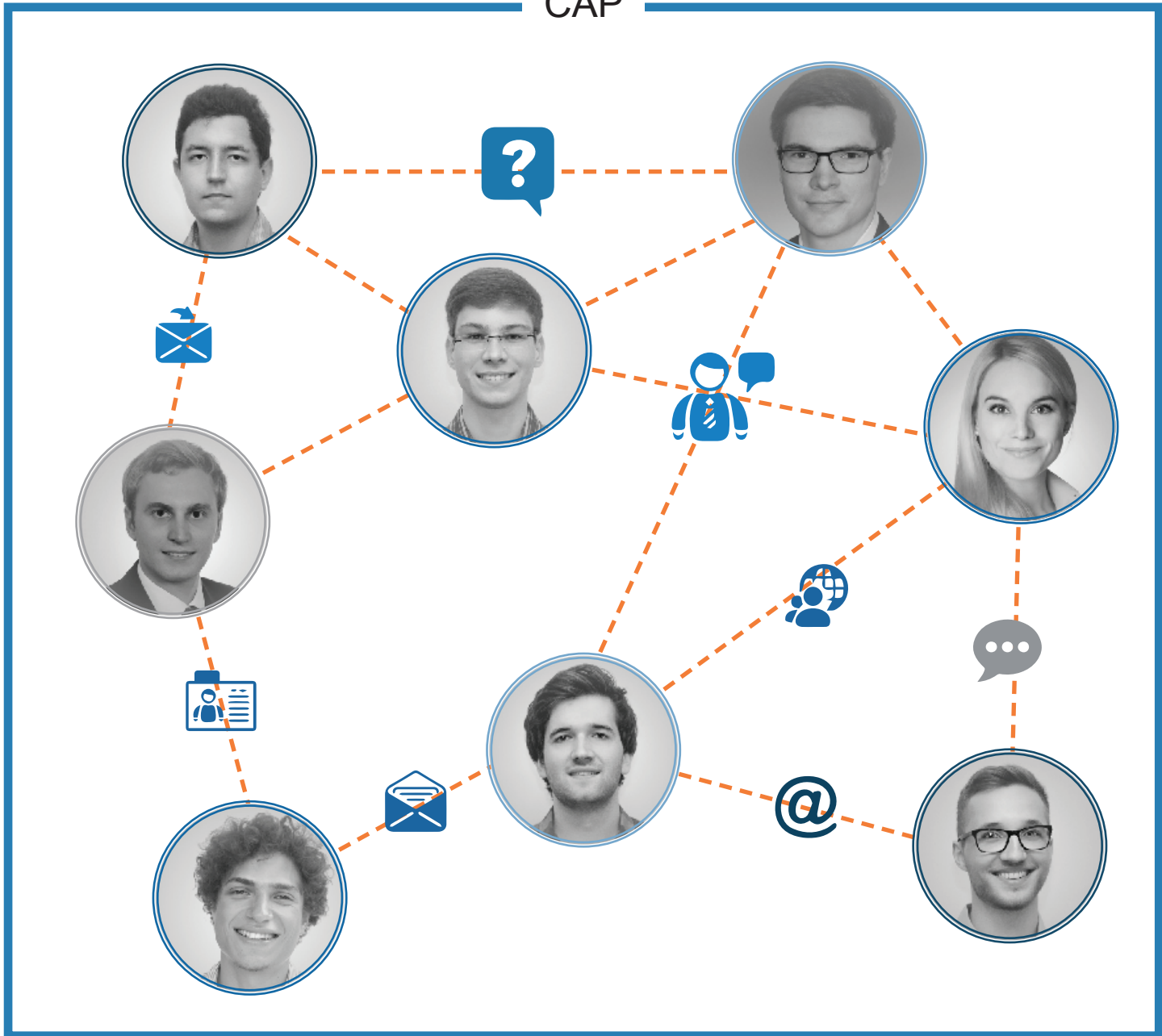


Committed: Taskforces, Tutors, Mentors, Office

The statement “Members for members” is understood as a leit-motif at the TUM: Junge Akademie: Members are actively taking part in the creation of the Academy’s programs. This is reflected, among other things, in the selection of workshops, such as the workshop on “creative writing”, which bolsters the development of the participants’ skills concerning editorial work and scientific writing.

In addition, the Academy provides access to experts at the Technical University of Munich as well as to external experts, it financially supports the realization of events and it offers its members the necessary space to carry out activities in support of the Academy’s network.

In this way, members of all years and alumni get involved in the Taskforces or as tutors for one of the project groups. To facilitate the operations, the office team supports and encourages all members in their commitment and work.



