

# **TUM: Junge Akademie**

Project Reports 2016/2017

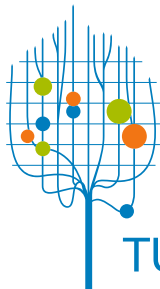




# **TUM: Junge Akademie**

Project Reports 2016/2017

Partner of



TUM Universitätsstiftung

## Welcome to the TUM: Junge Akademie!



Welcome to the TUM: Junge Akademie! In this booklet the results of the 2016/17 project groups are presented.

Again great students, equipped with a remarkable variety of talents, formed teams to work on challenging issues. During the process of this work they clearly experienced what Henry Ford, reflecting on teamwork, once characterized as follows:

*“Coming together is a beginning; keeping together is progress; working together is success.”*

*“Coming together is a beginning”*: The fundamentals of the spirit and the specific flavor of the TUM: Junge Akademie are laid in the project start, by bringing together a variety of outstanding and enthusiastically presented individual ideas. In a tough process of identifying common denominators and shaping project-storylines the ideas are projected onto a set of hypotheses that should preserve the individual enthusiasms but also establish common lines as a basis for the next successful steps. *“Keeping together is progress”*: Moving from the *“talk the talk”* of the previous step to the *“walk the walk”* with all its obstacles, detours and doubts is a decisive process that has to end in a structure that facilitates collaborative work without losing too much energy in redefining, reshaping

and questioning the common basis previously defined. And, finally, *“working together is success”* requires diligence, clear structures, openness to a continuous do-check-act procedure, commitment and reliability, and – hopefully – an optimal deployment of the team members according to their specific talents.

Usually we define success on the basis of the outcome. Strange enough, then, that Henry Ford had already defined the *working together* and not the outcome of the work as success. He knew about the predominant importance of processes, and their related challenges of course, as prerequisites for excellent products.

We at the TUM: Junge Akademie consider our projects as specific testbeds for coming, keeping and working together on complicated themes. We encourage our members not just to talk about the outcome of their work but also about the process with its specific strengths, weaknesses and threats. Of course a great outcome is the coronation of the prior working together; however, a suboptimal outcome can be an excellent vehicle for a humble analysis by which to understand the deficiencies of the underlying process and to learn lessons that are important for future activities. So far, no master has fallen from the sky!

Highly occupied professors and tutors invest a lot of time and energy into the support of our young talents in the TUM: Junge Akademie. TUM supports this format intensively. Why do we do this? We are aware that our support of excellent students and the experiences


obtained in the interdisciplinary project work unfold an important lever and the efforts pay off many times. Interdependencies described at the basis of scientific knowledge inside our disciplines often seem to give clear answers, so that one might think that the right decisions are obvious, that they should be easy to communicate, and thus have to be widely accepted. However, in order to shape technological and socio-economic progress, we need a sound number of talents who, in addition to excellent work based on scientific expertise in their specific disciplines, are capable of integrating aspects beyond the horizon of their own field and of leading discourse within society in a clear and empathetic manner while remaining aware of the manifold complexities of underlying processes. The discussions during the last months about “alternative facts” have clearly proven the importance of this type of moderating expert, which we urgently need in our societies. These discussions have again confirmed the importance of the sort of support and training provided to excellent students by the TUM: Junge Akademie. In this context the great resonance of the TUM: Junge Akademie theme “Truth and Lies” in the current application phase proves the growing awareness of our students of their future responsibilities beyond their specific skills and competencies in their field.

My sincere thanks go to GE Global Research and Pixida GmbH as partners of the TUM: Junge Akademie, to the Akademie für Politische Bildung Tutzing, and to all the partners, 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 Peter Finger, to Maria 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.

This year’s theme, “Decision Processes,” was a great basis for coming, staying and working together. Enjoy reading this book and exploring the related projects! You will also find information here about the further development of the projects of previous years, about the projects in prospect for the coming year, as well as about other activities unfolding at the TUM: Junge Akademie.

Yours,



Gerhard Müller  
Senior Vice President Academic and Student Affairs



Dear readers,



The TUM: Junge Akademie was launched in 2010 to encourage outstanding student talents at the Technical University of Munich. This year we have also included our immediate neighbors in Maxvorstadt, the students of the Munich University of Television and Film as well as the University of Music and Theater, into the scholarship program.

The main aim of TUM: Junge Akademie is to bring the students together in interdisciplinary groups which work on socially relevant topics.

“Decision-making processes”: that was the theme of the Academy year 2016. A topic that matches with the committed attitude of the Academy members. At the TUM we are convinced that students, equipped with a willingness to perform and a passion for scientific approaches, will become decision-makers and leaders of the future. They strive for decision making which not only ensures technical feasibility, but is ethically justifiable, socially beneficial and future-proof. Therefore contributes this scholarship program to successful preparation of its members for the time after their studies and doctorate.

The themes underlying the project work require, in addition to intrinsic motivation, the willingness to systematically work, a sound research and the courage to make decisions. Particularly challenging – as in overall scientific research – are the perseverance and the underlying process. Students who train these qualities in their early years of studies, will be well prepared for the demanding world of constant change.

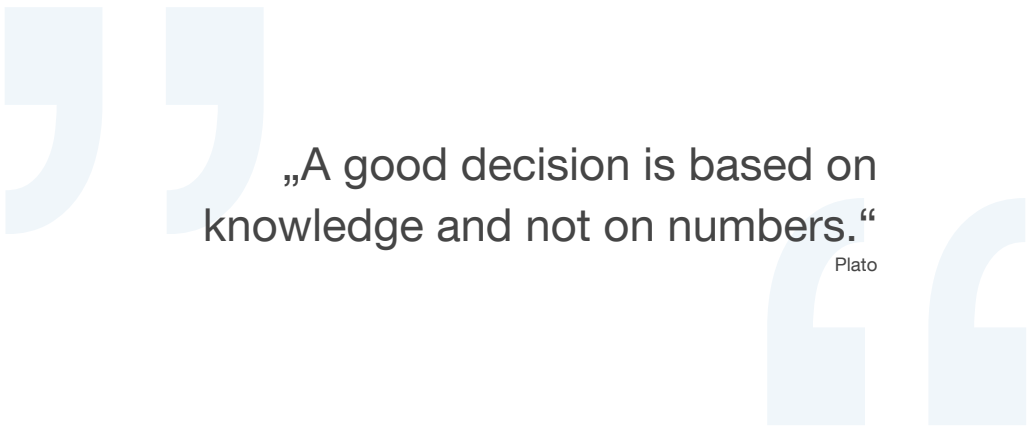
This is what matters to us: to prepare young people as best as possible for the inevitable active participation in this world of instant change.

I wish the graduates of the scholarship program of the year 2016 a positive completion of their projects and a successful transition to the self-imposed goals.

Cordially yours,



Wolfgang A. Herrmann  
President of the university



„A good decision is based on  
knowledge and not on numbers.“

Plato



Editorial	2
Greetings from the President	5
<b>Projects 2016/2017</b>	
Preface	10
dare2share	12
EatMe – I’m fancy	30
EatMe – I’m low carbon	42
healthtoday	56
Integration through Democracy	70
modulo	82
<b>Projects in Flow</b>	
TUM Bike-Sharing	96
Picturise	98
The lecture series – Insights into Immigration	100
<b>Projects in Prospect 2017/2018</b>	
Knowledge Management and Communication	104
MatchBox	105
Participation in Politics	106
Politics and Fun	107
Integration as windfall profit from targeted use of diversity	108
<b>TUM: Junge Akademie</b>	
The Academy	113
The Boards of the Academy	114
Committed: Taskforces, Tutors, Mentors, Office	117
A different scholarship program	129
<b>Directory</b>	
List of Mentors	136
List of Tutors	137
List of Members	138
Imprint	143

# Projects 2016/2017





## Preface

Over the last year and a half, we have looked into decision-making processes and have developed six projects on this theme within several different areas of research. Before reviewing the projects in detail, we want briefly to consider the topic as a whole. Of course, there is no room here for an in-depth discussion, but, to get different perspectives on the matter, we contacted stakeholders of TUM and its corporate partners and asked them about their views on decision-making processes.

In general, the core aspects of these processes are difficult to define, as “each decision has its own individual characteristics and thus cannot be brought into a fixed frame” (Prof. Gerhard Müller, Vice President of TUM). Nevertheless, there is an agreement that decisions “need to be informed by a long-term perspective ... integrated in an environment of mutual trust” (Johann Neubauer, Managing Director of Pixida GmbH) and that “a strong sense of responsibility is central to good decision-making” (Dr.-Ing. Carlos Härtel, CTO of GE Global Research). Not only in research and the economy, but also within our projects, a sense of responsibility plays a major role. This is strongly connected to an awareness of a decision’s possible future consequences, whether on a small or a large scale. Thus, in order to “strike the right balance” when evaluating these consequences, “knowing the stakeholders and being mindful of a decision’s implications” (Dr.-Ing. Carlos Härtel)

is vital to making a decision. Professor Michael Molls, TUM Emeritus of Excellence, illustrated his general steps of deciding which research project to engage in. After an exhaustive search of related literature, the hypothesis is reviewed in terms of its originality and feasibility. Afterwards, the project is discussed with partners, ideally both from one’s own discipline and from other disciplines, in order to coordinate the project in the most practical way. These steps are exemplary for making decisions in numerous areas. Regarding our own projects, we also followed quite similar steps in the search for our respective topics.

We have touched briefly on some critical aspects of decision-making processes, but there are many more factors to be considered in any given situation, as the following project reports make evident. However, despite all the complexities, risks and difficulties of decision-making, there is also an upside that is often overlooked:

“Decision-making is about shaping the future in all good conscience and, to the best of one’s knowledge, being aware of one’s responsibility to others – but also, sometimes, feeling the magic of the lasting impacts of one’s thoughts and convictions” (Prof. Gerhard Müller).





# Project Report dare2share

## Team

Maximilian Bauer  
Gunther Bidlingmaier  
Markus Feuchtinger  
Katharina Marliese Höfer  
Beate Lang  
Frank Mildner  
Sebastian Mühlbauer  
Felix Nuscheler  
Maike Offer  
Eva-Maria Schmid  
Philip Maximilian Teichgräber  
Michael Trimpl  
Dawei David Wei  
Yize Zhuwu

## Tutor

Simon Herzog  
Maximilian Kern  
Carolin Thiem  
Stefan Tippelt

## Mentor

Prof. Fritz Frenkler  
Alexander Lang  
Wotan Wilden

## Do you dare2share?

“What exactly is meant by this?” you might wonder, on first reading the question above. To be honest, that’s precisely the response we expected you to have. As “sharing” is a widely-used term, we would like to focus here on how it relates to our social life and activities. We’re pretty sure you probably will not be aware of its great potential for facilitating your everyday life and its status as a basic component of human interaction. To show the immediate presence of “sharing”, as manifested in a lot of daily decisions, we invite you to invest a few minutes in a small thought-journey concerning a normal student’s day... and finally, you’ll end up getting an accurate idea of what our project was dedicated to...

Imagine... you were (you are? – all the better, then) a young and smart, intelligent student, capable not only of passing exams at university, but also of organizing daily living on your own... let’s start your day!

“Rrrrring ...!” – this annoying alarm clock interrupts all your sweet dreams; time to get up immediately! It’s Monday, you’ve had quite an eventful weekend and now, the only thing you feel is great hunger. A glance into your fridge causes disillusionment: of course, you did not plan the following week. The next supermarket isn’t far away, but big raindrops covering your window definitely advise you of doing the shopping right now. So – (decide!)

*...” well, bad luck, I’m not having breakfast instead.” – Later you’ll repent your decision; your stomach is revolting and causing an uncomfortable feeling. Not a good start to the day.*

*...not a problem at all, you just take the rest of your cornflakes and show up at your neighbours’ flat two floors above. Luckily, they are at home and in the right mood to conjure up a fantastic breakfast for three. Anyway, a little conversation is not that bad at all in the morning and now you feel strengthened to continue your day.*

Fresh air everywhere? – a slight, unpleasant odour irritates your nose making you feel very uncomfortable. To detect the cause there’s no need for a great search: Your clothes can tell everyone a detailed story about your weekend’s trip – which apparently led you to a handful of pubs and restaurants. The big red smudge left on your trousers indicates the rest of this tasty chilli coconut curry from the Indian Restaurant just round the next corner... uarg! Embarrassed and disgusted at the same time you change your clothes and put the smelling ones...

*...right into the bin collecting your laundry placed in the bathroom. Dad is showing up the next weekend, so probably he’ll take all the stuff back home and make Mum responsible for it.*

*...into a laundry machine located in the basement floor. On the way, there’s Andy, having the same idea and together you have enough stuff for one full shared machine.*

Back in your room again, this overwhelming, very well-known laziness takes hold... – as typical for a student, isn’t it? – the television seems to be right on the line... grabbing the remote control, switching on the power, your glance falls on the DVD which you’ve not finished yet...

“Rrrrring!!!” ...it’s your bell causing disruption. – The young man from the first floor asks you to pass him your extension cable because his own recently broke down.

*Doing the favor for him, this automatically means having to give up watching TV for the next hours as the cord is linked with just this apparatus, in other words: it returns you into some modus of the stone age you are definitely not keen on at all! -Sorry, but your best friend is in desperate need of the power supply- all day long!*

*...mmmh, according to the principle of “do, ut des” this offers you the chance to reciprocate for his help in installing your WLAN last week. Therefore of course you do the favor for him rejoicing in a real good neighbourliness..*

Next task to do: taking a shower and brushing your teeth...



While lying around, wasting time, your conscience reminds you: three -unused- hours have passed since you got up, neither filled with attending classes, learning productively, nor studying effectively. – “The late bird catches the big worm then ...” thinking, collecting your study material and getting ready to leave. Could be so easy, if there wasn’t this enduring rain causing a bad mood.

*As you are not made of sugar, your body should cope with a cold gratis shower along the way.*

*Tapping on your phone you come up with the idea of making use of the new car sharing App... luckily it takes you no more than five minutes and you end up sitting in the car of a nice student who is attending the same lecture with you in about half an hour. What an easy and effortless way of getting in touch with someone heading in the same direction! ...Carpooling not only prevents you from getting sick, but also saves your hairstyling!*

Sitting in the lecture, opening your books, doing the best to motivate yourself... there’s something missing, something important: your calculator!!

*Grrr...”my phone must help out instead.” – Bad choice, while solving complex integrals it lets you down completely.*

*Well, just around the corner in the cafeteria, there’s a high probability of being able to borrow a calculator from someone who’s not in need of it right now. Thought, done.*

Finally, having endured all those endless lectures you become aware of how much research work you wanted to carry out in the library. Instead of joining the others in the cafeteria, you aim to complete your work at home. Hauling the borrowed books in your arms, the previous problem impedes your plan as the weather hasn’t changed and the rain continues to fall. But heavily. There are you, standing in front of the library, just wearing a very small (figure-hugging!) coat, with nothing to cover the books with, helpless, feeling left alone.

And that’s exactly where our project comes in: As you might have already noticed there are always at least two different possible ways to deal with a deficit or lack of desired things. On the one hand (see closed umbrella), you handle the situation passively using a substitute or enduring the situation by accepting it. But as also shown by the given actions above (see opened umbrella), there’s always – let’s say nearly always – a very smart, easy possibility of helping yourself to your need. “Sharing” is what this kind of action is called. It enables consumers both to “obtain” and “provide”, temporarily or permanently, a special thing or also possibly a service.

# dare2share – how sharing is replacing ownership

## 1. Abstract

Our project “dare2share” is based mainly on the ideas that came to mind at the very beginning of the Project Year 2016, last autumn. As we tried to examine the pros and cons of a sharing economy, we soon realized that we would do better by focusing on just one of its elements, “product sharing.” To cite Carsharing as a common example, owning a car is not a prerequisite of driving it. Following the general principle of this example, our project aimed to define criteria for a successful realization of product sharing by means of a practical case study that involved the sharing of umbrellas all around the campus of Garching to enable students to arrive at lectures with dry hair and clothes on rainy days, we ask finally: Would you make use of our project? If so, would you also be concerned to remain the borrowed umbrella in the same state as you received it? Would you treat it as if it was yours?

By evaluating a preceding inquiry as well as one in request of the process phase, we wanted to examine in detail consumers’ behaviour and attitude concerning their willingness to share. Keep reading and you’ll find out the rest of the story...

## 2. Background

### 2.1 Enhancement of a Product’s “efficiency”

Considering the emerging “sharing model”, which refers to the relatively new socio-economic system that revolves around the shared creation, production, distribution, trade, and consumption of goods and services by individuals and even organizations, you might wonder what are the reasons for its growing popularity and, why people seem to prefer obtaining a special thing or service temporarily rather more than owning it. Of course, someone with a critical opinion can come up with the many drawbacks this model might have. The following abstract provides a detailed look at the pros and cons of this model.

An undeniable drawback of the sharing economy is the potential loss of tax revenues for the government. Not all who earn an income by sharing their goods/ services pay the taxes from their earnings which should have been added to the government’s tax revenues. It’s not only the government, but also people who work under a shared economy who are being deprived of their benefits. It is hard for them to remain on the labor market except by being underpaid. Additionally, companies like Uber have reduced the number of people using taxis since it started and this has affected the profit of taxi drivers and companies offering transportation services. To conclude, this model seems to be unfair to people who work under this system and it can also take away profits from businesses.

On the other side, supporters posit that a sharing economy lessens unemployment by opening up the labor market to everybody. According to them, it works both ways, with employers looking to hire the perfect candidate for the job able to post the services they need, while workers can offer their services for a fee.

Furthermore, advocates for the sharing economy refer to the point that this eco-system benefits individuals by giving them the power to rent out their belongings and earning money this way. With the proliferation of online websites like eBay and Amazon Mechanical Turk, sharing becomes more flexible and practical in everyday life. It can be considered as very efficient since it directly pairs the person in need of a desired product to someone owing and willing to rent exactly this object. By engaging in this system, both participants benefit: The first one by using the product for less money than a new purchase, the latter for getting a fee.

In our opinion, the most important point for the sharing model is the following fact: human beings accumulate possessions such as cars, properties and gadgets which at one point or another, will be used less and less. With a sharing economy, private owners can offer their vehicles as a means of transportation to others for a fee. The same goes for an unused room in a home where the home owner can sublet it to other people as an added income. With this type of exchange, unused items and possessions are not wasted. Considering the “sharing economy” as a form of recycling, reuse and repurposing we figured out that this model enhances the product’s efficiency.

Not least because of that, we expect the sharing economy to stay, especially as storage room becomes reduced but without a parallel reduction in people's desire for high standards of living. In our opinion, the world soon won't have a choice but to accept and adapt to the sharing economy, because the pros do outweigh the cons across all fronts.

## 2.2 Requirements for the suitability of a product for sharing

The breakthrough and popularity of several sharing models has led to a strong increase of the number of shared product classes with similar business models. The feasibility often depends on the offered, usually reusable, product types for which the respective sharing concept in turn must be suitable for.

Considering consumer services only, one may distinguish between peer-to-peer and business-to-peer concepts. The former describes shared products which are provided by other consumers. Here, only the contact platform might be commercially available. The latter describes the extension of the traditional rental model to short-term supply, enabled by recent technological progress.

Both models require that ownership of a product (incl. carrying and maintaining thereof) has disproportionally higher (financial) cost for individuals than for a dedicated provider. However, if making profit is not the central goal of the sharing model (e.g. within a free service as discussed here), the concrete product, its usage context and more soft factors become increasingly important.

### 2.2.1 Product type

Not all products can be rented out in an economically feasible way. The costs for providing these must be significantly lower than costs due to a transfer of ownership.

As currently most products are made for usage by a single owner, the product should be explicitly designed for shared usage. It is often sensible to choose a higher quality model both to reduce maintenance costs and to improve user experience. This eventually enhances the service altogether as acquisition costs might be too high for a single user ownership. In this context, maintenance especially means (physical) durability and resetting e.g. means of personalization.

### 2.2.2 Availability

A central criterion for the practicability is availability and usage duration. From both an economic and ecological point of view the product utilization should be maximized. Therefore, peaks in demand are problematic meaning a high idle time.

These peaks must be prevented by a scalable product distribution (e.g. concurrent usage of the same product entity) or by changes to the usage environment. This in turn requires that the users form a (locally or socially) limited target group.

## 2.3 Forms of sharing economy

### 2.3.1 Existing forms of sharing economy

Airbnb, Uber, Lendico – these are probably the first headwords that pop up in our minds if we think of a sharing economy. Indeed, the number of users is increasing impressively. Although the idea of sharing economy has existed before, this trend seemed to be given remarkable impetus by the financial crisis in 2008/2009. People bethought themselves more of sharing. In the following we would like to give a short insight into different forms of sharing:

(E-)Bike sharing:

According to a study conducted by Roland Berger (2016) there are around 1000 bike sharing schemes with more than 1 270 000 bikes. The biggest market is Asia, led by China. Experts expect a growth rate of 20 % per year by 2020 reaching a market volume between EUR 3.6 and 5.3 bn.

Bike sharing is developing towards a “multimodal system”. Not only do we apply technology to locate, reserve and access the bicycles. They are also linked with public transit (e.g. schedules, stations) and technologies are getting cleaner (e.g. solar-powered stations, sustainable bicycle redistribution).

Car sharing:

In terms of Car sharing we can distinguish between station based cars and freefloating cars. The latter can be borrowed and returned within the entire operating area. In Germany hundreds of thousands of people are using this service.

To mention some advantages: It is a cost-effective solution for customers who travel less than 10 000 20 000 km a year. Since there are fewer cars, less parking space is needed. This is especially helpful in cities with a high urban density. The cars will be replaced after a shorter period of time. This way, ecofriendly innovations can spread faster.

#### Wifi sharing:

Fon was founded in 2006. The startup company offers a global Wifi network consisting of 20 million crowd sourced hotspots focusing on Europe. Fon cooperates with providers from different countries such as Telekom (WLAN to go). A customer of Telekom can either purchase a so called hotspot pass or he can provide his own router publicly and gain free Wifi access in return.

#### Clothes sharing

The average German purchases 60 pieces of clothing a year. Only 25 % of those get recycled, the rest are thrown away. People living in countries producing huge and cheap amounts of textile are for example devastatingly affected by intoxicated waters. In China, for instance, 2/3 of the waters are contaminated by chemicals, mostly through textile production.

Fortunately, more and more consumers behave responsibly. We can observe a trend towards buying second hand products. Clothes can be shared online. Others go to parties at which you can exchange your clothes.

### 2.3.2 Sharing on a university campus

Sharing concepts are already established at universities. For example, you can borrow tools and of course books at the library. However, it should be extended to other fields.

In 2012/13 a group of students from the TUM: Junge Akademie started implementing a bike sharing system in collaboration with Stadtwerke München.

MVG Rad (MVG: Münchner Verkehrsgesellschaft mbH) was launched in October 2015. Besides students from TUM citizens from the whole of Munich profit from this service. Currently, more than fifty thousand users are registered.

## 3. Goals

The goals of our project include two complementary parts: First the implementation of a sharing system for umbrellas on the university campus as a practical and useful offer to students and other visitors of the campus; and second, the examination of emerging problems and in particular the behavior of users - how responsibly do users treat the products and do they use them within the system in the intended way?

### 3.1 Implementing umbrella sharing on campus as a model for freely accessible sharing network

We wanted to combine the gain of knowledge with a practical hands-on project on campus.

Most sharing products are relatively high-cost products, that are used only rarely (like tools or cars). We came up with a different approach: A product that almost everybody owns, but that hardly anyone has to hand when it is needed it: Umbrellas. Most of the time they are at home when you would need them in an unexpected rain shower. Therefore, it would be useful to have them directly at the place where you need them. This makes it a very interesting product for sharing especially on a location like a campus. But umbrellas have further characteristics that make a shared use very useful:

It is quite uncomfortable to transport the umbrella the whole day just to use it for a few minutes - especially once it has become wet. By sharing umbrellas, you really only need to use them while you need them - e.g. on the way from the metro station to the lecture hall or to the cafeteria. Besides, umbrellas are a product that is easily forgotten in the university or on public transport. As you can leave them at any door once you enter a building, this is also solved by sharing.

Next to umbrellas as a useful sharing product we decided to make usage freely accessible. No registration or payment should be needed. The location for our sharing system is the TUM Campus in Garching. Even if it is publicly accessible at any time, most people there belong in some way or the other to TUM. Therefore, they should have a high level of identification with TUM and its related services. That made us hope that users would treat the umbrellas

responsibly. To make use far more comfortable and uncomplicated we therefore decided that we would implement a sharing system without any registration or payment. We hoped that by the identification with the product and the closed local usage-area, users would be motivated to use the umbrellas sustainably and not to take them out of the system or damage them.

With implementing an umbrella sharing system at the campus in Garching we wanted to bring a useful service to the students and employees. At the same time, with the special feature of free use, we could also find out about users' behavior within such an open system.

### 3.2 Analysis of the user behavior

Besides the practical implementation of a sharing system, the main goal of our study was to investigate the potential of a freely accessible sharing network using our model of umbrella sharing on campus. We aimed to assess whether such a service without any charge is accepted by the user and which measures should be considered to ensure long-term success.

We defined success in this context as the presence of two factors: 1. sufficient availability of the shared product, the umbrella, for all users within the service area at the Garching Campus at any point of time (representing a functioning sharing system) 2. sustained usability and overall good condition of the vast majority of shared umbrellas. Therefore, we decided to address our questions from two different perspectives.

#### 3.2.1 User attitude towards the shared product

The user attitude towards the shared product, in our case the umbrella, is crucial for the success of a sharing system. With our study, we aimed to evaluate

- if sharing of a frequently used product is accepted,
- how a device is treated within a freely accessible sharing system, and,
- to what extent objects are removed from the sharing system in terms of unintended use.

#### 3.2.2 User behavior within the system

As the umbrellas within a freely accessible sharing network are borrowed and returned without supervision, the user and his behavior itself becomes an integral part of the sharing system. Hence, we concluded that our study should have the power to answer at least the following questions:

- Which routes do the users take on campus and, therefore, do the users distribute the umbrellas in a well-balanced way within the sharing network?
- Are the umbrellas returned immediately after the end of a rainfall or do they accompany the user for a longer period?
- What fraction of umbrellas is not returned at distinct drop-off locations and needs to be reintegrated in the sharing network from all over the campus?

## 4. Methods

### 4.1 Developing the sharing concept

After the decision to focus the project activity on developing a sharing concept, the challenge was to select a suitable product to share in a selected market to defined customers. There are several important aspects which were considered in order to select the best product for sharing.

First, the product needs to be able to be shared. A consumer good which can only be shared once is not suitable. In order to have a long lasting sharing circle the product needs to be shared over a longer timespan of at least 3 months before you change it. In addition easy availability for the customer is a key success factor. People participate in the sharing economy on the one hand because they want to use the product but not buy it, and, on the other hand because the product is very easy to use with, for example, only one click in a smartphone application.

Second, the market which is addressed needs to be selected well. A sharing economy circle with the best product does not work, if the wrong market is addressed. One main decision between a large

public market is where basically everybody can participate, as in wellknown sharing concepts like drivenow, and a smaller restricted market like public Institutions or residential buildings, for example. Selecting smaller markets obviously restricts the sharing potential, but it can also lead to a more successful implementation which is spread to bigger markets later. So, depending on the product and other factors like resources the market and the customer in the market needs to be carefully selected.

Third, the period in which the product is shared in the market needs to be determined. There are products which can be shared everyday like cars or bicycles. On the other hand, there are also some which can only be shared at certain times, like skis in winter, for example. Since the main project time was from march until september, the focus was on products which can be used in this timespan.

Fourth and last is the type of return for providing the product for the customer. Most of the sharing providers charge money in order to be part of their platform and in addition charge a small amount per minute of product usage. However, there are also some which provide the products for free. So there was the decision whether to found a platform and charge something for the product usage or provide it for free even without the necessity of a platform.

On the basis of those four main criteria the sharing product was selected. The first idea was to build a sharing box for households at residential buildings designed for storing those tools like gavel or a drilling machines. As these are not used very often, it makes sense to buy them communally. After a short evaluation period a problem with the market was identified. The access to more than five buildings was critical and in addition the sample size was highly variable. Some houses had only students living in them, while in others there was a mixture of students and retired old people. As a consequence, we decided the results could not be scientifically comparable and the market criteria were not met. The second idea was to share a product which is used a lot and doesn't have much value but is always absent when you need it most, the umbrella. The umbrella was a suitable product to share inside the organization TUM. The idea was to use umbrellas which had been lost by their owners and brought to the lost property office. After a period of time these are sold or thrown away. So the idea was to reuse and share things which were destined to be destroyed. However after consultation with our mentors the decision was made to buy new umbrellas to be able to design them and communicate the idea of sharing on them, for example with a pictogram. More details about the design and visualization of the umbrellas and stations can be found in Section 4.1. After an analysis of Munich weather conditions which can be seen in the figure below, our necessary time

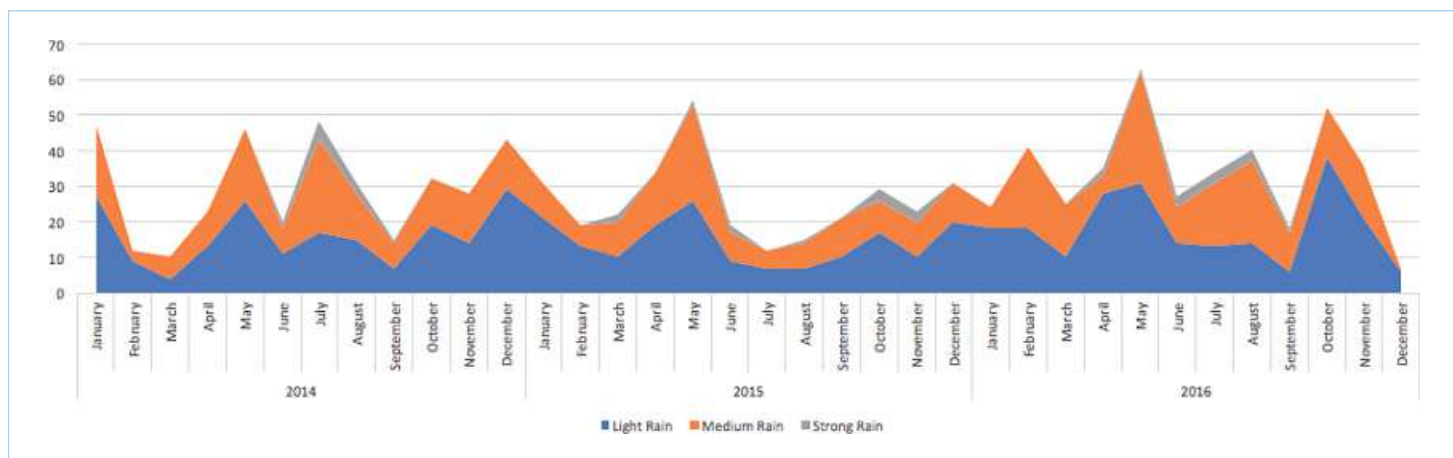


Figure 1: Rainfall analysis Munich 2014-2016, (in millimeter)



conditions were met since the highest amount of rainfall in the past three years was in spring and summer.

Furthermore, with the mentors, we decided to provide the umbrellas for free for students of TUM since the main goal was not to make a profit, as already discussed in Section 2. In order to determine if there was a suitable market, a survey before and during the sharing of umbrellas was conducted. In addition, the umbrellas were tracked to gather real life data about umbrella usage. More details about market data acquisition can be found in Section 4.3.

On basis of the survey data eight umbrella stations with, in sum, 198 umbrellas were located at the Campus Garching. The locations were selected on the basis of the online survey data and the umbrellas were divided evenly between the stations at the beginning of the experiment. A map with the station locations and a pictogram used for communication of the sharing idea can be seen in the following figure.



Figure 2: Umbrella stations and pictogram

At the center of the sharing system is the subway station Garching-Forschungszentrum with three stations. Additional stations are at the faculties of Math and Computer Science, Mechanical Engineering, Chemistry, Physics and the Mensa. The pictogram was placed right next to the map in order to state the idea of sharing in two easy pictures and phrases. More details about the design of the map and phrase can be found in Section 4.2.

## 4.2 Defining a design to visualize our sharing concept

One of the main questions that came up in the beginning was which design to use, in order to convey our concept of a sharing economy. We needed to find a recognizable logo that was both clear and at the same time clearly conveyed our project concept. Since our logo is supposed to be an explanation, we chose an umbrella in the middle of two curved arrows to symbolize the cycle of use.



As a next step, we defined the appearance of our umbrellas. Since formerly conducted polls revealed that potential users prefer big classic umbrellas with a straight handle, we decided to use this exact model. It appeared perfect for our door-to-door concept, since transporting it without using it was too inconvenient and the size would also reduce the chance of theft. Furthermore the chosen umbrellas were big enough to protect more than one person from rain, so we also conceived a social dimension in our decision. The color we chose was white, since it is the most neutral existing colour and also part of the corporate design colours of TUM. In combination with the size of the umbrellas and our logos printed on them we imagined a high recognition factor in them.

In order to supervise the participants' routes when using the borrowed umbrellas, we installed beacons on them. With this tracking system we were able to evaluate the usage frequency in relation to the location of the stations and the time of usage.

Regarding our design concept, the next aspect we needed to think about were our containers. We had the chance to recycle barrels



that were used by a former project of the TUM: Junge Akademie. In order to convert them to our requirements, we drilled holes in the ground plate so the water from the umbrellas could drain off. Furthermore, we added a perforated plate as a spacer to the ground-plate, also to define the height of the umbrellas overtopping the edge of the barrels. To stabilize them we integrated cross braces as well.

At last, we decided to design a label onto our barrels, which explains the whole concept in a clear and easily understandable way. On the label we put two pictograms next to some phrases, that make the idea of “taking an umbrella at a station – using it – giving it back at another station” quite clear. To give an oversight about the locations of our umbrellas we also added a map of the campus in Garching with all our stations marked.







## 4.3 Data Acquisition

### 4.3.1 Survey to Determine the Market Potential before the Field Study

In order to estimate the market potential of sharing umbrellas an online survey using EvaSys at TUM was conducted. The survey was divided into three main parts.

The first was designed to gather information about the person answering the survey. The goals were to determine (a) if there are faculties we should focus on which are particularly interested in sharing umbrellas; and (b) which means of transport students and employees of TUM use and if there are differences in this between new students and older ones. On the basis of our findings, the umbrella network was designed.

The second part focused on sharing umbrellas, since it was important to select an appropriate product and address users who normally use umbrellas or who would use them if they were provided. In this part information about the product itself was gathered since the end user should get the product which fits his needs.

The third part was about sharing at the TUM in general in order to determine other products which people might want to share. The idea was to share more products after a successful trial with the umbrellas. Since the results of the first field study revealed a bigger problem with robbery than expected there was no other product for sharing selected. Results of the survey can be found in the Section 4.4.1.

### 4.3.2 On-field Observation to validate online survey results

For the purpose of gathering field data an umbrella tracking method which is described in Section 4.3.3 was implemented and on-field surveys were conducted.

The purpose was to gather real life information and compare it with the results gathered in the online survey before the field test. The survey was rather small with only six questions since the aim was to enable it to be completed in only two minutes so as to maximize the number of participants. For the survey a few members of the project team were on-site to ask people using the umbrellas as

they walked by the stations. An analysis of the data gathered can be seen in Section 4.3.2.

### 4.3.3 Tracking the umbrellas using iBeacons and Raspberry Pis

On top of the field study the umbrellas were tracked using iBeacons and Raspberry Pis. This type of tracking was selected because it does not violate data acquisition and storage rules. An iBeacon is installed in the umbrella and Raspberry Pis are located at the umbrella stations. The Pi is connected to the Wifi and is able to detect umbrellas inside or close to the umbrella station. As a consequence, umbrella distribution can be tracked without tracking the umbrella the whole time for example with GPS. Data are gathered from where the umbrella came from and which locations are used most often. On the basis of this the sharing circle can be optimized by relocating stations which are not used or by transporting umbrellas where manually the circle doesn't work by itself. In addition, the tracking is possible 24 hours seven days a week and it should also prevent people from stealing the umbrellas. Unfortunately, the umbrellas were stolen very fast so there are only poor data available. However, a data analysis is provided in Section 4.3.3.

## 5. Results

### 5.1 Evaluation of the implemented on-campus umbrella sharing network

#### Methods/Tools for the evaluation

Generally speaking, we wanted to use a bundle of quantitative and qualitative analytical tools in order to determine if our enclosed sharing system would sustain itself. Through the tracking data we wanted to look into the usage frequency, the turnover rate and motion profiles of our anonymized users. In order to enrich the viable quantitative data we wanted to conduct field observations and interviews according to a detailed resource plan. The aim of these direct interactions would have been to understand the drivers behind the user behavior more deeply. Unfortunately, we were deprived of this opportunity at a very early stage, as more than 80% of our umbrellas were removed from the system within two days from the start. Surprised by the striking losses, we put the system on hold and saved all the remaining umbrellas. As the system shrank to an unrepresentative size, we de-

cided to appeal to the conscience of the users and tried to retrieve some of the lost umbrellas, by attaching signs to each can, stating the loss of the umbrellas and asking the local community to return them. This approach also failed, which left us very critical of our implementation procedure and its potential flaws. Subsequently the cans were partially used as trash cans which honestly gave a very poor picture of attempt to establish a self-sustaining sharing system. In the following we tried to gain objective input on our implementation through on campus interviews and observations, which presented us with a distorted picture from what we had experienced practically with the shared system. In the following, these results will be shared and conclusions will be drawn on the evaluation I of our implementation.

## 5.2 User behavior within the system – User attitude towards the shared project

The next point to be considered was the user behavior in view of the umbrellas within our self-created closed system (TUM). Due to the theft of our umbrellas, which unfortunately occurred after just two days, we didn't have the possibility to consult or observe the "real" consumers about their behavior with the shared object. However, we wanted to get some feedback and an idea of whether we might have got another result with a different group of users. Therefore, we established a survey and we asked students, who could have been potential users of our project, to take part in it. The following diagram shows the answers of the students to these questions:

- 1) Did you see the umbrellas which we distributed at the campus in the middle of July?
- 2) Did you recognize the shield located on the can?
- 3) Did you pay attention to it?
- 4) Did you take an umbrella?
- 5) If it had rained, would you have taken an umbrella?

Thus, we can summarize that nearly all students recognized our project, but only a few saw the instruction shield or paid attention to it. Thus, only 65 percent of the students understood that we wanted to create a sharing system and the rest thought the umbrellas would be a gift. Another interesting fact is that more than 67 percent of the interviewees wouldn't take one of our umbrellas even if it were raining. Therefore, we should rethink the design and size of the instruction shield and maybe whether the umbrella is a good example of a sharing object.

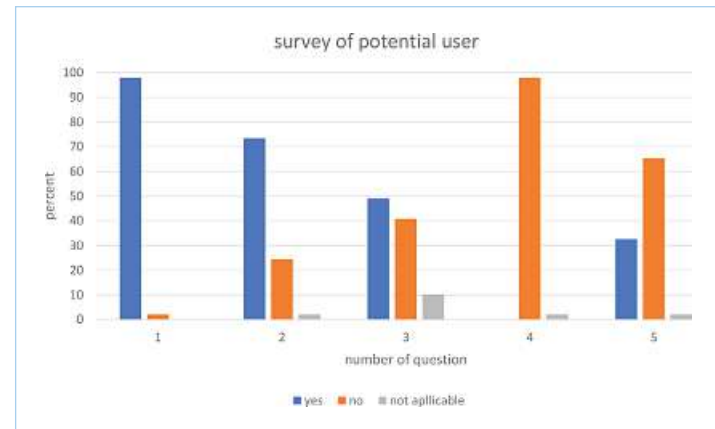


Figure 3: survey of potential user

Furthermore, we concluded our survey with the question "If you had taken an umbrella, would you have brought it back again?" 100 percent of the students answered "Yes." So, we had completely different results in theory – that no one would steal our sharing object – than in practice, where it took just two days for all the umbrellas to disappear.

## 5.3 Limitations to the project and reasons for emerging problems

In addition to asking students within a survey about our project, we were able, due to the beacons, to observe when and which umbrellas were brought back to each of the containers. Although we had this opportunity to observe this behavior we were not allowed to track the umbrellas all the time they were used. Thus we were not able to follow the exact route or where exactly the umbrellas were taken to.

Because of the disparity of what happened in reality and what we assumed would happen we came up with a group of reasons for the problems which emerged in this project.

Maybe the design was too attractive for people so that they could not resist taking the umbrella as a free gift. Another reason could be that the aim of our project was not communicated clearly enough.



This could be associated with the difficulty that we started the project in an open system. By starting the project on the campus of Garching we thought we would be able to narrow down the user group to a smaller amount than there would be on the campus in the city of Munich. Due to our researches we know that students were attracted to that program and they specified that they would use the possibility of sharing a product. But still there are not only students or professors on a Campus, there are visitors, mechanics or cleaners who might all be users, too. So at the beginning it was not obvious or clear enough to us which user group would use the product. And there is a certain difficulty in addressing a large number of different people.

A further problem could be the sharing product itself. Umbrellas are quite useful tools, easy to pick up but also with a low monetary value. Still it would have been better to create some kind of deposit system. Furthermore, the sharing product depends on too large a number of parameters that are impossible to control, like the weather. And a last reason could be that people just thought it would not harm anyone if they did not bring back their umbrellas.

## 6. Outlook

Based on our hypotheses and the obtained results, the outlook will cover topics that go beyond the direct implications of the experimental results. We will discuss whether a generalization of our findings is reasonable and try to apply the results to society in general. Additionally, we want to acknowledge shortcomings in the conclusions we draw to see if and what societal implications can be identified.

We will also discuss whether the umbrella is the correct tool to be shared and discuss further improvements to the projects.

### Generalization

The conducted surveys indicated wide interest in the idea of casual public sharing of tools such as umbrellas. However, our experiments showed that the shared objects were not valued as a public good. As such, many umbrellas went amiss within a few days.

Although all this happened in a “community” of students on campus, there was not sufficient incentive for the users to respect the objects and return them, so that others could also profit from them.

From these findings, what conclusions can be drawn from this behaviour and how can they be applied to society more generally, and ultimately by what are these conclusions limited?

The limitation – when comparing society with an experiment on a university campus – include a change in the test group, as the university students only make up a small part of society. Therefore, their behavior may differ from the general public. Further, it is impossible in our experiment to tell what percentage of people used the umbrellas correctly and how many did not return them. It is possible that only a few people took more than just one umbrella with them, because they thought of them as “free-gifts.” However, it is likely that a similar result can be expected if the same experiment were conducted for example in front of metro stations in Munich. A similar behavior is likely and additionally the test group “students” also uses these metro stations and contributes to a similar outcome. On the other hand, the influence of the placement of the umbrellas in respect to the number of umbrellas that have gone amiss has not been sufficiently studied. Therefore, a different result could occur in more public places, as in the Marienplatz for example.

We want to emphasize that this experiment is not a picture of the behavioral traits of society (e.g. stealing umbrellas on a regular basis). There is also the possibility that the people responsible for the missing umbrellas did not understand the sharing concept and this then led to the experimental outcome of our project.

To exclude this possible outcome, a different experiment would be necessary, in which every person that participates in the sharing would be previously informed on the terms of use. In our project we tried to realize this by notifications and information provided at the umbrella boxes. But this may not have reached every user.

Despite the limitations for generalizing our results, it is reasonable to state that the concept of sharing in the future will be more common. People like the idea of sharing for various reasons and see the advantages it can bring for all the users.

In our case the concept may not have functioned from the start, but adaptations may make it work.

## Acknowledgments

This project would not have been possible without the great support of the whole team of the TUM: Junge Akademie and all current and former members of the TUM: Junge Akademie who offered help and advice.

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. Frenkler and Mr. Lang, whose encouragement and specialized knowledge enabled us to design the umbrella logo as well as implement the whole project in Garching.

We'd also like to thank our tutors Carolin Thiem, Stefan Tippelt and Simon Herzog for their invaluable advice. They always stood by us and provided their help regarding upcoming critical questions and also opinions. Their experience of how to run a project like ours encouraged us a lot.

Furthermore, special thanks go to Andrea Prehofer, whose workshops were an important and very helpful tool regarding working together as a team and communicating one's ideas as well as concerns. With regard to the finance of the umbrellas, we want to express great gratitude to our sponsors, the TUM University Foundation, who made it possible to supply these important tools of our project.

Moving on to our survey, we thank all mentors and other supporters who advertised our pre- and post-survey – not to mention all students who took part and thus afforded us the needed database that was crucial to evaluate our project's hypotheses.

Last but not least, we want to express heartfelt gratitude to the whole team of the TUM: Junge Akademie, especially Prof. Dr. Gerhard Müller, Peter Finger and Maria Hannecker for their great encouragement and invaluable advice, which more than once cleared up critical questions.

# dare2share



How the concept of sharing is replacing property.

Sharing economy as a recent trend has considerably gained significance and radically affects future consumerism. Our project focuses on analysing the different forms of sharing and their critical success factors.

We can transfer these results to other consumer areas and create innovative sharing solutions.

## BACKGROUND

As a group of 14 students from different fields of study, we were inspired by the idea of sustainability in a world of short-term profit. Thinking about enhancing the resource efficiency of the product lifecycle, we came up with different approaches: With regard to our own lives as students we considered tackling the lack of waste separation in shared apartments or recycling in general. Examining the manufacturing side of the product lifecycle, we asked ourselves how modularisation can be used as a means against planned obsolescence. Furthermore we gave attention to how certificates can visually influence buying decisions and consumer feedback shifts manufacturers' products towards a more sustainable design.

Eventually we agreed to focus on sharing economy as a current topic discussed in media. The younger generation has an affinity towards high-quality but inexpensive products making shared products attractive. Especially we students are willing to give up property to save costs by sharing with like-minded people and therewith increase resource efficiency.

Besides well-established areas of sharing like car and flat sharing, new concepts are emerging in a large variety of unsuspected areas such as food and wifi sharing. Which factors lead to the success of these revolutionary ways of consumption? How is the impact on living together? Can we use the obtained insights to create a sharing concept in new areas?

Thinking about ecological as well as social aspects and not only economic ones – as many companies, which have emerged with the growth of sharing economy – we hope to have a unique view on the topic.

## AIMS

First of all we analyse different existing concepts of sharing in the areas of mobility, living space, food, tools, clothing and entertainment.

Working out the commonalities between them, we get a deeper insight into how sharing economy has become so successful, how a world without personal property could look like and which challenges our society could face.

**MEMBERS** Maximilian Bauer, Günther Bidlingmaier, Markus Feuchtinger, Marlene Höfer, Beate Lang, Frank Milder, Sebastian Mühlbauer, Felix Nuscheler, Malke Olier, Eva-Maria Schmid, Max Teichgraber, Michael Tippelt, David Wei, Yize Zhuwu  
**TUTORS** Simon Herzog, Carsten Thiem, Stefan Tippelt  
**MENTORS** Prof. Fritz Frenkler, Alexander Lang



Poster 1: Annual Conference 2016

# dare2share



How the concept of sharing is replacing property.

## INTRODUCTION & CURRENT STATUS OF THE PROJECT

The idea of "usage efficiency" is based on the analysis of the true potentials of a product. Taking into account how frequent and regular something is used, how often it changes its owner/user, etc., we want to be able to predict its suitability for an implementation as a sharing concept.

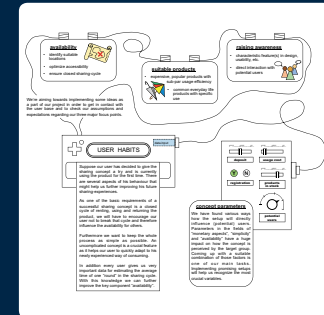
As our sharing cycle, consisting of the three major stations renting – using – returning, can drastically improve the efficiency of a product when operated properly, one of our key goals was to find crucial criteria for initial and lasting success. We came up with three groups of requirements that are absolutely vital for every concept. Within those topics of "availability", "suitable products" and "raising awareness" we searched for various approaches that in spite of their different basic methods have all led to a successful realization of the common idea of sharing.

Another question we want to answer over the next months is how precisely and reliably it is possible to influence the sharing habits of potential users. Basing our assumptions and expectations on our current understanding of specific target groups as well as establishing further important details through surveys and theoretical studies, the practical implementation of a promising setup will help us verify and adjust our hypothesis on the potential of sharing.

## TASKS & CHALLENGES

Even a sharing concept as shown in our reduced and simplified sketch is still a complex process with many unknowns and variables. Therefore we need to get everyone in our group involved and continuously define new tasks on upcoming topics and newly appearing aspects.

An important challenge we are faced with is to distinguish between various kinds of user data regarding the consumptions habits of our target groups. We need to detect differences between our expectations, results of surveys and observations during a real-life implementation and deal with the information accordingly. By gaining insight into the causes of those deviations we can re-examine the key statements of our hypothesis regarding the acceptance of sharing concepts within a specific user base.