The CAP Taskforce

The Taskforce, “Contacts, Alliances & Partnerships” (CAP), has been established with the goal of winning over partners for the TUM: Junge Akademie.

Individuals, scientific bodies, public and private organizations or companies can all be strong partners for the TUM: Junge Akademie. The Taskforce is eager to acquire supporters who share the principles, values, and ideas of the Academy. By valuing the rich potential of interdisciplinary teams, the TUM: Junge Akademie actively explores dependencies between technology and society and seeks to develop solutions to the most pressing problems.

Apart from the possibility of supporting the TUM: Junge Akademie in its entirety, partners are also welcome to focus on specific projects. These could be topics investigated by members in their project year, individual events organized by the Taskforces, or other promising ideas.

There are two principal ways in which we promote collaborative partnerships:

- Members of the Taskforce proactively approach potential partners and work to inspire them to become supporters of the TUM: Junge Akademie.
- We maintain an open invitation to all interested parties to contact the Taskforce concerning partnership opportunities and we warmly welcome all such approaches.

The Taskforce would be delighted to discuss all aspects of collaboration with potential partners and would be happy to advise on specific individual concepts or proposals.

Your CAP Taskforce

Mario Berk

Tim Kratky

Leonard Przybilla

Andrea Schlegel

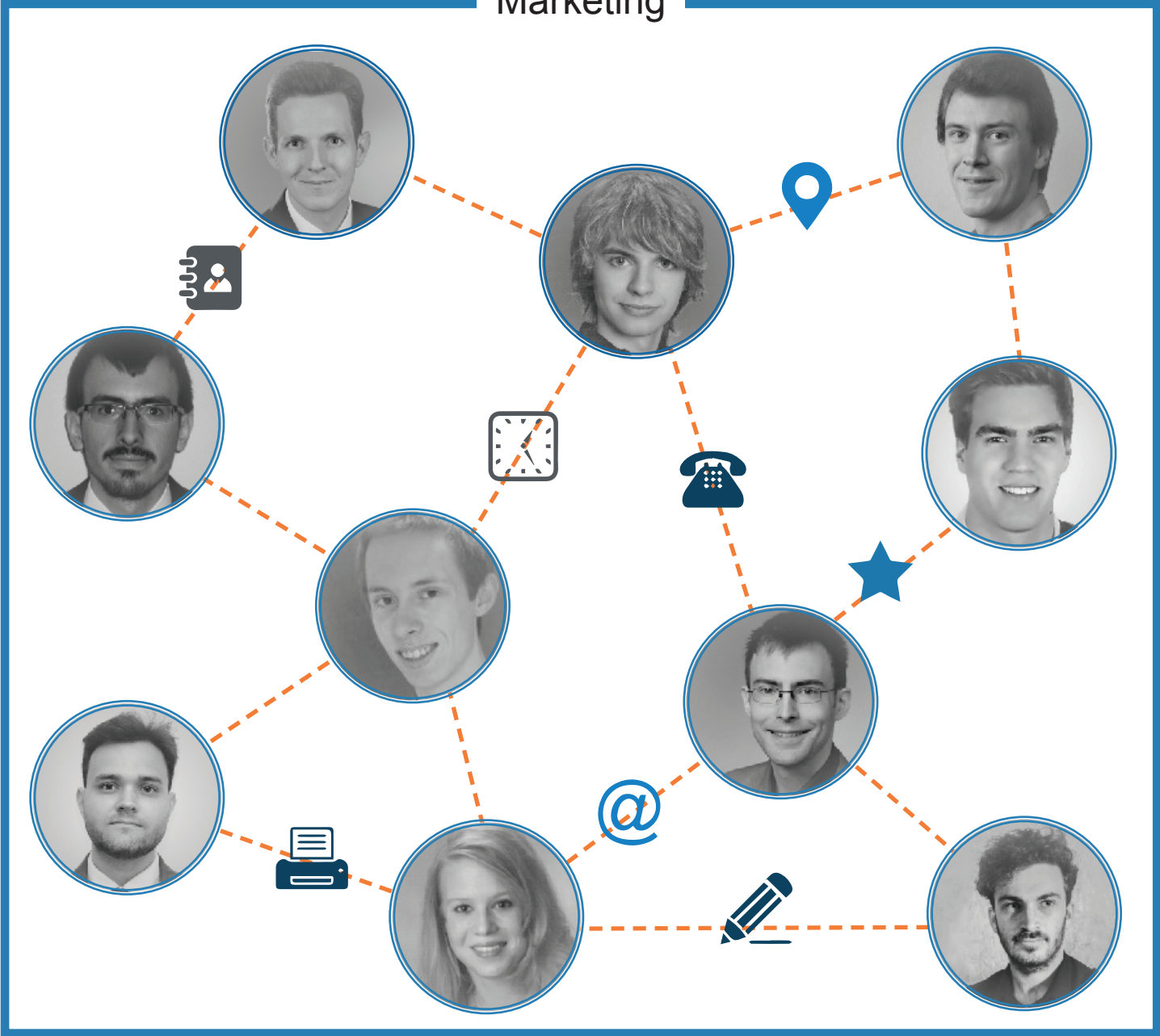
Max Schütz

Daniel Schwinger

Sebastian Zäpfel

Matthias Zipper

Marketing



The Marketing Taskforce

The aim of the Marketing Taskforce is to make the TUM: Junge Akademie more visible to students and employees at TUM as well as to potential partners and employers outside of TUM. To this end, the Taskforce supports the office team and the other Taskforces, as well as the project groups, on issues of public relations and marketing. The members take care of the web presence of the TUM: Junge Akademie by keeping it up to date with pictures, reports and any other news, and they develop concepts for the TUM: Junge Akademie branded giveaways.

The Marketing Taskforce also selects topics for publications, revises reports, and communicates with employees of TUM-internal institutions such as the press office. In addition, they are responsible for the style guide for the project reports which appear in this very project book. The members of this Taskforce are active in many places, where they seek constantly to improve the presentation of the TUM: Junge Akademie and bring to life new concepts and ideas!