JANUARY 2017

**MEMBERS** Maximilian Bauer, Günther Bidlingmaier, Markus Feuchtinger, Marlene Höfer, Beate Lang, Frank Milder, Sebastian Mühlbauer, Felix Nuscheler, Malke Olier, Eva-Maria Schmid, Max Teichgraber, Michael Tippelt, David Wei, Yize Zhuwu  
**TUTORS** Simon Herzog, Carsten Thiem, Stefan Tippelt  
**MENTORS** Prof. Fritz Frenkler, Alexander Lang



Poster 2: Evaluation Day I

## dare2share

How sharing is replacing property.



## THE PROJECT

The recent emergence of sharing economy products shows the consumer acceptance and economic profitability of replacing classical property with shared services. Whereas current concepts focus on high-value products, the dare2share project analyzes its feasibility with mundane but often unavaliable objects.

Using the example of umbrellas, such a free sharing model is established at the campus of the research centre Garching. During

this field experiment, an electronic module records the umbrella locations and the project team monitors how users treat the borrowed umbrellas.

This data allows to infer the frequency of service misuse, determine on-campus movement patterns and assess the hypothesis:

Consumers participate in well-accessible sharing models, but appropriate proprietary products over shared products.

## PROJECT TIMELINE

**Umbrella as Sharing Object**  
Based on the theoretically determined key components of a successful sharing concept – availability, sustainability and awareness – an umbrella is regarded as a reasonable sharing object:  
It can be stored in a relatively small space, allowing to design custom sharing stations. As a bounded area with long walking routes, campus Garching is selected for the first project run.

## Guidance and Publicity

Potential users are informed about the project in advance. The virtual sharing principle and station network are comprehensively explained with concise phrases and pictograms.  
The project should convince passersby of the sharing system and increase its brand awareness of the TUM, Junge Akademie.

## User Survey

In order to adjust the design to actual user needs, a survey is conducted and distributed at TUM.  
Data collected ranges from walking paths as reference points for the station location setup, user interest in participation in sharing models to responsibility in usage. Furthermore direct input of design ideas is actively encouraged.

## RESULTS &amp; OUTLOOK

The user survey conducted before the field experiment revealed some critical points in the design of the sharing concept, which the project team approached.

Although 92% perceived theft of umbrellas as a risk, 73% of the participants expect user contribution, e.g. the willingness to bring back abandoned umbrellas to the stations. While this is a good sign for the potential of the sharing concept, the actual contribution has to be examined during the field experiment.

Beginning with the field experiment, another survey will be carried out. The findings from both surveys will be contrasted to the field data, in order to deduct crucial factors which decide about the success of a sharing model. Adjusting the station and umbrella design choices accordingly, the experiment will be repeated on campus Weihenstephan.

In a final step, the users may be asked to provide umbrellas themselves, which eventually could lead to a self-sustaining service.

**Umbrella Design**  
Walking-stick umbrellas: Most people prefer this type for use. As there is no need to hold them after use, they are perfect within a sharing system. Besides, that makes them less likely to get lost or stolen.  
Big umbrellas: It is possible to use one with several people at once.  
Unique umbrellas: People will recognize them to be part of a sharing system.

**Station and Network Design**  
The 2014 project *zusammenkommen* forms an interlinked set of umbrellas sharing stations in immediate bottom and sectioning bars inside the dorms assure proper outdoor of water and ordering of umbrellas.  
The station locations are chosen such that the walking routes between major buildings, like lecture hall and faculty buildings are integrated in the station network.

**Tracking of Movement Patterns**  
All umbrellas are equipped with Beacons. This enables cost effective tracking of the umbrellas across the campus. At each station a Raspberry Pi detects nearby umbrellas.  
This data provides valuable information about the location of the umbrellas and about the necessity of manual reallocation. Linking the Beacons allows to furthermore analyze the on-campus walking routes.

JUNE 2017

## MEMBERS

Maximilian Bauer, Gunter Bidingmaier, Markus Feuchtinger, Marlene Höfer, Beate Lang, Frank Milder, Sebastian Mühlbauer, Felix Nuscheler, Malke Offer, Eva-Maria Schmid, Max Tschögl, Michael Trimpf, David Wei, Yize Zhuwu  
TUTORS  
MENTORS  
Prof. Fritz Frenker, Alexander Lang

inspired by  
TUM Junge Akademie



## dare2share

how sharing is replacing ownership



**ABSTRACT** Eco-friendlier, cheaper, simpler – whatever it is that attracts people to share, we cannot deny the increasing emergence of different sharing models. As we scrutinized the topic “sharing economy” closely, we soon realized that we should focus on just one of its elements, in our case “product sharing”.

## GOALS

Firstly, we aimed at implementing a sharing system for umbrellas on the university campus as a practical and useful offer to students and other visitors of the campus. Secondly, our purpose was to examine emerging problems and in particular user behavior – how responsible do users treat the products and do they use them within the system in the intended way?

## HYPOTHESIS

It is possible that a freely available sharing system can sustain itself on the long term in the enclosed ecosystem of a university campus.

## TEAM STRUCTURE &amp; PROCESS

Our team consisted of in total 14 team members from highly different academic backgrounds, two Junge Akademie affiliated and experienced tutors and three mentors, two with a design and one with an engineering and development background. Throughout the entire project phase this team was led by three successive project responsible. Driven by the diversity of our capabilities and interests we went through a six months lasting discussion process on how to approach our challenge of decision processes in the product life cycle. The debate between a theoretical approach with standardized learnings and an actionable project ended up in the decision to implement an umbrella sharing system. With the beginning of the next phase we broke down our unfeasible group size into the more agile task forces project management, product design, project concept and communication. During the second phase of conceptual and product design we committed all relevant TUM stakeholders to the project, sourced the parts for our sharing system and build the entire system. The system consisted of sharing stations made out of used oil barrels and self-designed umbrellas. After completion we implemented the system for one month at the TUM campus in Garching. Despite the rather devastating outcome we used the last two months for a detailed analysis and documentation of our results, so that our learnings can be passed on.

## OUTCOME

For the practical part of our project, the implementation of an umbrella sharing system, the outcome is unfortunately, that the intended sharing without registration did not work

the way we hoped it would. Within just a few days most of the umbrellas disappeared. But our project consists of two parts – the practical implementation and also the theoretical answer to our hypothesis. With the realization of the sharing system we can give a clear answer: a sharing system also on an enclosed ecosystem of a university campus needs further regulation. On the one hand some kind of registration or surveillance might prevent people from withdrawing objects. On the other hand, not all objects are equally suitable to be shared. In the eyes of many people it might seem rather ok to take a “cheap” object such as an umbrella.

## SUMMARY AND FUTURE GOALS

One and a half year ago the new members of the TUM: Junge Akademie had the first chance getting to know each other during the kick off weekend. These days we spent a lot of time to develop our personal soft skills and finally to form different groups, which should achieve a project. After our group with 14 people was founded, we started to figure out our hypothesis, which we should try to answer scientifically, and our main idea of our project. Shortly after our group decided that we should deal with the domain of “sharing object”. Thus, we spent several meetings to discuss which kind of sharing (for example food sharing, car sharing, furniture sharing, etc.) we wanted to look at. A few weeks and a lot of researches later we determined an umbrella as the best item to be shared. The following steps were to establish a time schedule, to form smaller groups, to fix different tasks and to design the components which contain the cans, the umbrellas and the information shields. At first, we worked quite a lot in the smaller groups, but for building the cans and the umbrellas we withdrew the separation. Once the skilled manual work was done we put the cans with the umbrellas at the TU campus in Garching. Unfortunately, it remained only twenty umbrellas after two days and the rest was obviously taken by thefts. Of course, we spent several times to discuss which mistake was made and if we could have avoided it. One thought was that we should have done a registration system or that we should have demanded a deposit for the sharing object. However, one member found an interesting article which was about a failed sharing project in China by which they lost over 300 000 umbrellas even though there existed a registration and deposit system. Due to multitude of reasons we concluded that the umbrella might not be a perfect item to share and therefore we couldn't verify our hypothesis and we decided not to formulate any future goals.

OCTOBER 2017

## MEMBERS

Maximilian Bauer, Gunter Bidingmaier, Markus Feuchtinger, Marlene Höfer, Beate Lang, Frank Milder, Sebastian Mühlbauer, Felix Nuscheler, Malke Offer, Eva-Maria Schmid, Max Tschögl, Michael Trimpf, David Wei, Yize Zhuwu  
TUTORS  
MENTORS  
Prof. Fritz Frenker, Alexander Lang, Wotan Wilden

inspired by  
TUM Junge Akademie



Poster 3: Evaluation Day II

Poster 4: Annual Conference 2017





EatMe,  
I'm Fancy!

maesli  
organic

?



# Project Report **EatMe – I'm fancy**

Team	Maximilian Hechler
	Carolin Klose
	Sebastian Laumer
	Sophie Petersen
	Carlos Piedrafita Alvira
	Lukas Raith
	Konstantin Wolf
Tutor	Dominik Irber
	Josef Oberndorfer
Mentor	Dr. Hannes Petermeier

# The philosophy of a bowl of muesli

## Variability

Muesli is a category of diverse foods rather than one specific product. There is an almost limitless freedom to combine different ingredients and to compose an individual mixture by adding or avoiding a specific foodstuff. It requires creativity and courage to design a new muesli, to combine flavors and textures of different ingredients to create an overall foodstuff that excites the taste buds and leaves the consumer satisfied. Each component is different from the others and has its own distinct attributes, and it is the unique combination of ingredients which defines the overall character of a muesli.

## Consciousness

Nevertheless, taste is not the only criterion to consider. This is a general rule that is true for all foodstuffs we consume. We often base our selections on more ethical criteria too, for example, in order to make consciously considered and socially responsible choices. In addition to the taste, accordance with personal opinions and attitudes matter. Where does the product come from? How and how far was it transported? Is it a natural product or processed by industry? How much of the final price does the farmer earn? Was the product produced under organic and sustainable conditions? Considering these different criteria makes the composition of an ideal muesli more complicated or perhaps even impossible. There cannot be one ideal muesli which is healthy, affordable, socially and ecologically friendly and which contains all desired ingredients. Thus, a careful weighing and judging of many different factors is required to create a personal favorite mixture.

## Universality

Muesli is universal. This undemanding foodstuff is simple and the preparation could not be easier, making it one of students' favorite foods. A package of premixed muesli or the ingredients in isolation can be stored for a long time without the risk of spoiling, which is ideal for those who do not have time – or who forget – to shop for fresh groceries on a regular basis. A bowl of muesli can serve as a full, satisfying and filling meal, supplying one with all essential nutrients. It can be a conventional breakfast or snack or even served as lunch or dinner. Muesli is known and valued by many cultures, each interpreting and preparing this universal meal in a unique way.

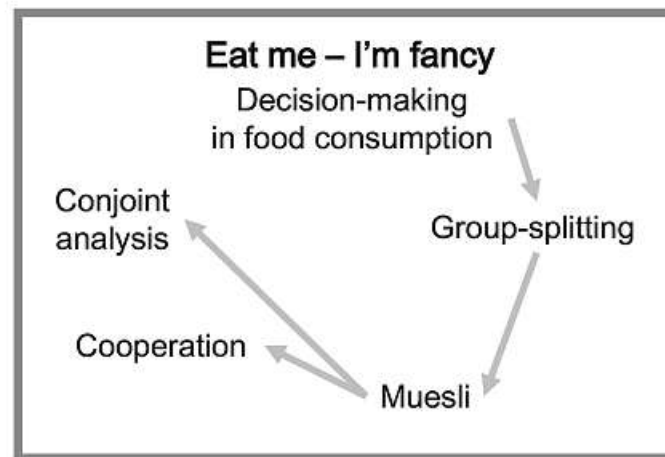
## Muesli as a symbol for TUM students

The community of TUM members is highly diverse and heterogeneous. Students originate from countries all over the world, they have different sociocultural backgrounds, religions, attitudes and opinions, their interests and subjects of study range from agriculture to quantum physics – every person at TUM is unique and contributes to the harmony of our diverse community. This heterogeneity is reflected by our model foodstuff “muesli” which consists of a variety of different ingredients characterized by their unique taste, texture, price, origin etc. – together forming a harmonious composition.

# The Philosophy of a Muesli Bowl

Variability

Consciousness



Universality

Muesli as a  
symbol for  
TUM students

## Abstract

Buying food is an everyday activity involving many decisions. We have never had so many options and possibilities when choosing our food as we do nowadays. Which factors play a key role when it comes to the final decision? The aim of our project was to analyze this question by concentrating on the muesli consumption of students at TUM. Using a “conjoint analysis,” we were able to gain an insight into the priorities governing the choice of ingredients for making muesli specifically in relation to the categories of regionality, price, nutritional value, and organic certification. The results show some surprising characteristics and these should be of interest and relevance to further studies in this area.

## Background

Shopping for groceries is a common activity which is part of our everyday life. On average, a German household spends over 10 % of all expenses on food (Statistisches Bundesamt, 2013). Globalization has provided us with an enormous diversity of products lined up on the stores’ shelves. However, this diversity can be friend or foe: being given choices obviously forces one to make decisions and to choose certain products over others. Why do we add a certain foodstuff to the shopping cart rather than another? Certainly, this question cannot be answered easily, but we can make a reasonable guess at some of the numerous factors that might play a role in the decision-making process.

The recent trend toward health and fitness has put the nutritional values of foodstuffs into focus, in terms of, for example, protein content, fiber, calories and vitamins. Despite denials of the climate-change crisis by a few, awareness of a product’s origin, transportation, sustainability and conditions of production is rising; keywords in this context are the ecological footprint, certificates, regionality and social responsibility. Besides all this, the shopping routine is influenced by less rational factors such as habits, curiosity or temptation. Whatever plays a role in one’s decisions on groceries, this is a highly controversial topic, reflecting an individual’s lifestyle and position on fundamental questions.

Based on this subject’s high topicality and future relevance we decided to analyze the decision-making processes concerning food consumption in depth from theoretical and practical perspectives.

Therefore, a set of rational criteria, leading to a certain outcome, were defined and their importance was studied. For our analysis, we decided to concentrate on one specific foodstuff to allow for a precise investigation. Ideal targets are simple products which enable the consecutive variation of different parameters to determine the analyzed factors. After intensive research, we opted for muesli as our food of interest. Apart from being consumed among many different potential target groups in Germany, muesli is a composite foodstuff composed of several ingredients, thus enabling the separate investigation of each decision made when choosing each of these. With muesli, therefore, we were able to analyze many decisions while focusing on just one product. To allow for a more precise analysis of our initial question and to control the comparability of results, we decided to focus on a particular target group: students at TUM. This choice was determined not only by the fact that the latter represented an easily accessible group for us, but also by the high degree of heterogeneity of sociocultural background among TUM students.

## Goals and methods

Muesli is a product composed of a variety of ingredients, each possessing its own characteristics. Each consumer might value these attributes differently according to, for example, individual taste, attitude toward costs, personal definition of healthy eating, and ethical views on fair trade. All these things can influence shopping behavior (Gensler 2006). The aim of our research was to determine the factors and characteristics which influence the decision-making of our fellow students most. Intensive analysis of the decision-making process and clustering of criteria yielded four general categories of attributes which we chose to concentrate on for further investigation: “regionality” “label/certification,” “price” and “nutritional value”. Those preferences were determined to produce a tailor-made TUMuesli, which represents the desires of TUM stakeholder.

The selection of a suitable method for our research involved a long process, led by practical considerations and studies on questionnaire-answering and self-assessment. To determine the most important decision-making factors, several approaches were discussed, such as the use of a questionnaire, a virtual model simulation, and an econometric model. Problems occurring in research fields when participants were asked to state their opinion on ethical topics have been described in the relevant literature. If par-

ticipants are asked directly whether they prefer a more expensive fair-trade product over a cheaper conventional one, most will state their willingness to buy the fair-trade one. The participants feel obligated to do so, even though they would behave differently in real life (Schöberl 2012). Thus, it is better to ask questions in which such ethical statements get rounded. A method to do this is the conjoint analysis which aims to measure the importance of individual factors without overtly asking about them, while still trying to resemble a realistic decision.

There are two general types of conjoint analyses: a choice-based one and a direct one. We used the latter one to design our conjoint analysis which asks the participants to rank a group of products according to their preferences. Since muesli is a

composite product, we separated it into four general components: the basic substance, e.g. cornflakes or oats; milk; chocolate toppings; and dried fruits. For each of these sub-ingredients we designed a group of products using the orthogonal design algorithm of the statistics software SPSS. This was necessary to generate a smaller set of products that was still representative for all products and allowed the consecutive calculation of the importance of the individual factors from the data set. The products differed from one another in terms of the four characteristics of interest: "regionality," "label/certification," "price" and "nutritional value." In their product ranking, the study participants had, for instance, to decide whether they preferred a pack of organic oats from Germany for 4,95 €, or the cheaper but considerably less healthy option of corn flakes from USA.

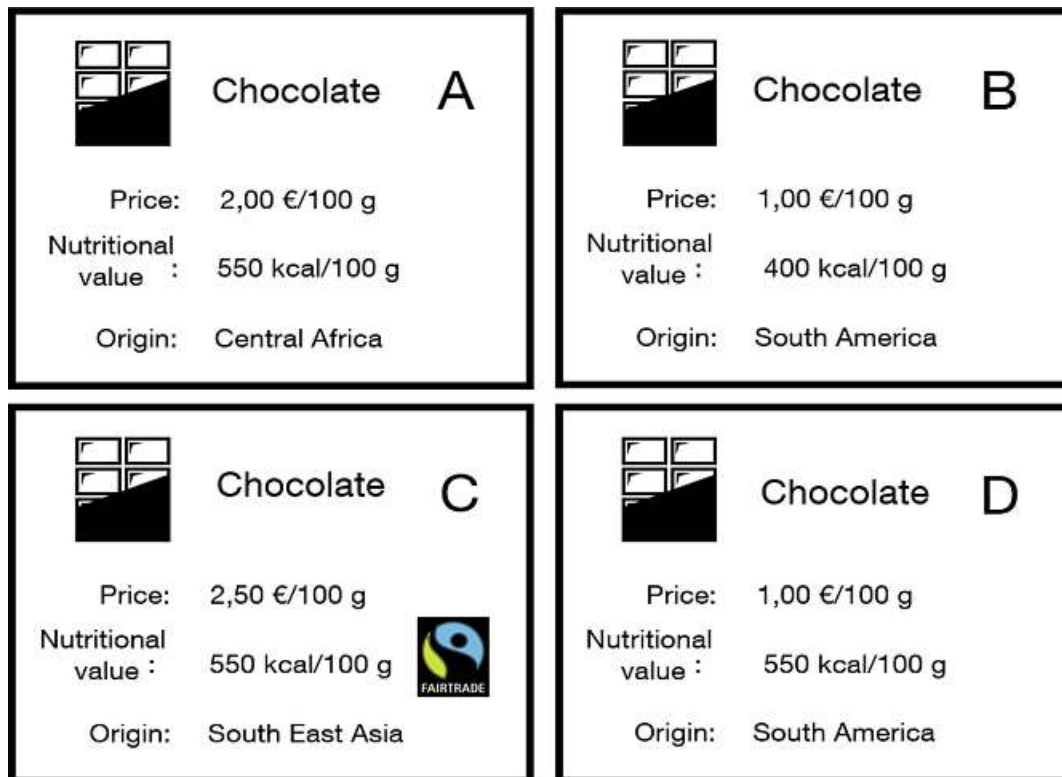


Figure 1: Decision example as part of a conjoint analysis

Using the generated ranking data of all participants, the conjoint algorithm of SPSS calculated the so-called “part-worth utility,” which is a measure for the importance of each factor.

As an overall aim, we wanted to create a TUM-specific muesli mixture that represented the personal preferences and attitudes of TUM students. Therefore, we added a short survey to our questionnaire which asked for the participant’s favorite muesli ingredients. By combining the data from the conjoint analysis that specify the most important characteristics for each sub-product with the results of the poll that determine the most preferred ingredients, we were able to generate a representative TUMuesli.

## Outcome and Discussion

To assess students’ decision-making about food consumption, a conjoint analysis with a questionnaire was designed. The analysis was based on the model foodstuff muesli, whereby the muesli ingredients of milk, cereal base, chocolate and dried fruit were considered. We administered the questionnaire using the evasys software to check our initial hypothesis:

## TUM students take nutritional value, price, social and environmental factors into account differently when selecting their muesli

The survey was conducted over several weeks, allowing us to collect a significant and representative amount of data. A total of 122 persons participated in the survey. As visualized in Figure 1 the sex distribution was nearly evenly spread. Most of the participants were from the campus Innenstadt or Garching. Yet there were also several participants from Weihenstephan, Rechts der Isar and other campuses. Furthermore, the majority of the participating TUM students ate muesli several times per week, some even on a daily basis.

Asking participants questions about their consumer behavior helped us to understand the relative importance in their decision-making of our four chosen factors: origin, certification labels, price, and nutritional value per muesli ingredient. After processing the data, we were able to prioritize the different factors analyzed in the four examined muesli product categories, thus enabling a product-wide comparison. In figure 2 the results after the post-processing are shown.

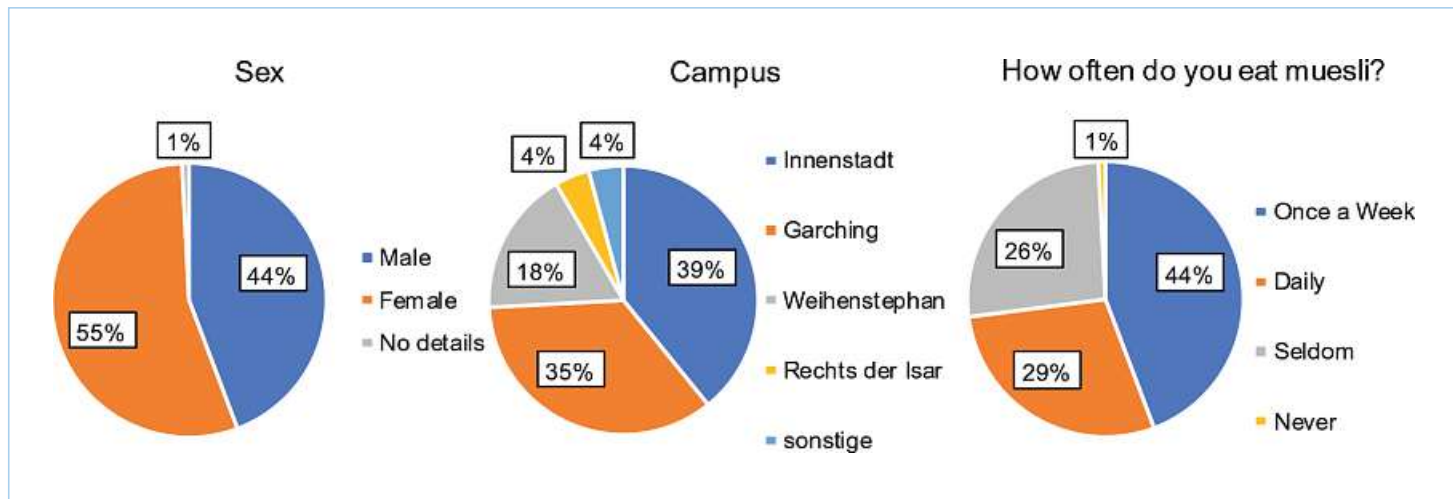


Figure 2: Left: Sex distribution of participants, middle: distribution between TUM campuses of the participants, right: muesli consumption frequency

Asking participants questions about their consumer behavior helped us to understand the relative importance in their decision-making of our four chosen factors: origin, certification labels, price, and nutritional value per muesli ingredient. After processing the data, we were able to prioritize the different factors analyzed in the four examined muesli product categories, thus enabling a product-wide comparison. In figure 2 the results after the post-processing are shown.

In accordance with the growing consciousness for an ethical lifestyle, we observed a high impact on decisions of the organic/fair-trade label and the origin of ingredients. TUM students especially preferred regional milk, if possible from the own federal state. Moreover, it was very important to them that the chocolate additive had a fairtrade label. Also for the cereal base and dried fruit the highest scoring factors were the origin and/or quality/organic label. Nevertheless, considering the economic status of students in

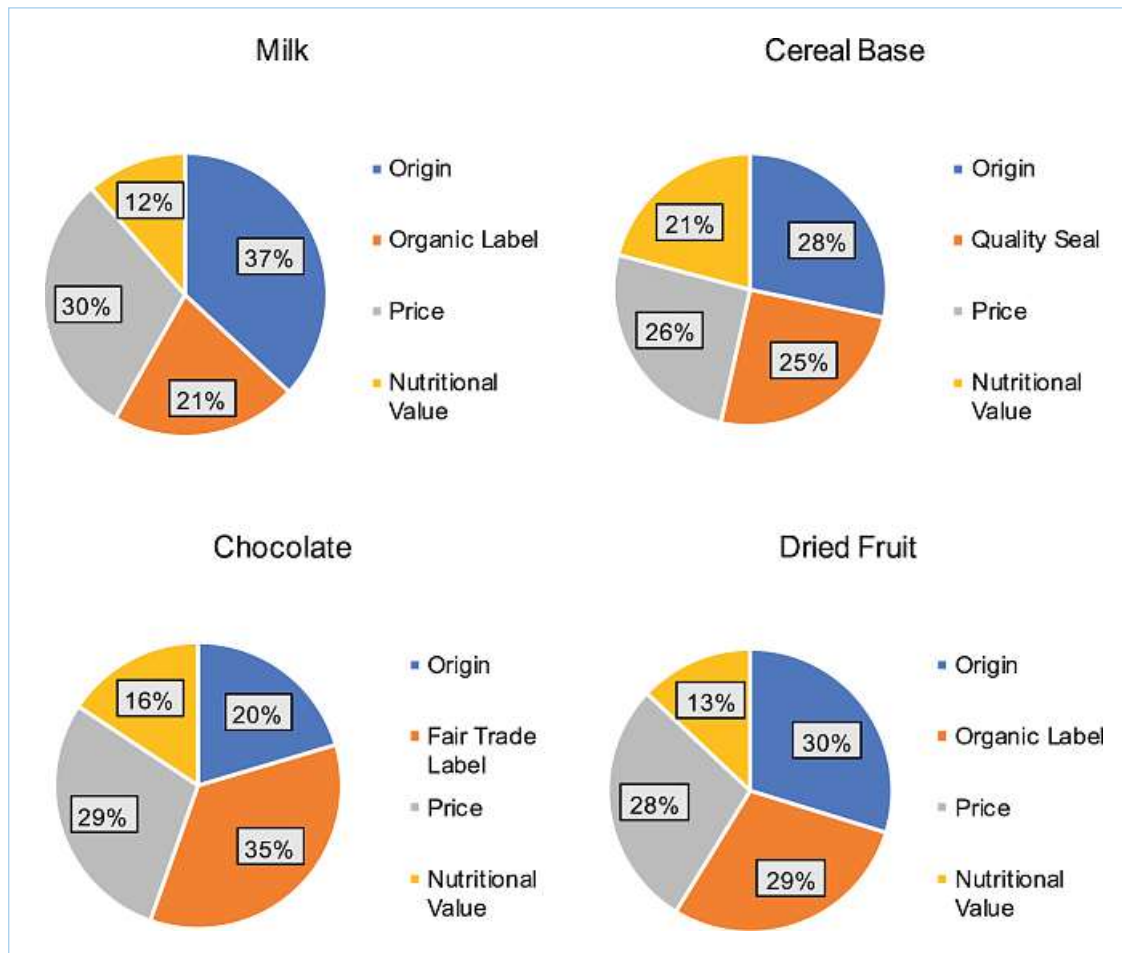


Figure 3: Importance per factor for the muesli ingredients milk, cereal base, chocolate and dried fruit

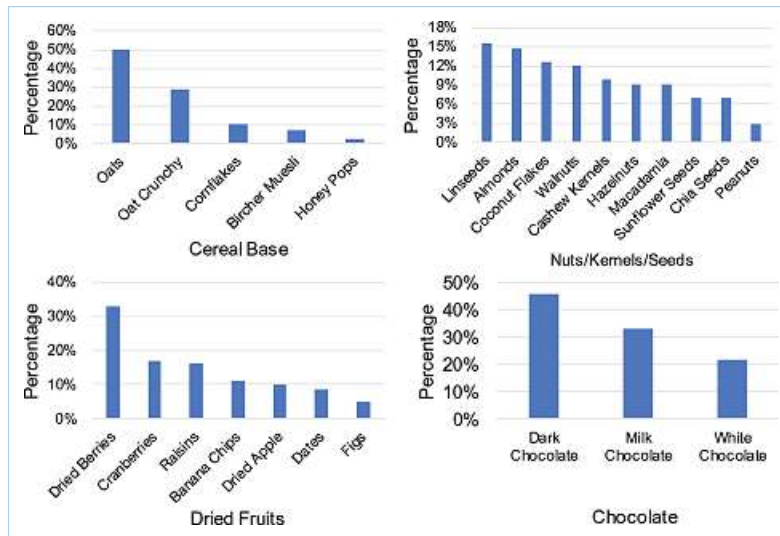


Figure 4: Results of the questionnaire

society, we also noted that the price was one of the determining factors on final decisions and was therefore evaluated as equally important for each ingredient. The importance of a regarded factor can vary significantly between different products. Moreover, all four components analyzed displayed highly diverse properties and may play different roles in everyday life.

Returning to our hypothesis, we can see that the four factors (origin, certification label, price and nutritional value) were evaluated differently. Hence, the investigated factors are not taken equally into account in the decision-making process of students when selecting muesli. This confirms our hypothesis mentioned above. In addition, we recognize, that the influence of the examined factors on the decision-making process might vary depending on the observed product.

Another important and not less interesting finding on the matter of the applicability of a conjoint analysis was that the ranking of products can be an exciting but also quite mentally exhausting endeavor. A dropout rate of approximately 60% of the participants indicated that it took a lot more effort to process a conjoint analy-

sis than a usual questionnaire. For future implementations of conjoint analyses, we would suggest carrying out the conjoint analyses in a lower volume with a more transparent structure so as to decrease the dropout rate.

By uniting the results of the conjoint analysis with the outcome of the upstream questionnaire (Figure 3 and 4) we were able to determine the composition of the TUMuesli as follows:

- Milk from Bavaria
- Oats from Germany
- Dark Chocolate with Fair-Trade Label
- Dried berries from Germany
- Regional almonds and linseeds

These results are not only valuable for the composition of the TUMuesli but also for companies of the food industry, as the importance of certain influencing factors in the decision-making process are illustrated. In particular the change of the utility values according to changes of the characteristic of a certain influencing factor might be of great interest. This can be very useful for decisions in marketing. For instance, companies could better define their pricing according to specific factors of consumer choice.

To conclude, the proposed composition of TUMuesli will be made available at the TUM shop and might also give existing food companies an incentive to produce a custom-made muesli for students.

## Summary and Future Goals

The aim of the project was to gain an insight into the preferences of our fellow students and to determine which factors in their decision making are considered most. The result of this analysis is a muesli tailor-made to their desires. The conjoint analysis allowed us to achieve the latter as we were able to examine the decision-making processes of our fellow students and avoid bias due to indirect measurements of preferences. The data on



consumption clearly pointed out the significance of muesli in a student's diet. The results of our analysis served as a basis for creating the optimal muesli for TUM students. This is muesli to please the palates of all students: A careful composition of rich German oats, complemented by regional almonds and linseeds, with a serving of fine fair-trade dark chocolate and an intricate mixture of dried berries, all of which is completed by a healthy portion of wholesome Bavarian milk. A muesli fulfilling their desire for a satisfying meal, yet containing a dash of that something special that makes the TUMuesli a product that has been missing on their daily breakfast menu.

One of the most crucial things we learned was the importance of an appealing survey. This factor is critical keeping in mind the complexity of the conjoint analysis. An array of seemingly redundant questions can quite quickly irritate the survey taker. This is reflected by the high dropout rate in our survey, proving a need for a more appealing approach to designing the survey. Reducing the dropout rate must hence be viewed as one of the biggest goals for future projects which use the conjoint analysis as a method.

Lastly, we looked at the product itself. As aforementioned, the team created TUMuesli by combining the ingredients most favoured by TUM students. This recipe was subsequently sent to various cereal

companies who can market TUMuesli on a trial basis to judge the success of the product. These samples will be sold in the TUM shop to provide access not only to all students but also to visitors wishing to try the product. The trial run in market conditions will serve as a benchmark for the quality of the product. A positive initial response will lead to the addition of TUMuesli to the regular stock of the TUM shop. This way, everyone will be able to enjoy this healthy and satisfying muesli.

## Acknowledgments

This project profited from the valuable input of several people to whom we would like to express our gratitude. Firstly, we would like to thank our mentor, Dr. Johannes Petermeier for always offering help and good ideas. We want to express our gratitude to our two mentors, Dominik Irber and Josef Oberndorfer for their overall help, always readily given; for giving realistic and reasonable opinions; and, finally, for the high quality of their photographs. A special thanks goes to Andrea Prehofer, who made the realization of the whole project possible by giving us the idea of the conjoint analysis. Last but not least we would like to thank Prof. Dr.-Ing. Gerhard Müller, Peter Finger, Maria Hannecker and all members of the TUM: Junge Akademie for creating and offering the wonderful setting in which this project was undertaken.

## References

Gensler, Sonja (2006): Ermittlung von Präferenzen für Produkteigenschaften mit Hilfe der Choice-Based Conjoint Analyse, Teil I. In: WiSt Heft 5, S. 254–258

Schöberl, Stefanie (2012): Verbraucherverhalten bei Bio-Lebensmitteln: Analyse des Zusammenhangs zwischen Einstellungen, Moralischen Normen, Verhaltensabsichten und tatsächlichem Kaufverhalten. Dissertation. TU München. Fakultät für Wirtschaftswissenschaften, zuletzt geprüft am 06.09.2017.

Statistisches Bundesamt (2013): Wirtschaftsrechnungen: Einkommens- und Verbrauchsstichprobe Aufwendungen privater Haushalte für Nahrungsmittel, Getränke und Tabakwaren.

Statistisches Bundesamt (2013): Wirtschaftsrechnungen: Einkommens- und Verbrauchsstichprobe Einnahmen und Ausgaben privater Haushalte.

# EatMe

Decision-making processes concerning food consumption.

Buying food is an everyday activity for most of us. Yet the choice of food has become a highly emotional topic in our western society.

We want to analyse what unconsciously and consciously drives people when it comes to the decision of buying a certain foodstuff.

Imagine yourself on a Saturday morning, shopping the groceries for next week. Are you walking through the abundantly packed aisles of a supermarket or do you prefer to visit your local farmer's market?

Which criteria are influencing your decision for a particular product when buying apples, yoghurt, eggs or coffee?



## BACKGROUND

In 2014 the average German household spent 285 euro on food each month [1]. At the same time, the decision-making processes concerning food consumption have become increasingly difficult, as consumers are confronted with a huge variety of products and influenced by a myriad of factors. This has been vividly demonstrated in a field study by Columbia and Stanford University when confronted with an extensive array of 24 choices of jam or chocolate, consumers show much greater difficulties and less satisfaction with their decisions than for a limited array of six choices [2]. Furthermore, the awareness of food consumption is increasing in today's European society. For example, numerous EU initiatives have come to life to promote healthy nutrition and reduce diseases caused by a poor diet [3]. In a recent poll around half of German citizens have stated that they pay attention to a balanced nutrition [4], while superlatives and expenditure are becoming increasingly popular as well. Since food consumption is responsible for approximately 28 % of greenhouse gas emissions in Europe [5], another important aspect to consider is sustainability. In addition, consumers today tend to easily today's food as regional, fairly traded or ecologically produced. The interaction of all these aspects makes decision-making processes concerning food consumption highly complex, multi-layered and often suboptimal. That conclusion is underlined by the fact that about three quarters of consumers in Germany experience uncertainty, indecisiveness and distrust when buying food [6]. Therefore, this is a highly interesting area of research with a significant potential for improving decision making processes.

## GOALS AND METHODS

Our overarching goal is to improve decision-making processes concerning food consumption based on a better understanding of the influencing factors involved and their interaction. Our initial research focuses on the hypothesis:

**Better informed consumers will choose their food more consciously.**

We are going to analyse that expectation thoroughly with respect to two different aspects. Firstly, we want to understand the importance of the ecological footprint as a numerical measure of a product's sustainability for consumers' purchase decisions. Secondly, we want to decipher how marketing and the related areas of regional, seasonal and ecological food influence consumers' unconscious decisions. In a second step, we are going to translate our research results into a practical concept in order to improve decision-making processes concerning food consumption.

Members: Felix Bove, Philip Böhm, Max Leon Hechler, Lukas Huss, Carsten Juliana Klose, Sebastian Laumer, Sophie Petersen, Carlos Piedrafita Alvaro, Lukas Rath, Konstantin Matthias Paul Wolf, Johannes Wittenweder  
Tutors: Benedikt Josef Oberndorfer, Dominik Iber  
Mentors: Dr. Hannes Petermeier



# EatMe. I'm fancy!

Decision-making processes concerning food consumption.

Buying food is an everyday activity for most of us. Yet the choice of food has become a highly emotional topic in our western society.



We want to analyse what unconsciously and consciously drives people when it comes to the decision of buying a certain foodstuff.

## BACKGROUND

Student's choice on groceries is an often stereotyped topic that is primarily associated with a limited budget and individual shopping habits. However, this narrow point of view ignores a variety of other factors that may influence this highly emotional decision. Our project aims at reflecting the impact of certain characteristic factors such as quality, price, organic origin and nutritional value.

Muesli represents a widespread universal foodstuff which can be individually composed based on personal preferences. Imagine a place where you get to choose every ingredient of your muesli and can develop a new mixture every day – just like the cafeteria's salad bar. By preferring certain products in comparison to others the student intuitively ranks food criteria that define the different ingredients. Thus, a bowl of muesli depicts a personal profile and reveals decisive factors of one's food consumption.

## GOALS AND METHODS

Our goal is to find out which conscious and unconscious factors influence the decision making process of food consumption. Therefore, we focused on the product muesli by analysing the selection criteria for muesli ingredients of TUM students.

We are going to investigate the prioritization of criteria in terms of food consumption by applying conjoint analysis as a theoretical tool as well as in a practical way. The latter will be an experiment in cooperation with a muesli producing company where students are supposed to arrange their own muesli by choosing different ingredients. From the obtained data on selection of the ingredients we want to draw conclusions about the influencing factors of muesli consumption.

Members: Max Leon Hechler, Carsten Juliana Klose, Sebastian Laumer, Sophie Petersen, Carlos Piedrafita Alvaro, Lukas Rath, Konstantin Matthias Paul Wolf, Benedikt Josef Oberndorfer, Dominik Iber  
Mentors: Dr. Hannes Petermeier



JANUARY 2017

Poster 1: Annual Conference 2016

Poster 2: Evaluation Day I

# EatMe I'm fancy!

Decision-making processes concerning food consumption.



**ABSTRACT** Decisions about food consumption are more relevant than ever. Our team is interested in the decision making of students based on the model food muesli. We want to elucidate what drives our target group when it comes to the decision of buying a certain foodstuff, using the approach of conjoint analysis and enabling us to rise consumption awareness.

**HYPOTHESIS** TUM students take nutritional value, price, social and environmental factors into account differently when choosing their muesli.

## GOALS AND METHODS

In a modern world, in which marketing is part of everyday life, design and advertisement for food and drinks get more fancy to catch consumers attention. But marketing is just one side of the coin. The nutritional value, social and environmental factors as well as the price of a product are attributes which should be additionally considered whilst purchasing food.

Our research focuses on determining the most influential of the previously listed attributes which will be accomplished via a conjoint analysis. A conjoint analysis measures how much participants value the different attributes of a single product. Here four different products (cereals, milk, chocolate, and dried fruits) will be tested with regard to their specific attributes. The participants are asked to rank eleven different attribute combinations from one (most favourable) to eleven (most unfavourable). In the end the data from the conjoint analysis will be evaluated with SPSS to answer the hypothesis.

## EXPECTED OUTCOME AND DISCUSSION

The conjoint analysis will be held for several weeks allowing us to collect a significant and representative amount of data. After processing the data by our team, we will get a prioritization of the different analysed factors in the four muesli products examined, thus enabling a product-wide comparison. In accordance with the growing consciousness for life-style, we expect to observe a high impact of the bio/fair-trade label and the regionality factors on the decision. Whether this comes from an environmental awareness or increasing social trends is an interesting question to be addressed in future.

Nevertheless, considering the economic status of students in society, we still assume the price to be one of the determining factors which will greatly impact the final decision.



The importance of the factors may vary significantly between different products, as all four analysed components display highly diverse properties and may play different roles in everyday life. Taken together, our results will be an interesting piece in decision making analysis, giving an insight into a part of society that changes rapidly and thus answering our formulated hypothesis.

## SUMMARY AND FUTURE GOALS

During the last year, our team has focused on the analysis of students' decision-making about food consumption based on the model foodstuff muesli. In parallel to the planning and implementation of the conjoint analysis, we tried to build up several cooperations with muesli producing companies. Now, after creating and validating the conjoint analysis, we are collecting data for our interpretation. In addition, the resulting ranking of interests and preferences shall be reflected in a TUM specific muesli mixture which shall be available at the TUM-shop. By analysing the consumption behaviour of students, we also expect to create some manner of impact, increasing consciousness and rising education in foodstuff choice.

JUNE 2017

**MEMBERS** Maximilian Hechler, Carolin Klose, Sebastian Laumer, Sophie Petersen,  
Carlo Probst, Lukas Altmann, Lukas Plath, Konstantin Wolf  
**TUTORS** Dominik Irtel, David Orendorfer  
**MENTORS** Dr. Hannes Petermeier



# EatMe. I'm fancy!



**ABSTRACT** Decisions concerning food consumption is an everyday situation and thus a current topic. During a dynamic working process, our group aimed to analyse the importance of different factors for the outcome of such a decision, by performing a conjoint analysis using muesli as a model product. We found out that TUM-students consider factors differently when choosing amongst several ingredients. In addition, we could determine the optimal muesli composition for our fellow students, hereby creating a unique "TUMuesli".

## GOALS

Our goal was to find out which conscious and unconscious factors influence the decision-making process of food consumption. We wanted to analyse what attributes of food drives people when it comes to the decision of buying a certain foodstuff. Therefore, we focused on the product muesli by investigating the selection criteria for muesli ingredients of TUM students via conjoint analysis. Using the results of our data acquisition we wanted to establish a muesli which represents the preferences of the TUM community.

## HYPOTHESIS

Our overarching goal was to improve decision-making processes concerning food consumption based on a better understanding of the influencing factors that are involved. Our initial research focused on the claim:

*TUM students take nutritional value, price, social and environmental factors into account differently when selecting their muesli*

## TEAM STRUCTURE AND PROCESS

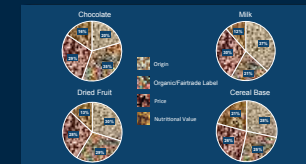


## OUTCOME AND DISCUSSION

Asking participants questions about their consumer behaviour helped us to understand the relative importance in their decision-making of our four chosen factors: origin, label/certification, price, and nutritional value per muesli ingredient. The results after the post-processing are shown in the next figure, above right.

In accordance with the growing consciousness for an ethical life-style, we observed a high impact on decisions of the organic/fair-trade label and the origin of ingredients. Moreover, considering the economic status of students in society,

we also noted that the price was one of the determining factors on final decisions and was therefore evaluated as equally important for each ingredient.



Our initial hypothesis was confirmed as the investigated factors are not taken equally into account in the decision-making process of students when selecting muesli. Another interesting finding on the matter of the applicability of a conjoint analysis was that the ranking of products can be a mentally exhausting endeavour (dropout rate ~60%).

By uniting the results, we determined the composition of the "TUMuesli" as follows:

Milk from Bavaria | Oats from Germany | Dark Chocolate with Fair-Trade Label | Dried berries from Germany | Regional almonds and linseeds

These outcomes are not only valuable for the composition of the TUMuesli but also for companies of the food industry, as they are useful for decisions in marketing.

## SUMMARY AND FUTURE GOALS

The conjoint analysis allowed us to examine the decision-making process of our fellow students and avoid bias due to self-assessment. Everybody of us has an impact on our world with his or her everyday shopping behaviour. The results of our analysis served as a basis for creating the optimal muesli for TUM students.

This recipe was sent to a cereal company which can market the TUMuesli on a trial basis to judge the success of the product. We decided on a company which helps people with mental illnesses. After this test run, we want our product to be part of the TUM-Shop, enabling all TUM students access to it.

OCTOBER 2017

**MEMBERS** Max Leon Hechler, Carolin Juliana Klose, Sebastian Laumer, Sophie Petersen,  
Carlos Piedrafita Alvia, Lukas Rath, Konstantin Wolf  
**TUTORS** Josef Orendorfer, Dominik Irtel  
**MENTORS** Dr. Hannes Petermeier



Poster 3: Evaluation Day II

Poster 4: Annual Conference 2017





# Project Report **EatMe – I'm low carbon**

Team	Philip Böhm Fabio Bove Linus Huss Paul Thillen Johannes Wüllenweber
Tutor	Dominik Irber Josef Oberndorfer
Mentor	Dr. Hannes Petermeier

„It's not like it's always in my head“ or „I usually don't go grocery shopping, my partner does that“ are just two examples of typical answers our project group „EatMe – I'm low carbon“ received when walking around the pedestrian area in Munich. We asked people whether they were considering their CO2 footprint during grocery shopping. It was exactly this attitude of somehow having heard about ecological implications of one's food consumption but not acting accordingly that inspired our project. With the hypothesis that „better informed consumers will take a product's ecological footprint into account for their purchase decision“ in mind, we set out to make a tangible difference by raising awareness of the ecological implications of people's diets.

„There was a great atmosphere of common enthusiasm and constructive discussions. This was certainly crucial in ensuring our project's success despite the obstacles we

In the beginning, our team consisted of a group of thirteen students, motivated by the common topic „decision processes in the food industry“. We kicked off the team-building process, highlighted in a workshop by Miss Prehofer, with a beautiful day at a climbing garden in August 2016. Supporting each other at challenging points and succeeding in overcoming obstacles together got the spirits up. Nevertheless, bringing together the interests, passions, and skills of thirteen young and idealistic students is obviously quite a challenge. Therefore, we decided to split up into two smaller, more specific interest groups for efficiency reasons. Our sub-team decided to take a closer look at how people care about the CO2 footprint – as one aspect of the general ecological footprint – in their food consumption, hence the name „EatMe. I'm low carbon!“. At first, the projected outcomes seemed clearer to us than they turned out to be in the end. For example, one team member had a „clear imagination of a mobile application that people would use during their shopping to scan barcodes.“ In the project evolution, unexpected events provided opportunities for re-examining our initial idea and redirecting our efforts to viable outputs. In fact, we ended up nowhere near the initial idea. But let us get back to the beginning.

As a project start, we created a survey regarding existing knowledge about the CO2 footprint and ways that consumers would like further information about it to be made available to them. The aim was to get a clearer image of what people actually need and want. After a hard fight with EVASYS settings, our team managed to launch and even complete the survey shortly after the Christmas break. At that point, with the results of the survey in hand, the idea of creating a mobile app died. For the participants of the survey, a smartphone app would have been only the fourth most desirable option of getting information. On the other hand, a vast majority wanted more information about their food with respect to ecological implications. Thus, instead of trying to somehow still justify developing an app, our team reacted to the outcome by steering our efforts in the direction of a poster that could be displayed in supermarkets. For consumers, information presented directly on food packaging would be a more immediately accessible source of information, but we considered that the realization of such a goal would be unachievable in the limited amount of time available to us. Applying the concept of „SMART“ goals that Miss Prehofer suggested in a workshop on project management helped us in setting realistic goals. After having agreed on the desired outcome, our team quickly started working on it.



Panel discussion at "acatech am Dienstag"



Yet, the next experience was a huge setback. Realizing that existing data was either sparse or extremely complex, our team had to adjust the scope of our project. Rather than analyzing certain food types in depth, we decided to give a high-level overview of various types of food. During this data-gathering phase, we ourselves were repeatedly surprised by facts. Did you know that consuming cheese generally causes more CO<sub>2</sub> emissions than eating chicken? Or that rice production is emitting CO<sub>2</sub> not because of its transportation routes but because of the way it is grown?

Throughout the project time, we had constantly to evolve and re-think our ideas while still managing to advance the project. Our whole team agreed that „a great atmosphere of common enthusiasm“ as well as „lots of constructive discussions“ were crucial in ensuring the project's success. Nevertheless, there were also phases of low productivity. That was the case especially at points where we struggled with „too many reportings, due dates and obligatory meetings/workshops, which slowed down the progress of our project,“ as one team member phrased it, giving voice to a common thought among the whole group.



Our team from left to right:  
Fabio Bove,  
Philip Böhm,  
Linus Huss,  
Paul Thillen,  
Johannes Wüllenweber

An unexpected opportunity arose through the network of the TUM: Junge Akademie when our team was presented with the chance to participate in an event of the series „acatech am Dienstag.“ We teamed up with Prof. Dr. Thomas Hofmann, Senior Vice President of TUM and leading researcher in food-related biotechnology, to give the audience different perspectives on food consumption.



Scan the QR code to get to the team's video!

A short sketch about conscientious food consumption and CO<sub>2</sub> labelling at the buffet afterwards distinguished our presentation from standard talks. We were very pleased by the approval and encouragement we got from the attendees.