Your Marketing Taskforce

Julian Birkmaier

Carl Ebbinghaus

Meric Firat

Dominik Irber

Tim Lauer

Konstantin Riedl

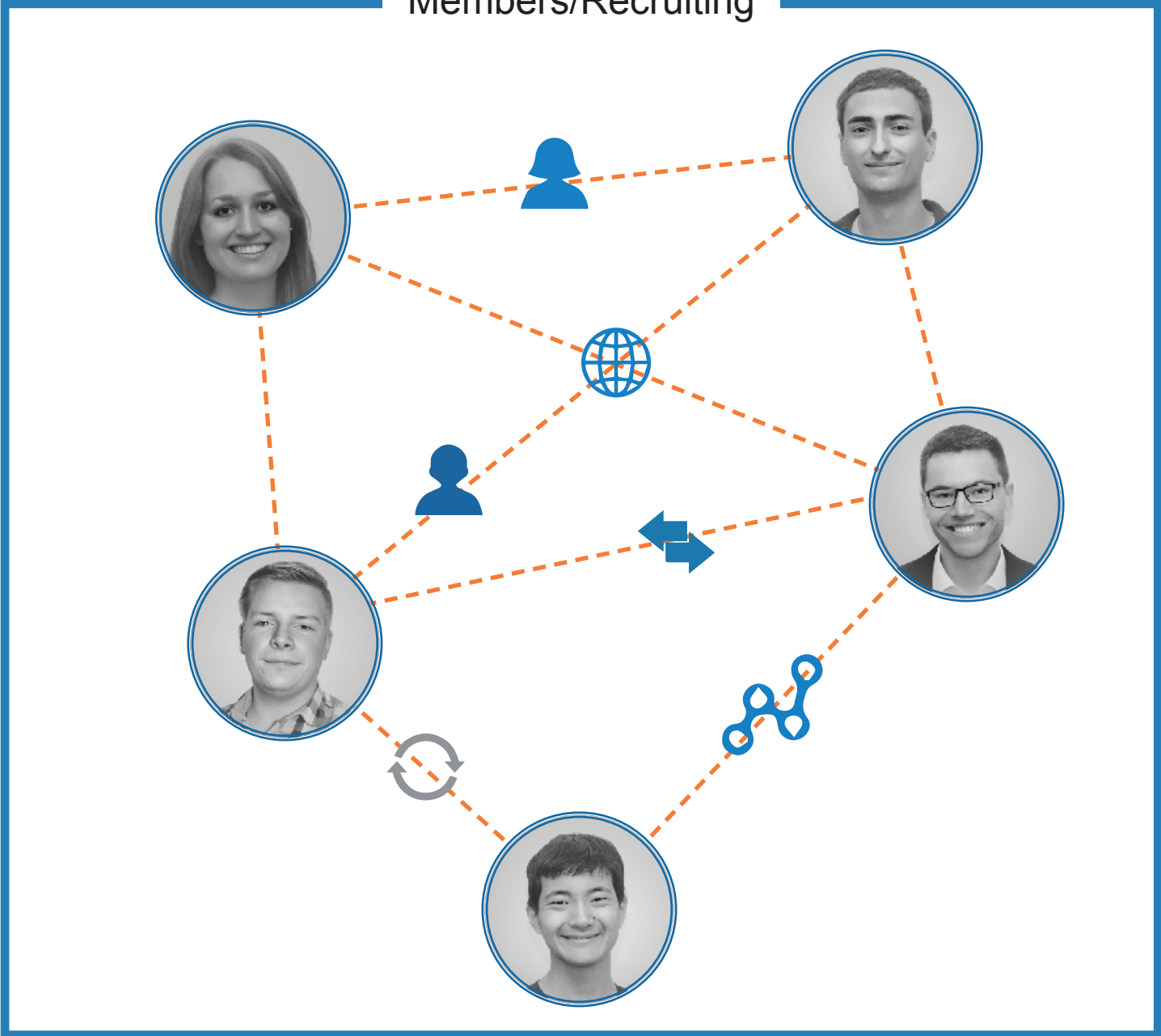
Florian Schwaiger

Johannes Steidl

Paul Stursberg

Lena Weber

Members/Recruiting



The Members & Recruiting Taskforce

In autumn 2015 the new Taskforce “Members & Recruiting” was established. So far the effort has mostly been carried out by members of the 2014 generation and the motivation behind it is manifold:

On the one hand, it is the declared goal of the Taskforce to be the number one support facility for members, offering help with all their questions and providing integrated support both to individuals and project groups as a whole. A major part of this effort has been the creation and promotion of a new internal Wiki that will from now on provide members in the various stages of the program with relevant information, helpful insights from older generations, and valuable points of contact for support, mentoring and partnership. In the process of creating this central resource, information from multiple sources has been consolidated and is now both consistent and available in one single place. The new platform will furthermore be used by the teams for project management to enable centralized coordination, documentation and stakeholder revision of the various initiatives taking place within the TUM: Junge Akademie.

On the other hand, we are convinced that outstanding member support should begin way before official admission and, ideally, during the very recruitment process. This is the reason why efforts to professionalize talent acquisition, brand marketing and candidate care were launched. We refashioned the Academy’s information

brochure for interested students and for the first time held the information event on two different campuses of TUM. In addition, as part of the on-boarding process of the 2016 generation, we have prepared a welcome package to help ensure that new members are well-informed, productive and connected from the very first day.

Future efforts of the Taskforce will be targeted at further strengthening the network of the TUM: Junge Akademie, improving alumni relations management and the development of concepts and ideas on how to make a membership even more formative and rewarding. As a cross-functional Taskforce we are working closely with the other Taskforces as well as with additional partners and stakeholders within the organization and beyond. We are strongly committed to reinforcing these collaborations in the future in order to be able to handle projects in an even more agile and dynamic way, thus enabling an optimal outcome for all involved parties.