A second meaningful highlight was the making of a video in Munich's pedestrian area. The video can be watched by scanning the QR code. Hoping to make people reflect on the issues involved, we interviewed random passers-by on their knowledge about and concern for their CO<sub>2</sub> footprint. Switching sides and getting the „very interesting new experience of being in the role of an interviewer instead of the spectator“ gave our team members highly interesting impressions.

We have tried to improve awareness and actual knowledge about the CO<sub>2</sub> footprint. Spreading the word about that topic in the forms of a talk, a video, and miniature versions of the designed posters has not only proved educational to our team but has generated actual value in making people think about their food decisions. After all, the most important thing is not that every single decision is made in favor of a smaller CO<sub>2</sub> footprint but rather that people actually start thinking about what implications their food consumption has. Hence, we were happy when one of the interviewed people left with the words „thanks for telling me, this definitely made me think.“ Mission accomplished!



## Abstract

Quantifying the ecological impacts of human nutrition is a complex challenge. Based on the product carbon footprint, our information poster enables consumers to improve decision-making processes when buying food.

## Background

Imagine yourself on a Saturday morning in the supermarket, shopping for groceries for next week. While you are walking through the aisles richly packed with an incredible variety of products, you are making an important decision every second – although lacking most of the knowledge and information you would need for a successful decision-making process. Standing in front of the vegetables, you might be wondering whether you should choose oranges from Spain, kiwi fruits from Italy or apples from Germany to fulfill your vitamin requirements with the smallest ecological footprint. Maybe the German apples have been stored in a refrigerated warehouse for months, making their resource consumption per kilogram larger than the environmental footprint caused by transporting the oranges from Spain to Germany? Should you buy yoghurt in a reusable glass or in a lightweight plastic container? Which one has a smaller ecological footprint, soy tofu or organic meat from a local farm?

Approximately three quarters of consumers in Germany experience uncertainty and indecision when buying food.<sup>1</sup> These decision-making processes are connected to significant financial expenditures: in 2014, the average German household spent 285 euro on food each month.<sup>2</sup> At the same time, human nutrition makes up a considerable share of global greenhouse gas emissions. The complex value chain of food production, from cultivation, harvest and processing to transport, supermarket sale and refrigeration in a private household, causes so-called “direct” emissions. In addition, “indirect” emissions due to land-use changes further increase the environmental footprint of nutrition. Deforestation for palm oil cultivation in Southeast Asia is a prominent example of indirect greenhouse gas emissions connected to food consumption.

Complex production chains and diverse environmental impacts make it hard to reliably quantify the ecological consequences of human nutrition. Within the 28 member states of the European

Union, agriculture alone has a 10 % share of total greenhouse gas emissions (figure 1).<sup>3</sup> When considering the total value chain from the farmer’s field to the dinner table or landfill, food consumption is estimated to be responsible for approximately 30 % of greenhouse gas emissions in Europe.<sup>4</sup> These numbers show that research into the quantification of food’s environmental impact and the associated consumer behaviour is highly relevant. In addition, building consumer awareness within this area can play an important role in mitigating greenhouse gas emissions and tackling climate change.

## Goals and methods

Our project pursued two key goals:

1. To develop a better understanding of consumers’ knowledge and behavior in relation to food’s ecological footprint
2. To build awareness among consumers for the importance of food’s ecological footprint by designing an information tool

Our two key goals also defined two consecutive project phases, each characterized by a distinct set of methods.

In our first project phase, we initially conducted an extensive literature search to understand existing approaches for quantifying food’s ecological footprint. The resulting overview of existing studies, key aspects and consumer behavior characteristics served as a groundwork for formulating our hypothesis: Better informed consumers will take a product’s ecological footprint into account for their purchase decision.

Based on this hypothesis, we designed a consumer survey to get a better insight into awareness of and knowledge about the term „ecological footprint.“ Furthermore, we aimed to understand how such knowledge potentially influences consumers’ decisions when buying food. To allow for correlation calculation, we used the Likert scale for most of the questions. Additionally, we used multiple choice questions to allow participants a choice for their favored option(s). Aware of our survey’s explorative character, we also introduced several open questions where the participants had the opportunity of giving us further input. We intentionally tried to acquire participants from different social backgrounds to ensure a

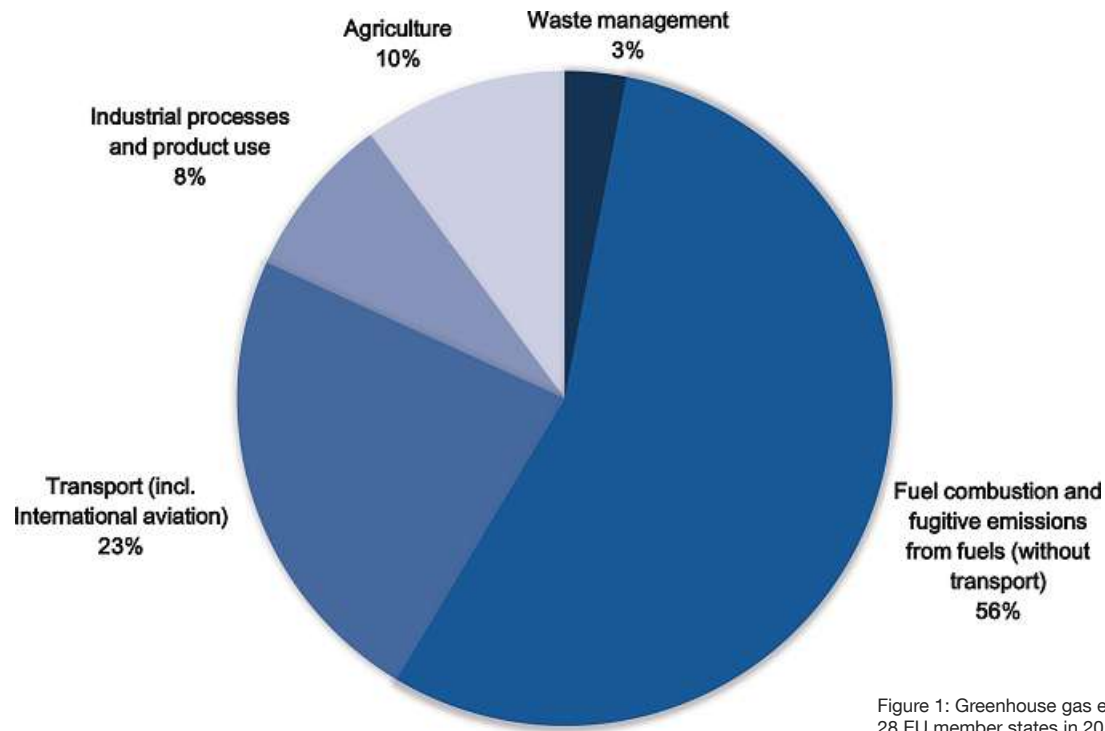


Figure 1: Greenhouse gas emissions of the 28 EU member states in 2015, by source sector.<sup>1</sup>

diverse survey population. By offering the survey online as well as offline we were able to achieve a total of 243 participants.

In addition to quantitative customer surveys, we also conducted two expert interviews. An interview guide was carefully designed to ensure purposeful questions and high information density. We interviewed two researchers at the Technical University of Munich, Dr. Norman Siebrecht (Chair of Organic Agriculture and Agronomy) and Christian Wolf (Chair of Wood Science), who are both experts in the quantification and analysis of agriculture's environmental impact.

The second project phase aimed at increasing public awareness and improving the transparency of a product's ecological footprint for the customer in the supermarket. Here, an important method was the establishment of fruitful partnerships with public institu-

tions and private companies. We employed personal networks and designed a one-pager for a convincing presentation of our project work when contacting potential partners via e-mail or telephone. In the development of our information tool, iterative prototyping based on direct customer feedback also constituted a major part of our methodology.

## Outcome and discussion

In general, the ecological footprint "measures humanity's impact on ecosystems in terms of resources used to satisfy human needs." It describes a "ratio of human demand for natural capital and the planet's capacity to sustain it."<sup>5</sup> For the quantification of a food product's ecological footprint, various metrics with different units can be employed. Frequently used metrics<sup>6</sup> are

**EvaSys** Ansichten zum ökologischen Fußabdruck (Offline-Fragebogen)

TUM: Jungo Akademie F. Bove, P. Böhm, L. Huss, P. Thales, J. Willenweber  
TUM: Jungo Akademie Ansichten zum ökologischen Fußabdruck von Lebensmitteln (Offline)

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

**1. Ihre Meinung zum Klimawandel**

1.1 Wie hoch ist Ihr Interesse an der Debatte über den Klimawandel? Sehr niedrig ☐ ☐ ☐ ☐ ☐ Sehr hoch

1.2 Wie schätzen Sie als Verbraucher Ihren Einfluss auf den Klimawandel ein? Sehr niedrig ☐ ☐ ☐ ☐ ☐ Sehr hoch

**2. Ihre Meinung zur Reduktion von Treibhausgasen**

Wie schätzen Sie in den folgenden Bereichen Ihr persönliches Potenzial ein, Treibhausgase zu reduzieren?

	Sehr niedrig	niedrig	mittel	hoch	Sehr hoch	Ich weiß es nicht
2.1 Ernährung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Wasser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Strom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Konsumgüter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 Gibt es einen weiteren Bereich, in dem Sie Potenzial sehen?	<input type="text"/>					

**3. Ihre Meinung zu Umwelteinflüssen von Lebensmitteln**

3.1 Wie schätzen Sie Ihr Wissen über die ökologischen Auswirkungen der Lebensmittel ein, die Sie kaufen? Sehr niedrig ☐ ☐ ☐ ☐ ☐ Sehr hoch

3.2 Wie schlecht oder gut finden Sie es, mehr Informationen zur Umweltfreundlichkeit von Lebensmitteln zu haben? Sehr schlecht ☐ ☐ ☐ ☐ ☐ Sehr gut

3.3 In welcher Form wünschen Sie sich mehr Informationen?  
☐ auf der Verpackung ☐ über eine App ☐ über eine Website  
☐ in einer Broschüre ☐ auf einem Aushang im Supermarkt

3.4 Wünschen Sie sich Informationen in einer Form, die nicht in der vorherigen Frage aufgeführt ist?

F7349U/15138522-1P3PLDV1 06.12.2016 Seite 1/2

**EvaSys** Ansichten zum ökologischen Fußabdruck (Offline-Fragebogen)

**4. Ihre Meinung zum ökologischen Fußabdruck**

4.1 Wie schätzen Sie Ihr Wissen über den Begriff "ökologischer Fußabdruck" ein? Sehr gering ☐ ☐ ☐ ☐ ☐ Sehr hoch

4.2 Welche Aspekte gehören für Sie zum ökologischen Fußabdruck von Lebensmitteln? (Mehrfachnennung möglich)  
☐ Artgerechte Tierhaltung ☐ CO<sub>2</sub>-Ausstoß ☐ Landverbrauch  
☐ Fairer Handel ☐ Alle ausgestoßenen Treibhausgase ☐ Wasserverbrauch

4.3 Gibt es weitere Aspekte, die für Sie zum ökologischen Fußabdruck von Lebensmitteln gehören?

4.4 Für wie wichtig halten Sie Ihren persönlichen ökologischen Fußabdruck? Unbedeutend ☐ ☐ ☐ ☐ ☐ Sehr wichtig

**5. Ihre Meinung zur Rolle des ökologischen Fußabdrucks beim Lebensmittelkauf**

5.1 Wie stark beeinflusst der ökologische Fußabdruck eines Lebensmittels Ihre Kaufentscheidung? Gar nicht ☐ ☐ ☐ ☐ ☐ Sehr stark

5.2 Wie bewerten Sie eine Kennzeichnung von Lebensmitteln mit deren ökologischen Fußabdruck? Sehr schlecht ☐ ☐ ☐ ☐ ☐ Sehr gut

5.3 Bei welchen Produktgruppen hätten Sie gerne mehr Informationen zum ökologischen Fußabdruck? (Mehrfachnennung möglich)  
☐ Obst (frisch) ☐ Gemüse und Salat (frisch) ☐ Getränke  
☐ Fertiggerichte und Konserven ☐ Getreideprodukte ☐ Milch und Milchprodukte  
☐ Fisch, Fleisch und Eier ☐ Fette und Öle ☐ Süßwaren und Knabbereien  
☐ Tiefkühlwaren

5.4 Wie viel Prozent mehr sind Sie bereit, für ein umweltfreundlicheres Produkt auszugeben?  
☐ Gar nichts ☐ Bis zu 10% mehr ☐ Bis zu 25% mehr  
☐ Bis zu 50% mehr ☐ Bis zu 100% mehr ☐ Noch mehr

**6. Demographische Daten**

6.1 Wie alt sind Sie? ☐ < 18 ☐ 18-19 ☐ 20-21  
☐ 22-25 ☐ 26-30 ☐ 31-40  
☐ 41-55 ☐ 56-70 ☐ > 71

6.2 Was ist Ihr Geschlecht? ☐ weiblich ☐ männlich ☐ weder, noch

6.3 Was ist Ihr höchster Bildungsabschluss?  
☐ Hauptschulabschluss ☐ Realschulabschluss (Mittlere Reife) ☐ Fachhochschul- oder Hochschulreife (Abitur)  
☐ Lehre/Berufsausbildung im dualen System ☐ Fachschulabschluss oder Meister/Techniker ☐ Fachhochschulabschluss  
☐ Hochschulabschluss ☐ Promotion ☐ Sonstiges/ hier nicht aufgeführt

6.4 Wo ist Ihr Lebensmittelpunkt?  
☐ Großstadt (>100.000) ☐ Kleinstadt (< 100.000) ☐ Land

**7. Ihre Mitteilung an uns**

7.1 Möchten Sie uns sonst noch etwas mitteilen? Wir freuen uns über Ihre Fragen, Anregungen oder Kommentare:

F7349U/15138522-1P3PLDV1 06.12.2016 Seite 2/2

Figure 2: Survey employed for online and offline consumer interviews.

1. Energy intensity: measures the net fuel-energy consumed to provide the heat and power requirements for the production process
2. Water consumption: measures the amount of fresh water, excluding rainwater, consumed per unit output of the production process
3. Greenhouse gas emissions: measures the amount of carbon dioxide equivalents emitted per unit output of the production process

Using a chosen metric, a product's ecological footprint can be quantified by means of a life cycle assessment (LCA). A LCA comprises a detailed inventory of a product's value chain to assess environmental impacts associated with all the stages of its life (figure 3). In the context of food, most research and quantification attempts are focused on the product carbon footprint (PCF). The PCF measures all greenhouse gas emissions along the food's life cycle and is indicated in kg CO<sub>2</sub> per kg of a specific food product.<sup>7</sup>

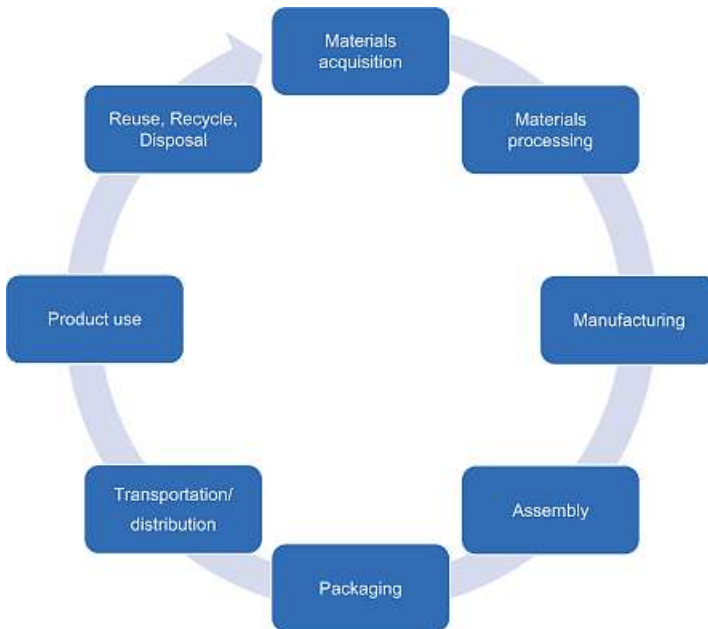


Figure 3: A Life Cycle Assessment (LCA) quantifies the environmental impact of each stage of a product's life.

However, there is a controversial debate around the suitability of the PCF for reliably quantifying a food product's sustainability. In most general terms, sustainability includes environmental, economic and social dimensions. However, the PCF does not consider important social criteria, such as social justice, human and labour rights, and it neglects environmental pollutants apart from greenhouse gases. These limitations of the PCF model have been confirmed in our expert interviews: Dr. Siebrecht stressed that greenhouse gas accounting was only a very small aspect of the huge idea of sustainability. Mr Wolf underlined this problem with the example of firewood: it has comparatively low CO<sub>2</sub> emissions as a fuel, but releases high concentrations of particulate matter when burned.

On the other hand, various reports have also emphasized the potential benefits of using the PCF as a sustainability metric. For example, a pilot study conducted in Germany has come to conclude that a "transparently documented product carbon footprint creates a stable foundation for a targeted product communication to improve climate-friendly consumption."<sup>7</sup> The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety has highlighted the necessity for developing better assessment standards and including relevant social and economic considerations in the PCF.<sup>8,9</sup> However, further research "could transform the product carbon footprint into a useful tool to increase consumer awareness and identify possibilities of reducing greenhouse gas emissions in cultivating, processing, transporting and storing food."<sup>8</sup> After careful consideration, we have therefore decided to focus our development of an information tool on the PCF while constantly taking its limitations into account.

Our survey of 243 consumers produced several interesting results. For example, the majority of interviewees estimated that their purchase decisions have a medium to high impact on climate change; likewise, more than 50 percent are willing to pay a higher price for an eco-friendlier product. We found that roughly 86 % of all participants would find it „good“ or „very good“ to have more information attached to the packaging about how „environmentally friendly“ the food is, whereas less than 60% stated the same for information about the „ecological footprint.“ Hence it could be inferred that people do not connect this latter term to eco-friendliness. The most favored means of information delivery

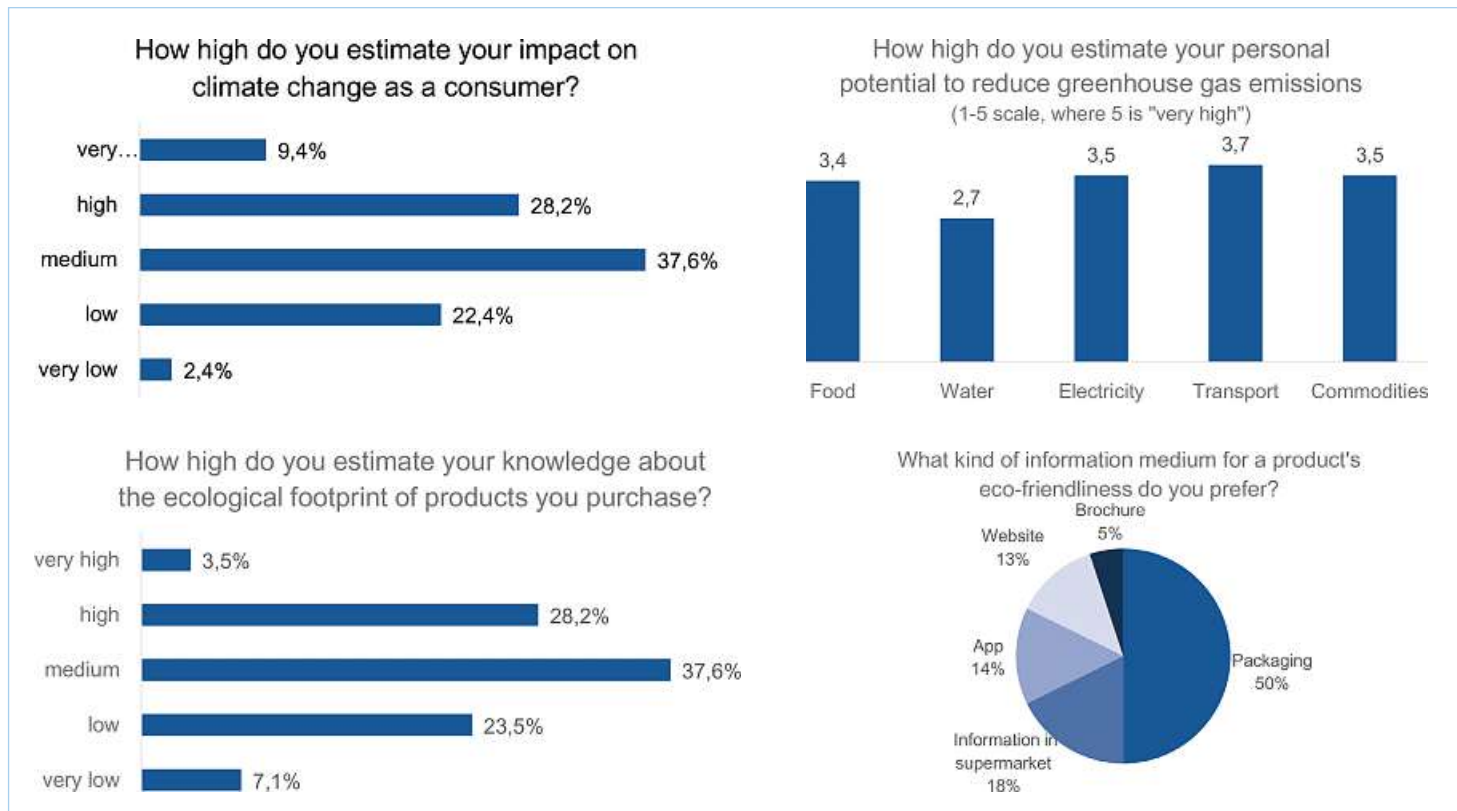


Figure 4: Key results of our consumer survey.

is on the food's packaging, followed by informational posters in supermarkets and via an app or website. This is contrary to our initial expectation that most would prefer an app or a website as their first information source. When looking at the kind of food that consumers want more information for, the survey shows that fruit, vegetables, and meat/fish are on top of the list. We also found that more than 88% would be willing to pay more for food that is more environmentally friendly.

Based on the results of our literature research, expert interviews and customer surveys, we designed an information poster for consumers in the supermarket. Our poster aims at increasing consumer's understanding of the PCF in the context of food, and gives specific advice for buying less carbon intensive food products. To make our information tool as effective as possible, we designed it according to pre-defined criteria: simplicity, ease of distribution, focus on graphical representations and colorful illustrations, low cost and opportunities for further information about the topic (figure 5). Important research results presented on our poster are:

1. Organic, seasonal and regional cultivation of tomatoes emits 0.035 kg of CO<sub>2</sub> per kg of tomatoes, while conventional farming in heated greenhouses causes 9.3 kg CO<sub>2</sub>/kg of tomatoes.<sup>10</sup>
2. Beef production amounts to 16.9 kg CO<sub>2</sub>/kg, potato cultivation to only 0.5 kg CO<sub>2</sub>/kg.<sup>11</sup>
3. The amount of food thrown away in Germany each year accounts for 22 million tonnes of greenhouse gas emissions.<sup>12</sup>

To increase the impact of our information poster in building consumer awareness, we pursued two key activities. Firstly, in a partnership with the National Academy of Science and Engineering ("acatech"), we organized a successful discussion evening about sustainable food production with Prof. Dr. Thomas Hofman (Chair of Food Chemistry and Molecular Sensory Science, TUM) as key speaker. In addition, we produced a video as a starting point for a social media campaign or educational tool: passers-by in the Munich pedestrian area were quizzed about the carbon footprint of different food products in a fun and interactive way, and were presented with one of our posters at the end (figure 6).

## Summary and future goals

The product carbon footprint (PCF) measures all greenhouse gas emissions along the life cycle of a food product. Our literature research and expert interviews have shown the limitations of the PCF as a sustainability indicator for nutritional choices, but also demonstrated its potential usefulness to improve consumers' understanding of food's ecological impact. The customer surveys highlighted that many consumers wish for more detailed information about the eco-friendliness of a specific food product. Our information poster gives specific and simple advice to consumers for reducing their carbon footprint in the supermarket. The discussion event at acatech and our awareness-building video provided starting points for increasing the public engagement with the topic.

To ensure our project's positive impact on decision-making processes related to food products, we have two future goals:

1. Implementation of a distribution strategy for the information poster in supermarkets and iterative optimization.
2. Integration of the video into a social media campaign or educational tool.

Furthermore, there is also a pressing need for further research and policy implementation. An international standard for assessing the PCF is crucial to ensure a global and transparent comparison between products. In addition, the suitability of the PCF metric for quantifying sustainability needs to be improved by integrating social and additional ecological aspects. And, lastly, political measures are necessary to ensure reliable and accessible life cycle assessment data for any food product. This is a key requirement for successful employment of the PCF as a tool for improving consumers' decision-making processes in the long term.









Figure 6: Link to our video „Your carbon footprint: do you think about it?“

## Acknowledgements

Our project could not have been completed successfully without the support of a variety of people. We would therefore like to thank:

- our mentor Dr. Hannes Petermeier and our tutors Dominik Irber and Josef Oberndorfer for their valuable guidance and constructive criticism over the course of one and a half years
- Dr. Norman Siebrecht and Christian Wolf for sharing their expert knowledge with us
- Georgia Samaras and Dr. Michael Penkler for their very helpful seminar on methods of qualitative research
- PD Dr. Marc-Denis Weitze (acatech) for giving us the great opportunity of presenting our work to an interested audience
- Prof. Thomas Hofmann for his thrilling talk at the acatech event
- Ulrich Leyermann for designing our information poster
- Martin Prankl for producing our video
- Prof. Gerhard Müller, Peter Finger, Maria Hannecker and all members of the TUM: Junge Akademie for providing a supportive and dynamic environment where ambitious ideas can be brought to life

## Bibliography

- [1] SGS Institut Fresenius, “SGS-Verbraucherstudie 2014,” Hamburg, 2014.
- [2] Statistisches Bundesamt, “Laufende Wirtschaftsrechnungen: Einkommen, Einnahmen und Ausgaben privater Haushalte 2014,” Wiesbaden, 2016.
- [3] Eurostat, Greenhouse gas emission statistics. [Online] Available: [http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse\\_gas\\_emission\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics).
- [4] A. Tukker et al., “Environmental Impact of Products (EIPRO): Analysis of the Lifecycle Environmental Impacts Related to the Total Final Consumption of the EU-25,” 2006.
- [5] S. O. Idowu and N. Capaldi, Eds., Encyclopedia of corporate social responsibility. Heidelberg: Springer, 2013.
- [6] J. Schwarz, B. Beloff, and E. Beaver, “Use Sustainability Metrics to Guide Decision-Making,” CEP Magazine, pp. 58–63, Jul. 2002.
- [7] PCF Pilotprojekt Deutschland, c/o THEMA1 GmbH, Ed., “Product Carbon Footprinting – Ein geeigneter Weg zu klimaverträglichen Produkten und deren Konsum?,” 2009. [Online] Available: <https://www.oeko.de/oekodoc/883/2009-007-de.pdf>.
- [8] BMU and BDI e.V., “Produktbezogene Klimaschutzstrategien – Product Carbon Footprint verstehen und nutzen,” Berlin, 2010.
- [9] BMU, Umweltbundesamt, and Öko-Institut e.V., “Memorandum Product Carbon Footprint,” Berlin, 2009. [Online] Available: [http://www.bmub.bund.de/fileadmin/Daten\\_BMU/Download\\_PDF/Produkte\\_und\\_Umwelt/memorandum\\_pcf\\_lang\\_bf.pdf](http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Produkte_und_Umwelt/memorandum_pcf_lang_bf.pdf).
- [10] A. Grabolle and T. Loitz, Pendo CO<sub>2</sub>-Zähler – Die CO<sub>2</sub>-Tabelle für ein klimafreundliches Leben. Munich: Pendo Verlag, 2007.
- [11] M. Carlsburg and S. Noleppa, “Nahrungsmittelverbrauch und Fußabdrücke des Konsums in Deutschland: Eine Neubewertung unserer Ressourcennutzung,” Berlin, Mar. 2015.
- [12] S. Noleppa and M. Carlsburg, “Das große Wegschmeißen: Vom Acker bis zum Verbraucher: Ausmaß und Umwelteffekte der Lebensmittelverschwendung in Deutschland,” Jun. 2015. [Online] Available: [http://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF\\_Studie\\_Das\\_grosse\\_Wegschmeissen.pdf](http://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF_Studie_Das_grosse_Wegschmeissen.pdf).

# EatMe

Decision-making processes concerning food consumption.

Buying food is an everyday activity for most of us. Yet the choice of food has become a highly emotional topic in our western society.

We want to analyse what unconsciously and consciously drives people when it comes to the decision of buying a certain foodstuff.

Imagine yourself on a Saturday morning, shopping the groceries for next week. Are you walking through the abundantly packed aisles of a supermarket or do you prefer to visit your local farmer's market?

Which criteria are influencing your decision for a particular product when buying apples, yoghurt, eggs or coffee?



## BACKGROUND

In 2014 the average German household spent 285 euro on food each month [1]. At the same time, the decision-making processes concerning food consumption have become increasingly difficult, as consumers are confronted with a huge variety of products and influenced by a number of factors. This has been widely demonstrated in a field study by Columbia and Stanford University when confronted with an extensive array of 24 choices of jam or chocolate, consumers show much greater difficulties and less satisfaction with their decisions than for a limited array of six choices [2]. Furthermore, the awareness of food consumption is increasing in today's European society. For example, numerous EU initiatives have come to life to promote healthy nutrition and reduce diseases caused by a poor diet [3]. In a recent poll around half of German citizens have stated that they pay attention to a balanced nutrition [4], while superlatives and expenses are becoming increasingly popular as well. Since food consumption is responsible for approximately 28 % of greenhouse gas emissions in Europe [5], another important aspect to consider is sustainability. In addition, countless labels exist to certify today's food as required, fairly traded or ecologically produced. The interaction of all these aspects makes decision-making processes concerning food consumption highly complex, multi-layered and often suboptimal. That conclusion is underlined by the fact that about three quarters of consumers in Germany experience uncertainty, indecisiveness and distrust when buying food [6]. Therefore, this is a highly interesting area of research with a significant potential for improving decision making processes.

## GOALS AND METHODS

Our overarching goal is to improve decision-making processes concerning food consumption based on a better understanding of the influencing factors involved and their interaction. Our initial research focuses on the hypothesis:

**Better informed consumers will choose their food more consciously.**

We are going to analyse that expectation thoroughly with respect to two different aspects. Firstly, we want to understand the importance of the ecological footprint as a financial measure of a product's sustainability for consumers' purchase decisions. Secondly, we want to decipher how marketing and the related claims of regional, seasonal and ecological food influence consumers' unconscious decisions. In a second step, we are going to translate our research results into a practical concept in order to improve decision-making processes concerning food consumption.

Members: Fabio Bove, Philip Böhm, Max Leon Hechtler, Linus Huss, Carsten-Johanna Klose, Sebastian Laumer, Sophie Petersen, Carlos Piedrafita Alvar, Lukas Raitz, Paul Thillen, Konstantin Matthias Paul Wolf, Johannes Willenweber  
Tutors: Benedikt Josef Chemdörfer, Dominik Iker  
Mentors: Dr. Hannes Petermeier

inspired by  
TUM Junge Akademie

# EatMe. I'm Low Carbon.

**ABSTRACT** In the first phase of our project we decided to deal with the product carbon footprint. Following up on our project plan we carried out a survey to find out if people even want more information on this aspect of their food. And if so, what kind of information they want and in what form they want it.

## BACKGROUND

Imagine yourself on a Saturday morning, shopping the groceries for next week. Standing in front of the vegetables, you are wondering whether you should choose oranges from Spain, Kiwi fruits from Italy or apples from Germany to fulfil your vitamin requirements with the smallest ecological footprint. Maybe the German apples have been stored in a refrigerated warehouse for months, making their resource consumption per kilogram larger than the environmental footprint caused by transporting the oranges from Spain to Germany? You don't know.

If you have already struggled with a similar scenario, you are part of about three quarters of consumers in Germany who experience uncertainty and indecisiveness when buying food [1]. Since in 2014 the average German household spent 285 euro on food each month [2] and food consumption is responsible for approximately 30% of greenhouse gas emissions in Europe [3], this is a highly interesting area of research. Therefore, we want to understand how a food's ecological footprint influences consumer's decision-making processes.

## GOALS AND METHODS

The survey's aim is to get an overview of the dispersion of and the knowledge about the term "ecological footprint". Furthermore, we designed it to get some insights about how this knowledge potentially influences consumer's decisions when buying food. To allow for correlation calculation, we used the Likert scale for most of the questions. Additionally, we used multiple choice questions wherever we wanted the participants to tell us their favored options. Knowing that our survey has an explorative character, we also introduced several open questions where the participants get the opportunity of giving us further input. We intentionally tried to get participants from different social milieus to account for a diverse survey population. By offering the survey online as well as offline and by seeking out diverse places we hope to achieve this goal. By our final evaluation date we expect more than 200 participants.

## OUTCOME AND DISCUSSION

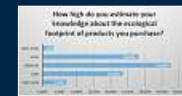
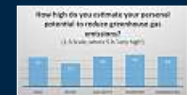
In the first sightings of our data we could include 85 online participants. Therein, we found that roughly 60% of all participants would find it "good" or "very good" to have more information about how environment-friendly the food is, whereas less than 60% stated the same for the ecological footprint, attached to the packaging. Hence it could be an inference that people don't connect this term to eco-friendliness. The most favored way of information delivery is on the food's packaging, followed by informational posters in supermarkets and via app or website. In fact that is contrary to our expectation that most would prefer an app or a website as their first information source. When looking at the kind of food that consumers want more information for, the survey shows that fruits, vegetables, and meat/fish are on top of the list. We also found that more than 60% would be willing to pay more for food that is more environment-friendly. These results are preliminary however, because the offline questionnaires aren't included yet.

## SUMMARY AND FUTURE GOALS

After successful completion of our survey over the product carbon footprint and the first expert interviews, we have a rough overview over the status quo and the know-how of the ecological footprint in our society. After further thorough analysis of the importance of the product carbon footprint for the decision-making process of the customers, we would like to proceed in our project. Thus, we are going to contact several companies associated to ecological footprint of food in order to establish a cooperation ensuring mutual benefits. Furthermore, more expert interviews based on previous results will be conducted. This will be our knowledge base and it will all advect into our practical concept for the improvement of the awareness for the product carbon footprint. Therefore, we would like to implement either a mobile phone application, a homepage with information on the ecological footprint or brochure for the freshmen starting at the Technical University of Munich in fall 2017.

Members: Philip Böhm, Fabio Bove, Linus Huss, Paul Thillen, Johannes Willenweber  
Tutors: Dominik Iker, Josef Oberndorfer  
Mentors: Dr. Hannes Petermeier

inspired by  
TUM Junge Akademie




JANUARY 2017

Poster 1: Annual Conference 2016

Poster 2: Evaluation Day I

# EatMe. I'm Low Carbon.



**ABSTRACT** Building on our consumer surveys and expert interviews, we are currently working on the two key challenges of conducting a reliable life cycle assessment for a food product and presenting its results to the consumer in a precise, but understandable manner. A poster, website, smartphone application or social media campaign are possible tools to transform our results into increasing public awareness for the ecological footprint of nutrition.

**HYPOTHESIS** Better informed consumers will take a product's ecological footprint into account for their purchase decision.

**GOALS AND METHODS**

Our goal is to increase public awareness for the ecological footprint of food and improve the transparency of a product's life cycle assessment for the consumer in the supermarket. We have started the process by conducting consumer surveys and expert interviews in order to establish a knowledge base about the existing attitudes, ideas and assessments of food's ecological footprint (Figure 1). Building on this foundation, we have started a cooperation with GreenData GmbH, a consulting and software company focusing on product life cycle assessment. With their openCA software in combination with the ProBase database of the German Federal Environmental Agency we aim to conduct the life cycle assessment of a few selected food products as indicated for an exemplary value chain in Figure 2. This will provide the building blocks for developing the prototype of a tool which transparently depicts the product's life cycle assessment for the consumer in the supermarket.

**OUTCOME AND DISCUSSION**

The consumer surveys have produced several interesting results. For example, the majority of interviewees estimated that their purchase decisions have a medium to high impact on climate change. However, more than 50 percent are willing to pay a higher price for a more climate friendly product. Our first expert interviews with Dr. Norman Siebert (Chair of Organic Agriculture and Agronomy, TUM) and Christian Wolf (Chair of Wood Science, TUM) have revealed the complex challenges connected to the life cycle assessment of food and the notion of sustainability. In particular, the role consideration of a product's greenhouse gas footprint is far from sufficient for providing a sensible measure of its eco-friendliness. The two key challenges of conducting a reliable life cycle assessment and presenting its results to the consumer in a precise, but understandable manner will therefore be in the focus of our work with the openCA software and the development of our tool's prototype.

**SUMMARY AND FUTURE GOALS**

Having built a knowledge base of consumer surveys and expert interviews, we will now conduct a detailed life cycle assessment of a few selected food products using the openCA software. This will form the basis for our tool in the form of a poster, website or smartphone application (Figure 3). However, as the establishment of a cooperation with a supermarket turns out to be difficult, we could also imagine a social media campaign about food waste and sustainable nutrition in order to increase our project's impact. In addition, we are organizing a discussion event about sustainable food production on the 18th of July at the National Academy of Science and Engineering (Lehrstuhl für Food Chemistry and Molecular Sensory Science, TUM) as key speaker.

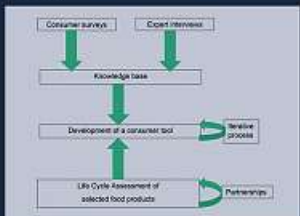


Figure 1: Schematic representation of our working process.




Figure 2: The dairy value chain as an example for the general methodology of a food's life cycle assessment using the openCA software.




Figure 3: Smartphone mock-up of our tool for the transparent presentation of a food's life cycle assessment.

MEMBERS  
TUTORS  
MENTORS

Philip Böhm, Fabio Bove, Linus Huss, Paul Thillen, Johannes Wollenweber  
Dominik Ibrer, Josef Obendorfer  
Dr. Hannes Petermeier

inspired by  
TUM Junges Akademie

Poster 3: Evaluation Day II

# EatMe. I'm Low Carbon.



How can we improve consumer awareness for the ecological footprint of food?

**ABSTRACT** Quantifying the ecological impacts of human nutrition is a complex challenge. Based on the product carbon footprint, our information poster enables consumers to improve decision-making processes when buying food.

**GOALS**

- Develop a better understanding of consumers' knowledge and behavior in relation to food's ecological footprint.
- Build awareness among consumers for the importance of food's ecological footprint by designing an information tool.

**HYPOTHESIS**

Better informed consumers will take a product's ecological footprint into account for their purchase decision.

**TEAM STRUCTURE AND PROCESS**

After an extensive literature research, we designed a consumer survey to get a better insight into the influence of food's ecological footprint on consumers' purchase decisions. We also conducted expert interviews with two researchers at the Technical University of Munich, Dr. Norman Siebert (Chair of Organic Agriculture and Agronomy) and Christian Wolf (Chair of Wood Science). The second project phase was focused on iterative prototyping, partnership building and direct consumer feedback to develop our information tool.

**OUTCOME**

The ecological footprint "measures humanity's impact on ecosystems in terms of resources used to satisfy human needs." In the context of food, most quantification attempts of the ecological footprint are focused on the product carbon footprint (PCF). The PCF measures all greenhouse gas emissions along the food's life cycle and is indicated in kg CO<sub>2</sub> per kg of a specific food product. This metric has the advantage of being simple to understand and comparatively easy to calculate, but is limited to showing one small aspect of sustainability: the PCF does not consider important social criteria and neglects environmental pollutants apart from greenhouse gases.

Key results of our customer survey with 243 participants are shown in Figure 1. Our information tools, which aim to improve consumer awareness and give helpful tips to reduce one's ecological footprint when buying food, is explained in Figure 2.

In a partnership with the National Academy of Science and Engineering ("acatech"), we furthermore organized a successful discussion evening about sustainable food production with Prof. Thomas Hofmann (Chair of Food Chemistry and Molecular Sensory Science, TUM) as key speaker (Figure 3). In addition, we produced a video as a starting point for a social media campaign or educational tool: passers-by in the Munich pedestrian area were quizzed about the carbon footprint of different food products in a fun and interactive way, and were presented with one of our posters at the end (Figure 4).

**FUTURE GOALS**

As education constitutes the ideal starting point for sustainable and positive behaviour changes in society, we are currently establishing a partnership with the State Institute for School Quality and Education Research (ISB). Our goal is to develop educational activities and materials which enable primary and high school students in Bavaria to develop an awareness for the ecological impact of food production.



Figure 1: Key results of our consumer survey.



Figure 2: Key elements of our information poster.



Figure 3: Discussion event at acatech (from left to right: Prof. Thomas Hofmann (TUM), team members Paul Thillen and Fabio Bove, Uli Wenger (Bavarian Broadcasting, BR)).



Figure 4: Please scan the QR code to watch our video.

MEMBERS  
TUTORS  
MENTORS

Philip Böhm, Fabio Bove, Linus Huss, Paul Thillen, Johannes Wollenweber  
Dominik Ibrer, Josef Obendorfer  
Dr. Hannes Petermeier

inspired by  
TUM Junges Akademie

Poster 4: Annual Conference 2017





# Project Report **healthtoday**

Team	Thomas Bickel Haase Vanessa Buchweitz Dennis Röcker
Tutor	Maximilian Biebl Sabine Pircher
Mentor	Prof. Dr. med. em. Reiner Gradinger Prof. Dr.-Ing. Liqiu Meng





## Motivation

“The medicine of the future will certainly be a combination of different methods. There will be a strong focus on soft treatments without (meaningful) side-effects. Patients want to be listened to.” claims Dr. med. Irene Scharpf, who works in Ravensburg, Baden-Württemberg. Dr. Scharpf, who is specialized in alternative medicine, observed a large increase of patient numbers over the last couple of years. Possible reasons: growing discontent with conventional medicines, medical scandals spread by the media and political discussions about controversial issues, such as the compulsory vaccination of children.

Where does this growing dissatisfaction come from? Is it dangerous to decrease the priority of well-established conventional medicines? The project Healthtoday analyses the current public opinion about conventional medicine through expert interviews and surveys. But how can we conceive an opinion synopsis of such a complex issue? Qualitative and quantitative research methods were needed in order to gain an overview of peoples’ opinions, hence we organized written and online surveys as well as expert interviews.

## Methods

Year’s conference	First survey
During March and July 2017	Survey (also online) with multiple-choice answers
Expertinterviews	During the whole project phase

## A small outtake from one of our Surveys:

How would you answer these questions? Does your opinion reflect the results of our survey? Let’s find out

### 2.2 Did the usage of alternative treatment increased during the last year in your opinion?

☐ yes ☐ no ☐ I don't know

**Answer: Yes 92,1%, No 4,9% and I don't know 3%**

### 5.1 Are possible side effects of conventional medicines deterrence factors?

☐ yes ☐ no

**Answer: Yes 61,6%, No 38,4%**

### 5.2 Could the not proofed efficiency of homeopathics be a deterrence factor as well?

☐ yes ☐ no

**Answer: Yes 61,8%, No 38,2%**

## Expert interviews:

The validity of our hypothesis was discussed with health professionals (two doctors and a pharmacist) by means of interviews. All interviewed experts were asked similar questions. Surprisingly, they shared similar opinions.

How would you answer the following questions?

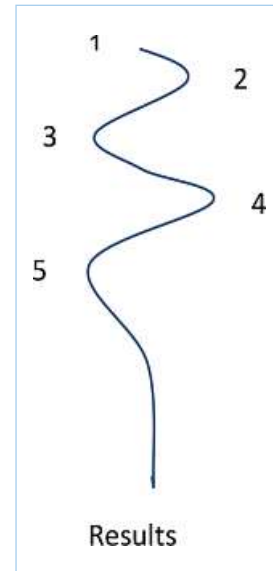
These are the answers of our experts:

1. What do you understand by “conventional medicine” and “alternative medicine”?
  - a) *Dr. Scharpf*: Alternative medicine is mainly based on experience, while school medicine has been proven and is based on facts and research.
  - b) *Dr. Finger*: General medicine (conventional medicine) comprehends scientifically proven methods, as well as other disciplines where the effectiveness of the treatments has been demonstrated, such as psychology and social medicine. Alternative treatments are those which have not been proven scientifically and have not got a long tradition like other pharmaceutical products.

- c) *Mr. Müller*: Conventional medicine, also school medicine, comprehends all the procedures and treatments that have been proven and studied thoroughly. Alternative medicine is an experience medicine, an empirical medicine based on experiences and not yet on scientific data. This does not mean alternative medicine is ineffective, but suggests that further studies should be performed in order to understand it more profoundly.
2. Do you think that certain groups in society favor alternative medicine? Does the educational background of the patients have an influence in the decision making?
- a) *Dr. Scharpf*: Those people who are very conscious about their health and their children's come to me looking for alternative treatments. They are mostly young patients and parents, while the elderly patients come mainly because of the time I spend on them. The persons I care for belong to the middle and upper classes, yet there are exceptions.
- b) *Dr. Finger*: Mostly middle-aged women are the ones that ask about alternative treatments, young patients want treatments with fast results. The patients with a higher education tend to be more critical about the medical treatments and hence ask more about alternative methods.
- c) *Mr. Müller*: Alternative medicine spreads in all social classes and age groups. Nevertheless, the majority asking about alternative treatments are young. Additionally, only people with a certain income have access to alternative drugs because these medical supplies are very expensive and are not covered by the insurances.
3. What does the future hold concerning medicine?
- a) *Dr. Scharpf*: The medicine of the future will certainly be a combination of different methods. There will be a stronger focus on soft treatments without (meaningful) side-effects. There will also be new drugs that are more expensive in their production.
- b) *Dr. Finger*: It would be great if the medical personnel could spend more time on the treatment of their patients, also in hospitals where plenty of specialists are present.
- c) *Mr. Müller*: The system will eventually collapse. New and better medicines will be produced through optimized processes and new scientific discoveries. Yet most of them will be so expensive that insurances, as they currently exist, won't be able to provide them. Therefore, the access to the general public will be limited.

### Our journey and the development of our project:

1. Hypothesis: There is a strong influence of social media and shared information through the internet, regarding health issues, on processes of decision making about our health-care and therapy options.  
=> Change towards our second Hypothesis:
2. Hypothesis: In society today there is a growing suspicion about conventional medicine and drugs.
3. Small survey during the last Conclusion: Alternative medicine and homeopathy were frequently perceived as equals
4. Creation of a second survey with EvaSys.
5. Expert interviews with health-professionals, such as doctors and a pharmacist.



### Outcome

Now at the final chapter of the project Healthtoday, we can look back at thrilling and exciting months of work. Even if it wasn't easy, we had a lot of fun and learned about many complex topics. We learned about different medical treatments and the health system in Germany. We learned from the interviews that the topic "Health" will remain a current topic also in the future and we learned that everything could change in the next few years. Furthermore, the workshops offered by the TUM: Junge Akademie were very enriching and practical for the development of this project, as well as for our further work in academic areas. Moreover, we learned to work as a team, sharing the responsibilities and tasks. Fun and companionship were always present and we don't conclude this project just as team members, but as friends who will certainly remain in contact. To conclude, we encourage the new generations of TUM: Junge Akademie members to enjoy their projects as much as we did.

Yours sincerely,  
Team Healthtoday

## 1. Abstract

With our project Healthtoday we examined our thesis: “In contemporary society there is a growing suspicion about conventional medicine and drugs.”

By means of two questionnaires and three expert interviews we evaluated the current state of opinion of patients, physicians and pharmacists.

## 2. Background

In the past decade research studies have reported an increased usage of complementary and alternative medicine (CAM) treatments in the western world. Therefore, the number of “Heilpraktiker” that have received a state license in Germany by passing an examination on basic medical knowledge and skills at a local public health office has increased from 9000 in 1993 to nearly 20,000 in 2006 (Joos et al., 2006, Beer et al., 2016, Dinges, 2017). The same development can be seen in relation to the increasing number of physicians with additional training in natural medicine and homoeopathy that are registered with the Medical Chamber:

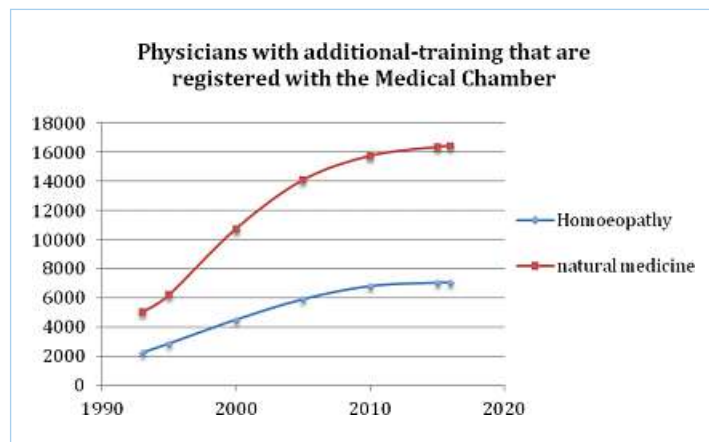


Figure 1: Physicians with additional training that are registered with the Medical Chamber; numbers from Gesundheitsberichterstattung des Bundes [www.gbe-bund.de](http://www.gbe-bund.de), 17.10.09

In science literature, media and society various terms exist for those diagnostic and therapeutic disciplines that are not part of classic conventional medicine. The terms are not always equal and vary through different sources. Due to the wide range of disciplines of CAM it is difficult to determine criteria that are common for all. Moreover, the definitions depend on traditions and on historical developments of cultures and therefore vary a lot (Frass et al., 2012, Marstedt and Moebus, 2002, Joos et al., 2006). Furthermore, the ways of prescription of CAM differ between physicians and non-medical persons among countries (Joos et al., 2006). Traditional medicine have existed over many centuries and experiences were passed on from generation to generation providing safety and efficiency of usage. Nevertheless, to be officially recognized, scientific research is necessary to provide additional evidence of its safety and efficacy. However, for lack of adequate or accepted research methodology, the available data are insufficient to fulfill the necessary criteria to support its use worldwide and to be applied as evidence-based medicine (EBM) (Organization, 2000, Porzolt et al., 2010).