Your Members & Recruiting Taskforce

Fabian Gura
Michael Haubenschild
Marlies Köpke
Yuki Nojiri
Daniel Straimer

Event



The Event Taskforce

The sun burns on your neck, the grass tickles between your toes and there is the smell of barbecue in the air: One might almost think one was at the Flaucher in Munich. But not at all! The TUM: Junge Akademie is celebrating its annual summer festival, which will be remembered by many not only for its culinary delights.

Cohesion and community spirit play an essential role within the TUM: Junge Akademie. Therefore, by taking part in high-quality events, the Academy's members and alumni have the opportunity to get to know each other better aside from university, project work and official meetings, in order to establish an active network with other members of the Academy. In this context, great value is laid on the principle "By members for members", because: What is experienced together, welds together properly.

A particular challenge is to meet the different preferences of as many members as possible, and not to limit the program to a few, specific events. Therefore, we offer events from six categories: Business, Culture, Nature, Science, Society and Sports. It guarantees a good mixture for every taste.

Since the Academy's foundation, the Event Taskforce has been actively involved in the Academy's programming and, in future, the Taskforce plans to collaborate more closely with the Board of Members in order to respond even more effectively to the preferences of the Academy's members.

This year, the Event Taskforce introduced a new format for getting to know one another within the Academy. Every participant of the "running dinner" enjoys appetizer, main course and dessert in three different locations. A team of two is in charge of one of the three courses while enjoying the other ones as guest. After the event's success in January and May, it will be retained and hosted once per semester.

We hope readers will be curious to see what kind of exciting activities the Event Taskforce will be offering the Academy's members next year!