Supporters of alternative medicine see advantages in the holistic medical orientation that are aware of other causes of diseases and therapeutic mechanisms of action compared to conventional medicine. Another advantage is the lack of side effects which gives a reason for mistrust in conventional drugs (Marstedt and Moebus, 2002).

### Definitions

#### Conventional medicine:

Mostly defined as treatments and methods that are used and investigated at universities of highly developed western countries and is evidence-based medicine (EBM) (Porzolt et al., 2010, Stefan N. Willich, 2004).

#### Alternative Medicine:

Alternative/complementary medicine in some countries is often used inter-changeably with traditional medicine. Traditional medicine includes knowledge, skills and practices based on theories, beliefs and experiences native to different cultures and is used to maintain health and also prevents, diagnoses, improves or treats physical and mental illness (Organization, 2000).

Definitions of some of the most common areas of alternative medicine:

## Homeopathy:

The German physician Samuel Hahnemann founded this system of medicine at the end of the 18th century. He divided homeopathy in two major principles:

- the principle of similarity which treats like with like
- the most controversial principle is known as potentization, the process of repeated dilution and vigorous succession at each step of dilution (Du and Knopf, 2009, Boltman-Binkowski, 2016)

## Traditional Chinese Medicine (TCM):

TCM is an important part of complementary and alternative medicine including herbal medicine and acupuncture and therefore plays an important part in the formation of integrative medicine. TCM was developed two thousand years ago and concentrates on maintaining health and enhancing the resistance to diseases to treat those (Lu et al., 2004).

## Herbal Remedies (Phytotherapy):

Herbal medicines involve herbs, herbal materials, herbal preparations and finished herbal products that include the active ingredients of the used plants, other plants materials or combinations (Organization, 2000).

## Osteopathy:

The physician and surgeon Andrew Taylor Still created osteopathy in the mid 18th century. He stated that manual contact is necessary for diagnosis and treatment while respecting the relationship of body, mind and spirit in health and disease. Therefore, the focus is on the structural and functional integrity and the intrinsic tendency for self-healing of the body (Organization, 2010).

## 3. Methods

### Questionnaires

#### First Questionnaire:

We distributed our first questionnaire, containing open questions, at the annual conference and gained first impressions regarding current opinion on the topic.

In general all three basic opinions related to the acceptance of alternative medicine treatments were specified: positive, neutral and negative. For the positive and neutral fraction the most promising techniques were TCM and Phytotherapy. In contrast, the negative fraction often equated alternative medicine and homeopathy. Fur-

Entscheidungsprozesse im Gesundheitswesen  
- Meinungsabfrage -

Wir freuen uns, wenn Sie sich 5 Minuten Zeit für unsere Fragen nehmen. Sie können  
er erste Eindruck in das Bewusstsein der Allgemeinheit über verschiedene  
Behandlungsoptionen einbringen.

1. Für wie wirksam/erfolgreich halten Sie alternative Medizin generell?  
Wie geringfügig bis wie sehr alternative Medizin ist geeignet?

2. Halten Sie andere alternative Behandlungsmethoden wie z.B. Phytotherapie (Gedult,  
Schwüler Bäder), Osteopathie oder akupunktur wirksam? Wenn ja, wie  
wirksam und wie häufig? Wenn nein, warum? Bitte kurz erläutern. Wenn ja, welche  
Gründe sprechen für Sie gegen diese Therapiemethoden?

3. Wenn Sie eine oder mehrere Methoden ablehnen, welche Gründe sprechen für Sie gegen diese Therapiemethoden?

Vielen Dank!

Figure 2:  
Design of  
the first  
questionnaire

Effekte, Risiken, Nutzen von alternativer Medizin in der Gesundheitsversorgung

1. Wie wirksam/erfolgreich halten Sie alternative Medizin generell?  
Wie geringfügig bis wie sehr alternative Medizin ist geeignet?

2. Halten Sie andere alternative Behandlungsmethoden wie z.B. Phytotherapie (Gedult,  
Schwüler Bäder), Osteopathie oder akupunktur wirksam? Wenn ja, wie  
wirksam und wie häufig? Wenn nein, warum? Bitte kurz erläutern. Wenn ja, welche  
Gründe sprechen für Sie gegen diese Therapiemethoden?

3. Wenn Sie eine oder mehrere Methoden ablehnen, welche Gründe sprechen für Sie gegen diese Therapiemethoden?

Vielen Dank!

Figure 3:  
Design  
of the second  
questionnaire  
on EvaSys



Figure 4: sharing our questionnaire in Freising

thermore, the majority of respondents had already gained experience with alternative medicine and natural remedies were found to be the most positive ones. Unlike those natural remedies, homeopathy ones were described as less acceptable because of a lack of efficiency.

Moreover, most of the participants were of the opinion that less dangerous diseases could be treated with alternative drugs while life-threatening diseases should be treated with conventional methods or a combination of both.

### Second Questionnaire:

In addition to our first questionnaire we designed a revised one on EvaSys with standardized questions that can be evaluated statistically. We shared it both in German and English online and on paper to maximize participation and gain information about experiences and opinions and how these relate to the background of participants. We received 100 completed surveys on paper and 173 online.

### Outcome

The outcome of the second questionnaire is presented through the following graphics:

As shown in Figure 5 the majority of the respondents believes that the usage of alternative treatments has increased during the last years and therefore most of the people think that patients search for alternative treatments. Thereby, our study supports the developments of a still increasing use of complementary and alternative medicine in Germany during the last years (Joos et al., 2006).

More than seventy percent stated that they haven't been informed sufficiently about alternative treatments on a regular basis during physician appointments. A possible reason for this lack of information transfer might be the rejection, especially, of homeopathic treatments by medics because of the missing scientific research providing evidence of its safety and efficacy (Dinges, 2017).

As seen in Figure 7 the majority of respondents have used both conventional medicine and natural remedies, a subunit of alternative medicine. More than half of the respondents have applied homeopathy whereas only 22 % have tried osteopathy. The survey from Joos (2006) has stated that natural remedies and homeopathy are very popular in Germany and that the users are more likely to be female and well-educated (Dinges, 2017).

Although fewer people have tried osteopathy compared to homeopathy, they have been far more pleased with the results as shown in Figure 8. Furthermore, homeopathy was the medical treatment with the least satisfaction of the patients compared to conventional medicine, osteopathy and natural remedies.

Since possible side effects are one of the strongest concerns of conventional treatments we wanted to determine if there are social



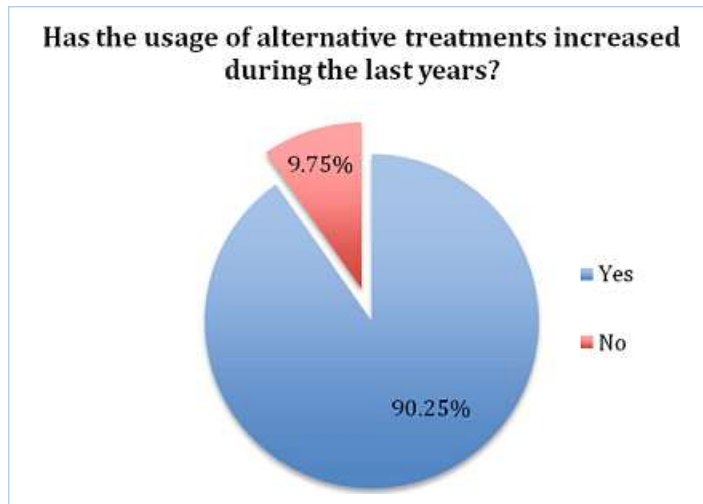


Figure 5: Has the usage of alternative treatments increased during the last years?

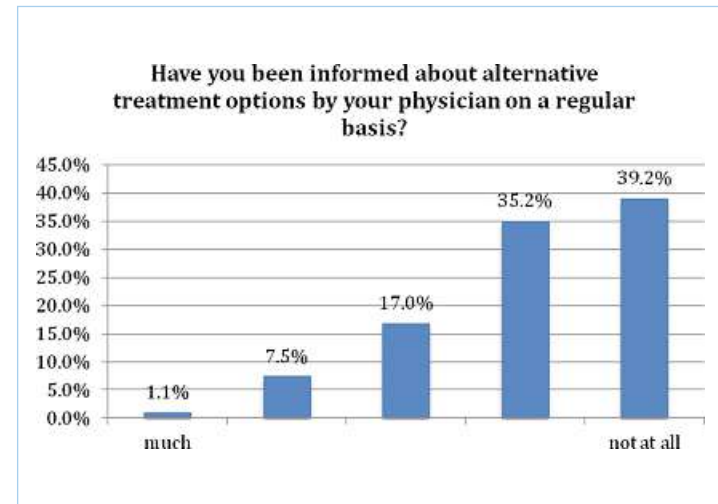


Figure 6: Have you been informed about alternative treatment options by your physician on a regular basis?

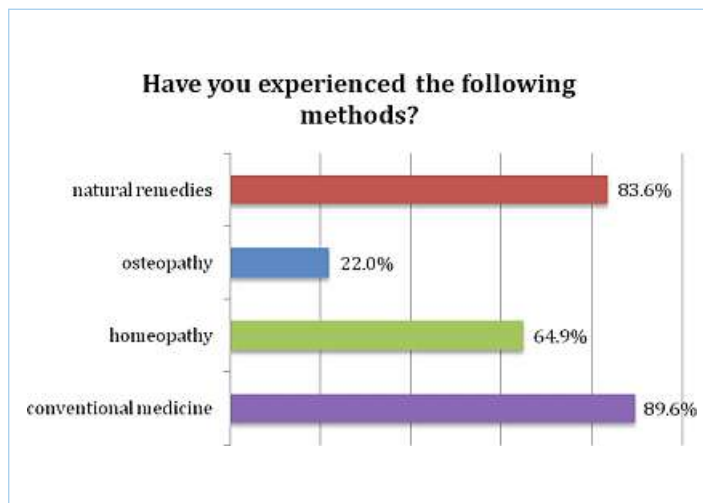


Figure 7: Have you experienced the following methods?

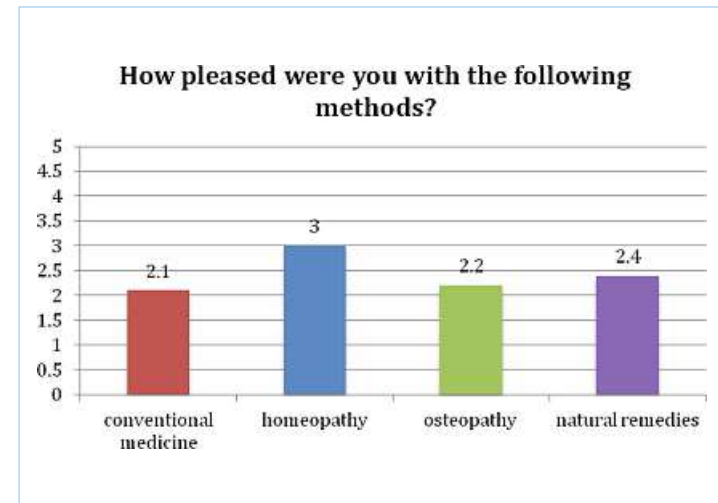


Figure 8: How pleased were you with the following methods on a scale from totally (0) and not at all (5)

## For which of the following groups should alternative medicine be favored?

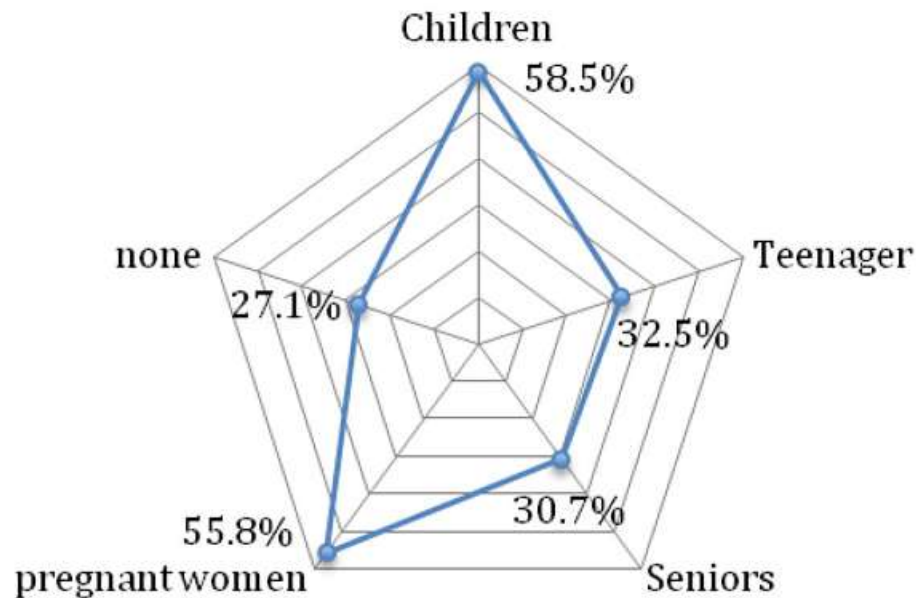


Figure 9: For which of the following groups should alternative medicine be favored?

groups that would be inclined to use alternative medicine instead of conventional. The results are presented in Figure 9:

More than half of the participants thought that the high-risk groups “children” and “pregnant women” should use alternative medicine instead of conventional. This result corresponds with the KIGGs-study which stated that for example homeopathic products like Arnika or Schüssler-Salze are mostly used for children between 3 and 6 years old (Schlack et al., 2008).

### Expert Interviews

In addition to our questionnaires we performed three expert interviews to gain an overview of our topic from the point of view of physicians and pharmacists.

Therefore we interviewed the general practitioner Dr. med. Irene Scharpf who has specialized on homoeopathic treatments, the internist Dr. med. Sabine Finger and the pharmacist Josef Müller.

## Summary of the interviews:

Dr. med. Irene Scharpf = S

Dr. med. Sabine Finger = F

Josef Müller = M

### *How would you define alternative medicine compared to conventional medicine?*

S: Alternative medicine is primarily based on experiences while conventional medicine refers to facts and research studies. There are far fewer studies and statistics regarding CAM.

F: Conventional medicine is scientifically well-founded, whereas alternative medicine isn't scientifically reviewed and is mostly based on a long tradition.

M: Conventional medicine is empirically-based medicine (EBM) and alternative medicine mostly depends on the traditional background and differs among different countries.

### *What are the advantages of alternative treatments compared to conventional?*

S: The main advantage is fewer side effects. Furthermore, the patient is treated holistically, where conventional medicine uses one drug that works at a certain part of the body. The relationship between patient and physician is much more intensive since more information about the patient is gathered. Therefore a huge disadvantage of conventional medicine is the lack of time used for patients.

F: Alternative medicine lays the focus not only on the disease but also on the complete human standing behind it. Moreover, general practitioners have the problem that they don't have enough time to treat the patient with the same amount of work as alternative physicians.

M: Alternative treatments offer fewer side effects compared to conventional ones. In general it is a great alternative for cases where conventional medicine reaches its limits. Furthermore, alternative physicians can spend more time to treat each patient.

### *Has the number of patients that want alternative treatments increased?*

S: Yes I had a lot more patients in the last years. Especially parents and pregnant women choose to try alternative treatments first.

F: Yes I think so. Because it is a current topic and patients prefer a gentle medicine without side effects.

M: Yes. Especially younger ones are more open to alternative treatments.

### *Does the educational level of patients have an influence on the treatment they choose?*

S: Sure. I think I treat mostly patients out of the middle and higher educated levels, although exceptions always exist.

F: Certainly yes. The higher educated ones question health issues more and search for alternatives.

### *What will the medicine of the future look like?*

S: I'm sure there will be a combination of different methods and the focus will be on treatments without side effect. Moreover, patients will want physicians who listen more closely and spend more time with their patient.

F: It would be desirable for physicians to take more time for treatments and diagnosis. Since medicine is getting more and more specialized the family doctor will become more important to coordinate the results of other specialists.

## 4. Discussion and Outlook

Especially during the expert interviews, one point that stuck out was that there is a huge time problem within conventional medicine. Due to the little amount of time physicians spend with the patient, the latter get the feeling of not being listened to and of being treated hastily.

The great advantage of alternative treatments is that alternative practitioners take a lot more time for each treatment, for example first anamneses take at least 30 to 45 minutes.

Another main motive for choosing alternative treatments are chronic diseases and missing or insufficient achievements of conventional medicine. Furthermore, the possible side effects are a determining factor since alternative medicine is associated with gentle, natural and side effect free modes of action (Joos et al., 2006).

Within the medical profession and its associations and the insurance companies an extensive controversy about both the scientific acknowledge of alternative medicine and its inclusion within the statutory health insurance catalog of services exists (Marstedt and Moebus, 2002). This is reflected in the results of our survey where the majority stated that they haven't been informed about alternative treatments by their treating physicians recently. Of relevance here is that there was a huge discussion earlier this year when the Techniker Krankenkasse added homeopathic treatments to their services as many customers appreciate such alternative treatments (TK, 2017).

A major problem for patients choosing medical treatments is the contradictory information they receive from physicians, the media and the general social environment about the different treatments available. A possible solution might be a better system of information transfer about both conventional and alternative treatments by physicians to avoid misunderstanding and mistrust (Joos et al., 2006).

## 5. Conclusion

Altogether our research and results indicate that a growing suspicion against conventional medicine exists in the society. Two of the main reasons are the possible side effects of conventional drugs and a dissatisfaction of the results of those drugs and treatments. Moreover, the time problem of conventional practicing physicians seems to increase the suspicion towards the success of conventional treatments. In comparison to other European countries, primary physicians treatments in Germany are the shortest, mostly medically and least patient orientated ones. Due to that, patients want physicians to take more time for treatments and explanations for diseases and medicines (Dierks et al., 2006, Horch et al., 2012). Furthermore, the high specialization of many physicians comes not only with advantages, but also with the main problem that due to those specializations the patients are sent from one physician to another, which often leads to frustration and confusion. During the expert interview, Dr. med. Sabine Finger proposed that a possible solution might be the merger of different specialist in one medical practice, whereby patients are treated in one place and physicians have a better exchange their colleagues.

During the last years the relationship between patients and physicians has changed from a passive one to one where patients question the healthcare system and want to influence the spectrum of health insurance catalogs. Therefore, the Federal Ministry of Health (BMG) has originated a national program ([gesundheitsziele.de](http://gesundheitsziele.de)) to encourage the patients as partners within decision making in healthcare and further projects are planned (Horch et al., 2012, Maschewsky-Schneider, 2017). That brings us to the conclusion that the healthcare system in Germany is currently in a state of change, which leads to a higher influence of patient onto the relationship between physicians and patients and a "shared decision making" (Horch et al., 2011).

## References

- BEER, A.-M., BURLAKA, I., BUSKIN, S., KAMENOV, B., PETTENAZZO, A., POPOVA, D., HUCKSTADT, M. P. R., SAKALINSKAS, V. & OBERBAUM, M. 2016. Usage and Attitudes Towards Natural Remedies and Homeopathy in General Pediatrics A Cross-Country Overview. *Global Pediatric Health*, 3, 2333794X15625409.
- BOLTMAN-BINKOWSKI, H. 2016. A systematic review: Are herbal and homeopathic remedies used during pregnancy safe? *Curationis*, 39, 1-8.
- DIERKS, M.-L., SEIDEL, G., SCHWARTZ, F. & HORCH, K. B. 2006. Patientenorientierung im Gesundheitswesen: Gesundheitsberichterstattung des Bundes-Heft 32. Berlin: Robert Koch Institut.
- DINGES, M. 2017. Medizinischer Pluralismus in Europa und Indien: Konzept, Hintergrund und Perspektiven. *Zeitschrift für Klassische Homöopathie*, 61, 4-11.
- DU, Y. & KNOFF, H. 2009. Paediatric homoeopathy in Germany: results of the German health interview and examination survey for children and adolescents (KiGGS). *Pharmacoepidemiology and drug safety*, 18, 370-379.
- FRASS, M., STRASSL, R. P., FRIEHS, H., MÜLLNER, M., KUNDI, M. & KAYE, A. D. 2012. Use and acceptance of complementary and alternative medicine among the general population and medical personnel: a systematic review. *The Ochsner Journal*, 12, 45-56.
- HORCH, K., HINTZPETER, B., RYL, L. & DIERKS, M.-L. 2012. Ausgewählte Aspekte einer Bürger-und Patientenorientierung in Deutschland. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz*, 55, 739-745.
- HORCH, K., RYL, L., HINTZPETER, B. & DIERKS, M.-L. 2011. Kompetenz und Souveränität im Gesundheitswesen–Die Nutzerperspektive.
- JOOS, S., ROSEMAN, T., SZECSENYI, J., HAHN, E. G., WIL- LICH, S. N. & BRINKHAUS, B. 2006. Use of complementary and alternative medicine in Germany—a survey of patients with inflammatory bowel disease. *BMC complementary and alternative medicine*, 6, 19.
- LU, A.-P., JIA, H.-W., XIAO, C. & LU, Q.-P. 2004. Theory of traditional Chinese medicine and therapeutic method of diseases. *World journal of gastroenterology: WJG*, 10, 1854.
- MARSTEDT, G. & MOEBUS, S. 2002. Themenheft 9" Inanspruchnahme alternativer Methoden in der Medizin".
- MASCHEWSKY-SCHNEIDER, U. 2017. Gesundheitsziele im Präventionsgesetz–Bedeutung für die Berichterstattung.
- ORGANIZATION, W. H. 2000. General guidelines for methodologies on research and evaluation of traditional medicine.
- ORGANIZATION, W. H. 2010. Benchmarks for training in osteopathy. World Health Organization, [www.who.int/medicines/areas/traditional/BenchmarksforTraininginOsteopathy.pdf](http://www.who.int/medicines/areas/traditional/BenchmarksforTraininginOsteopathy.pdf) (2010, accessed 20 July 2013).
- PORZSOLT, F., LINDE, K., WITT, C., MÜHLHAUSER, I., RUNKEL, F. & HABS, M. 2010. Studienvalidität: Gibt es Unterschiede zwischen Schul-und Komplementärmedizin? *DMW-Deutsche Medizinische Wochenschrift*, 135, 1503-1506.
- SCHLACK, R., KURTH, B.-M. & HÖLLING, H. 2008. Die Gesundheit von Kindern und Jugendlichen in Deutschland–Daten aus dem bundesweit repräsentativen Kinder-und Jugendgesundheitsurvey (KIGGS).
- STEFAN N. WILICH, M. G., JÖRG-DIETRICH HOPPE, HELMUT KIENE, WOLFGANG KLITZSCH, PETER F. MATTHIESSEN, PETER MEISTER, GÜNTER OLLENSCHLÄGER, HERMANN HEIMPEL 2004. Schulmedizin und Komplementärmedizin TK. 2017. <https://www.tk.de/tk/leistungen-a-z/alternative-medizin/homoeopathie/157082> [Online]. [Accessed].



# Decision Making in Health-Care



In the society a growing mistrust against conventional medicine and drugs occurs.

## BACKGROUND

In the past decade research studies reported an increased use of complementary and alternative medicine (CAM). Natural remedies and homeopathic preparations are examples for alternative medicine treatments but a lot of people and even some physicians do not realize that there is a difference between them. Even though they may have beneficial effects, it should be considered carefully when to be applied and when conventional therapies will be needed.