Your Event Taskforce

Lorenz Baumgartner

Eva Biehl

Julian Biendarra

Sarah Braun

Jennifer Herrmann

Martin Kaumanns

Andreas Noll

Stefan Röhrli

Kristina Schick

Anna Schmidt

Tutors

To take on the task of a tutor is one of the ways of involvement within the TUM: Junge Akademie. Several tutors support each group of students with respect to their ideas throughout the whole project year. They assist and advise the teams in the project realization, from concept to practical implementation. In this context, the tutors draw on experiences from their own project work. In the search for and the address of experts and other contacts they represent important interfaces for the project teams because of their already existing networks. The tutors 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, p. 115](#)

Mentors

Mentors are recruited mainly from the group of active and retired professors of the Technical University of Munich. However, they might also be employees in TUM's scientific management or TUM alumni with specific expertise. As part of their mentorship, they support their respective project team throughout the whole project work. Due to their years of experience they are ideally prepared for this task: They advise the project groups regarding the orientation of their concepts, they critically question the aims and methods

used, they bring expertise in scientific issues 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 and this therefore represents a profitable factor for all sides.

[See List of Mentors, p. 114](#)

Office

In order to help the members develop their projects and work on different ideas within the Taskforces as well as the Board of Members, the office team oversees the general operation. 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 members of the TUM: Junge Akademie perceive and experience themselves as a network.

The TUM: Junge Akademie is managed by the Executive Vice President for Academic Affairs of the Technical University of Munich, Mr Professor Gerhard Müller. In this regard, he is operatively supported by the office team that currently consists of the Managing Director, the Team Assistant and two Student Assistants.

The Office Team

[Peter Finger](#), [Maria Hannecker](#), [Göksu Bulut](#), [Katerina Vesela](#)

A different scholarship program

Being part of TUM: Junge Akademie lets me contribute not only to my personality but also to the society. Most importantly, I enjoy being part of a wonderful family away from home, with events and kind people from various backgrounds.

Meriç Firat

In addition to the invaluable experiences, learning and networking directly associated with the projects, the TUM: Junge Akademie also offers members the benefits 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.

In addition, the annual summer festival, the monthly regulars' table and the Academy's festive annual conference provide a pleasant setting to meet and exchange views. The members are integrated actively by the Event Taskforce in both the selection of eventformats as well as in their organisation and implementation and so can contribute their ideas, wishes and expectations. In this way, each semester anew the TUM: Junge Akademie is able to offer a unique programme to its members, friends and supporters.



Guest Speaker: Prof. Dr. Ursula Münch



April

Kick-off in Feldafing



June

May

July



Selection Day



Alumni to Newbies

Futurelab



Annual Conference



© Andreas Heddelgott

August

September

October

November



Evaluation Day



Improvisation Work Shop

Alumni to Newbies – Global Career



Running Dinner



December

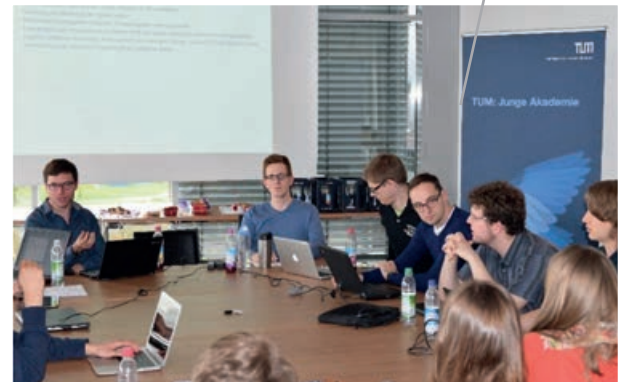
January

February

March



The Day of Initiative



Board of members meeting

Academy Talk with Christian Ude and Dr. Siegfried Balleis



April

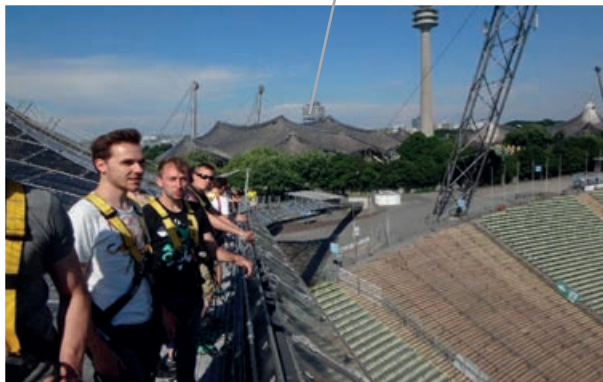
May

4. TUM Campus Run



June

July



Rooftop Tour Olympiapark



Academy Talk with Claudia Tausend

Directory

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