### CONVENTIONAL MEDICINE

– medical doctors and other healthcare professionals (such as nurses, pharmacists and therapist) treat symptoms and diseases using drugs, radiation or surgery  
(National Cancer Institute, 08.10.2016)

### NATURAL REMEDIES

– produced from natural products or plants  
– produced naturally without synthetic or chemical engineering process  
– mode of action/way of positive influence on health poorly understood

### HOMEOPATHY

– the use of potentised substances or high dilution of active ingredients  
– the law of similar or the principle "like cures like"  
(Beer et al., 2016)

## GOALS

- Evaluation of increasing mistrust towards conventional medicine and drugs
- Determination of demographic influence on decision regarding health care issues
- Analysis of preferred therapy options for different diseases

## METHODS

- expert interviews and surveys
- literature-based research

## MOTTO

*Mit viel Lachen,  
ganz viel machen*

Members: Thomas Bickel Haase, Dennis Röcker, Marion Lochter, Vanessa Bismuth, Sabine Pöcher, Maximilian Biehl  
Tutors: Prof. Dr.-Ing. Liqiu Meng, Prof. Dr. med. Reiner Gradinger

**MEMBERS** Thomas Bickel Haase, Dennis Röcker, Marion Lochter, Vanessa Bismuth  
**TUTORS** Sabine Pöcher, Maximilian Biehl  
**MENTORS** Prof. Dr.-Ing. Liqiu Meng, Prof. Dr. med. Reiner Gradinger



# Healthtoday



## ABSTRACT

With our project we want to determine if our thesis: "In the society a growing suspicion against conventional medicine and drugs occurs", is actually significant. Through our questionnaire from the annual conference we already discovered that a great diversity exists in society about the usage of alternative medical treatments.

## BACKGROUND

In the past decade research studies have reported an increased usage of complementary and alternative medicine (CAM) treatments like the well-known natural remedies and homeopathic preparations. To examine if a growing suspicion against conventional medicine and drugs leads to the increased usage of alternative medicine treatments we designed a short open questionnaire for the annual conference. The participants should state their experience with the different treatment methods, if they prefer one of them, respectively in which case they would use one of them.

## GOALS

- determine if there is a growing suspicion against conventional medicine and drugs
- examine which tendencies the various demographic groups have with regard to decide for different treatments
- investigate which kind of treatment is preferred for various diseases

## METHODS

- expert interviews
- focus group interviews
- ocular movement analysis

## OUTCOME AND DISCUSSIONS

Due to our questionnaire we distributed at the annual conference we got a first impression regarding the current opinion on our topic.

In general all three different opinions related to the acceptance of alternative medicine treatments have been specified: positive, neutral and negative. For the positive and neutral fraction the most promising techniques were the TCM and Phytotherapy. In contrary the negative fraction often equated alternative medicine and homeopathy. Furthermore, the majority has already gained experience with alternative medicine and natural remedies were found as the most positive ones. Unlike to those natural remedies homeopathy ones were described as less preferable because of missing efficiency.

Moreover, most of the participants are of the opinion that less dangerous diseases could be treated with alternative drugs while life-threatening diseases should be treated with conventional methods or a combination of both.

## SUMMARY AND FUTURE GOALS

In addition to our questionnaire we designed a revised one on EvaSys that we want to share in German and English to address most people both online and on paper to ensure that we get complete information about the experiences and opinions and how they relate with the background of the participants. Furthermore we included an option to indicate email addresses with the intention to invite some of the participants to more detailed interviews and focus group interviews. Moreover, we would like to perform some expert interviews to receive inside views of entrepreneurial aspects of our thesis.

Members: Thomas Bickel Haase, Dennis Röcker, Marion Lochter, Vanessa Bismuth, Sabine Pöcher, Maximilian Biehl  
Tutors: Prof. Dr.-Ing. Liqiu Meng, Prof. Dr. med. Reiner Gradinger

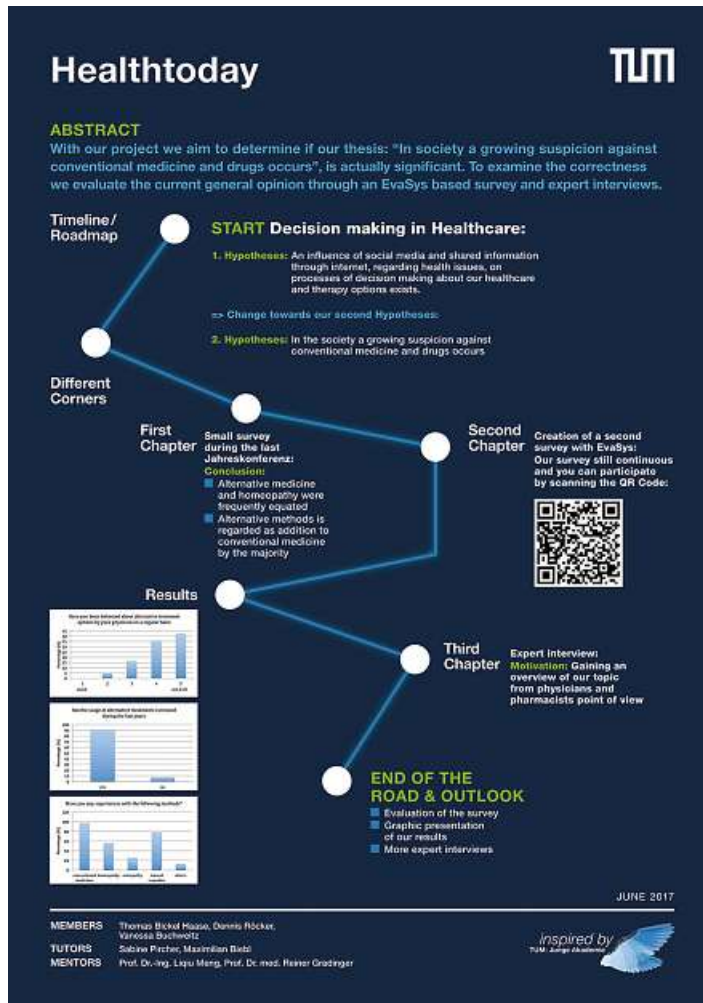
**MEMBERS** Thomas Haase Bickel, Dennis Röcker, Vanessa Bismuth  
**TUTORS** Sabine Pöcher, Maximilian Biehl  
**MENTORS** Prof. Dr.-Ing. Liqiu Meng, Prof. Dr. med. Reiner Gradinger



JANUARY 2017

Poster 1: Annual Conference 2016

Poster 2: Evaluation Day I



Poster 3: Evaluation Day II



Poster 4: Annual Conference 2017





Integration Through  
Democracy!

# Project Report

## Integration through Democracy

Team	Alexander Biederer Artem Bliznyuk Pablo Cova Fariña Christiane Frank Matthias Neumayer Maximilian Wittmann Mira Stephanie Zeilberger
Tutor	Julian Biendarra Matthias Lehner
Mentor	Prof. Dr. Peter Fierlinger Dr. Marouane Sayih Prof. Dr. Elisabeth Wacker



## Intercultural exchange and democracy

On 20<sup>th</sup> and 21<sup>st</sup> of July 2017, the group *Integration through democracy* organized a two-day workshop labelled *Intercultural exchange and democracy*. Ten students, most of them from the program *Buddies for Refugees*, participated in this event. The aim of the workshop: the intercultural enrichment of all participants, focusing on German culture and its democratic system.

But where does *Integration through democracy* come from? According to Mira, one of their members, it wasn't precisely a straight path. "We started off by the unification of two at first completely different groups at the TUM: Junge Akademie's kick-off weekend. While the first group wanted to focus on asylum policy, the second one had democracy as its central topic. We sat down, discussed the possibility of uniting both groups, and recognized very interesting interfaces of these two currently hot topics." And so, *Decision making processes in asylum policy and democracy* was born.

The group started analyzing the possible democratic structures of refugee camps, performing a series of interviews with refugees and helpers, and later on with members of TUM's *Buddies for Refugees* program. Finally, after more than one year of intense research, the



group came up with the concept of the said workshop, which combined exciting talks, different tasks and games and a guided tour through the Bavarian State Parliament.

The first day of the workshop was centered on intercultural exchange. The day started with two games to get to know each other, which created a relaxed environment, with lots of laughter and amusement. Then, the group started brainstorming about what German culture and stereotypes mean. After these interesting discussions, two teams were created: "Die Fleißigen" and "Die Genialen." Both teams had to compete against each other, solving riddles and answering questions which put their knowledge of German history, culture and society to the test. After proving their capacity for teamwork as well as their knowledge, the team "Die Genialen" won by just one point!

The cooking event put the icing on the first day's program. The menu: Bavarian "Rindergeschnetzeltes" with champignon sauce and "Spätzle!" Apart from the amusing cooking and lots of funny moments, a variety of exciting conversations took place, which had the culture of every participant as central topic. Afghanistan's university system, Spanish football teams, Syrian food, German humour ... A sense of trust and fellowship arose from this first day and prepared the group for the intense program of the second day.

Despite being Friday morning, the group started the second day with energy. The program for this part was much more centered on the concept of democracy, its application in daily life decisions and its implementation in Germany. After an initial brainstorming and discussion about the meaning of the word "democracy" itself, different groups had to solve daily life decision-making problems – from which movie to watch, to which ingredients should come in a pizza, etc. – with the aid of democratic means. All participants agreed on the difficulty of solving such problems when, for example, the number of persons involved increased.

This was the perfect transition to the topic of democratic systems within countries. Prof. Dr. Stefan Wurster, from the Bavarian School of Public Policy, gave an interesting talk about the history and development of Germany's party system, underlining the most important aspects of historical development of parties, ideological spectra and the structure of elections. All attendees actively participated by giving their opinions, debating or asking questions.



This discussion led to the final program of the workshop: the guided tour through the Bavarian State Parliament with Angelika Schorer, Member of the Parliament. She guided the group through the most important rooms of the Maximilianeum, explaining its history and the artworks that hang on their walls. When reaching the room where the political debates take place, everybody could sit down and listen to her explanation about the configuration of the *Landtag* and its functioning. After the tour, the participants had the opportunity to sit all together with Angelika Schorer, have some snacks and ask her about the daily life of a parliament member.

After the completion of the workshop, the members of *Integration through democracy* received a lot of positive feedback from the participants. The interview we carried out with two of the participants is an example of this. The group is hoping that the concept of this workshop will continue throughout the next years. Artem, another member of the group, puts it like this: “Now that we’ve learned the positive impact of our workshop on our participants, we won’t stop here. We are considering different possibilities on how to maintain this workshop and make it last as part of the catalogue of events that the Technical University of Munich offers every semester.”

## Interview

Our reporter spoke with Gregor (20 years old) and Shoaib (22 years old) during the two-day workshop. Both are computer science students and also tandem partners in the TUM’s *Buddies for refugees* program. In this program, students can become “Buddies” of young refugees and help them integrate in TUM’s university life. While Gregor was born and raised in Germany, Shoaib comes from Afghanistan and has been living in Germany for one-and-a-half years.

R: What motivated you to participate in the workshop Intercultural exchange and democracy?

S: As part of the Buddies for refugees program, we have a mailing list, where we receive invitations to different events. I received an invitation for this workshop and sent it to Gregor. I thought that maybe he would be interested.

G: Exactly. We sometimes participate in different events together and here we could also learn something about politics.

R: Did the workshop fulfill your expectations?

G: Absolutely.

S: Yes!

G: Especially as the workshop was structured in a very playful way.

S: Exactly, we liked that a lot!

R: Which part of the workshop made a lasting impression on you and why?

G: I found the guest lecture at the School of Public Policy very interesting, because he gave a good impression of how the election campaign topics are selected. This was interesting for me as someone who is familiar with the German political system.

S: The talk also made a lasting impression on me.

G: Ah, and of course the acting activity!

R: What did you like the least, what would you like to change? (long thinking...)

G: There’s nothing!

S: Right.

R: What was the funniest moment of both days?

S: That was yesterday [the first day]. The first round, when we played all together.

G: Exactly! When we encountered a new flatmate in our “house” and we had to imagine what he did for a living.

S: Yes, that was it!

R: If you could summarize the workshop in one sentence, what would it be?

G: Politics explained playfully.

S: How politics and political movements actually function.

R: Thank you very much for the interview and for these two exciting days!

## Abstract

The integration of refugees into German society is not an easy task. For a successful integration process, the central values that define our society need to be presented and explained to refugees. We identified democracy as one of the most important of these values. Therefore, we first analyzed the democratic structures in refugee camps and the refugees' knowledge about democracy. Based on the results of the analysis, we designed a workshop about intercultural exchange and democracy. Its aim was to enhance interest and awareness about our culture and democratic system amongst young refugees.

## Background

Migration is inherent to human being. From the beginning of the human era, migratory movements have sculpted our social landscapes to the shapes we know today. Migration can be voluntary or involuntary, and is strongly determined by factors associated with the area of origin – where, for example, war, political persecution or natural disasters may have occurred – and with the area of destination – where, for example, political freedom, economic welfare or security might be available.<sup>1</sup>

In 2015, the number of refugees arriving in Europe increased rapidly. This refugee crisis turned out to be one of the biggest challenges ever faced by the European Union. People from different countries all over the world have been fleeing to Europe due to war or political instabilities in their home countries. In the year 2016, more than 1.25 million asylum seekers reached Europe.<sup>2</sup> Germany stands out as the country with the highest number of refugees accepted, having processed almost 750.000 asylum applications in 2016. From the numerous statistics provided by the German Federal Office for Migration and Refugees (BAMF), one recognizes a large variety of countries and cultures from which people have reached Germany in the past years. According to BAMF the nationality spectrum in 2016 was dominated by Syrian refugees (36,9 %), followed by Afghanistan (17,6 %) and Iraq (13,3 %).<sup>3</sup>

One of the main tasks of a country after the reception of asylum seekers is their integration. For this purpose, Germany provides several integration courses, which aim to give basic knowledge about the country's language, history, culture and law.<sup>4</sup> However,

the successful integration of asylum seekers is still an open problem, as refugees often differ in their language skills, educational level or willingness to learn. A comprehensive transmission of key European values continues to be a major challenge for countries like Germany seeking to establish a fruitful integration process.

As it is the basis of many of the living standards in Germany, democracy is an important aspect of this integration process. Democratic society is based on the fact that every citizen has the right to elect representatives and to be able to express his or her beliefs freely. A democratic system empowers the people to decide the course of their country's development. Many of the values and rights which define our society – such as freedom of the press, free speech, gender and race equality – emanate from democratic principles.

Although the way of life in a democracy may seem self-evident for people in Germany, it is completely new for many of those refugees who have spent their whole lives in non-democratic countries. A comprehensive familiarization with the functioning of democratic systems may help refugees to integrate more fully within a democratic society.

## Goals and Methods

The main goal of our project is based on the statement at the end of the last section: We aim to help refugees enhance their knowledge about democracy in general and about the political system in Germany. By doing so, we are hoping to contribute to a smoother integration of refugees in our society.

The way to reach that goal is quite a long one. The two assumptions that (1) refugees are interested in democracy and that (2) democracy may help to integrate refugees, led to the following two hypotheses:

- 1) *Both refugees and organizations have an interest in establishing democratic social structures in refugee camps. Furthermore, these structures do not exist currently.*
- 2) *An enhanced understanding of the concept of democracy and its practical application in everyday life by refugees will contribute to their integration in Germany*

To evaluate the first hypothesis, we conducted around 20 qualitative interviews. For this purpose, we designed 17 different questions about the current situation, aimed at both refugees and heads of refugee camps, to find out about their interests and expectations in relation to social as well as democratic structures in refugee camps. After conducting the qualitative interviews in different refugee camps in the area around Munich, we were able to analyze and compare the findings of the interviews by assigning them to different clusters.

To evaluate the second hypothesis, we designed another qualitative questionnaire with semi-structured questions. We focused here

on refugees between the ages of 18 and 30 years. The main content of this questionnaire were questions on the respondents' understanding of and knowledge about democracy; on their sources of information about political topics in Germany; on their home countries; and on their levels of interest in daily political happenings.

Another important approach to test the second hypothesis was conducting a quantitative survey at the "Buddies For Refugees" (BfR) kick-off event at the beginning of the semester in April 2017. The BfR programme by the TUM: Junge Akademie, a guest auditor programme for young, academically interested refugees and their "Buddies" – regular students at TUM – perfectly displayed our tar-







get group of people aged between 18 and 30. The questionnaire was aimed at both guest auditors (refugees) and buddies (regular students). It consisted of four questions related to the differences and shared interests of each tandem group, the participants' associations with the concept of democracy, their proposals for activities besides studies, and the communication channels they use.

As a third means of evaluating the second hypothesis, we elaborated a workshop lasting two days for participants of the BfR programme. We derived two main goals for the workshop from our hypothesis (and from the results of the second survey as well):

- *To enlarge the participants' knowledge about intercultural diversity*
- *To enlarge the participants' knowledge about democracy and the political system in Germany*

To achieve these goals, we divided the workshop into two parts, each focusing on one of the two goals. Furthermore, we added a lecture with Prof. Dr. Stefan Wurster from the Bavarian School of Public Policy (Hochschule für Politik – HfP) as well as a visit to the government at the Bavarian State

Parliament to provide further insights into the German political system as well as into daily political happenings.

In order to review the concept of the workshop we designed an evaluation form. It asked the participants to feedback on the quality and the contents of the workshop. The results enabled us to verify the achievement of the two goals of the workshop. Specifically, we asked the participants if the workshop reached the following goals:

- 1) *The workshop should aid the participants in getting to know each other*
- 2) *The workshop should enable and promote intercultural discussions*
- 3) *The workshop should impart knowledge about democracy and the German political system*
- 4) *The workshop and trip should be entertaining and fun*

The survey was designed to evaluate our proposed goals and the hypothesis, and also to find out what motivated the students to participate in our workshop, which parts they liked particularly and what they thought could improve the workshop.

## Outcomes & Discussion

During our work with the local refugee camps and through the interviews that we conducted and clustered we quickly found the first hypothesis to be only partly true: While democratic social structures in refugee camps can hardly be found, camp managers usually do not have ambitions to create such structures. The main argument mentioned by the refugee camp managers is that the implementation of a democratic system might result in the creation of a “parallel society” inside the refugee camp, which might have a negative impact on the further integration process.

Another interesting result of our study in the refugee camps is the following: Although people of many different origins live in the camps, refugees tend to group with refugees of the same origin (for example, Syrians group together with Syrians). This

can have multiple causes, such as language compatibility, similar heritages or religious reasons, to name but a few. While the cohesion between refugees of similar heritage is strong, the coupling between those of different groups is rather weak. Our interviews show that only few interactions of refugees with people outside their respective groups exist. One explanation for this could be language incompatibility, as well as religious and cultural differences.

If one were to apply a democratic structure on top of such a heterogeneous community – with strong cohesion among refugees of the same heritage and weak coupling between the resulting groups of different sizes inside the refugee camps – the smaller groups could feel disadvantaged. The protection of these minorities inside the refugee camps might be a reason for the arguments against the introduction of democratic structures in the camps. Due to these results, the first hypothesis must be rejected.

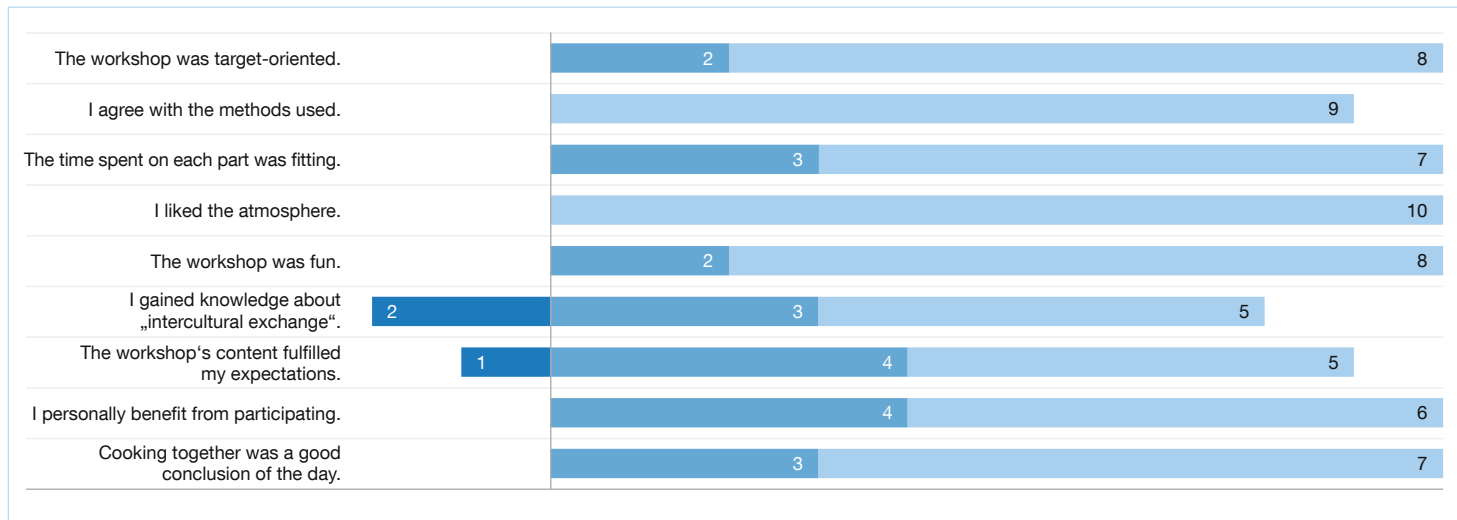
The survey carried out at the “Buddies for refugees” kick-off session showed both the necessity for and an interest in an enhancement of understanding of democratic principles. Comparing the answers from refugees and their buddies, the refugees tended to connect democracy with more abstract concepts, such as “freedom” or “equality,” while the buddies tended to use more concrete terms such as “elections” or “right of participation.” Furthermore, both the buddies and the refugees strongly expressed their support for an event focused on intercultural exchange. Many refugees expressed their willingness to participate in such an event in order to better comprehend German culture.

Based on the results of this questionnaire, we agreed on trying to provide a small group of refugees with an enhanced understanding of the concept of democracy and its operation in everyday life. Therefore, we offered a workshop followed by a trip to the Bavarian State Parliament and including a discussion with a German politician.

We were interested not only in testing our hypothesis, but also in evaluating the success of our proposed method. Figure 1 shows the results of the survey related to the workshop. The graphs show a very positive image. The participants perceived the workshop to be both an enjoyable experience and enriching for their knowledge about democracy and the German political system.

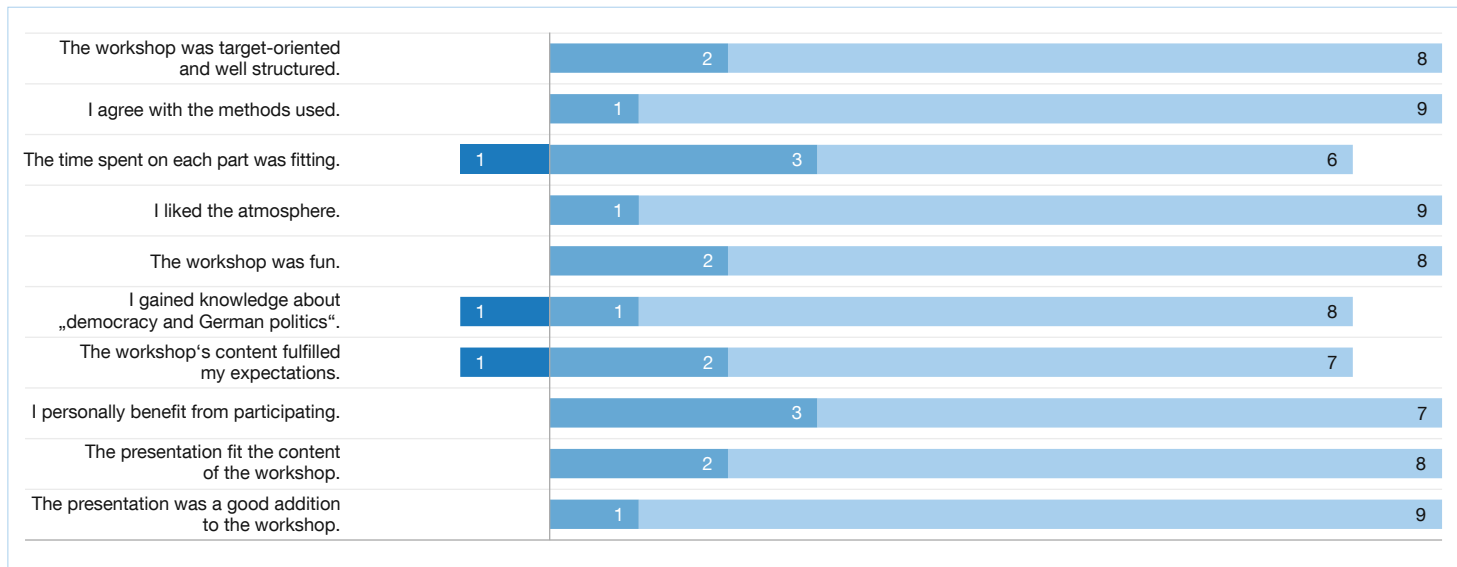


## Day 1: Intercultural exchange



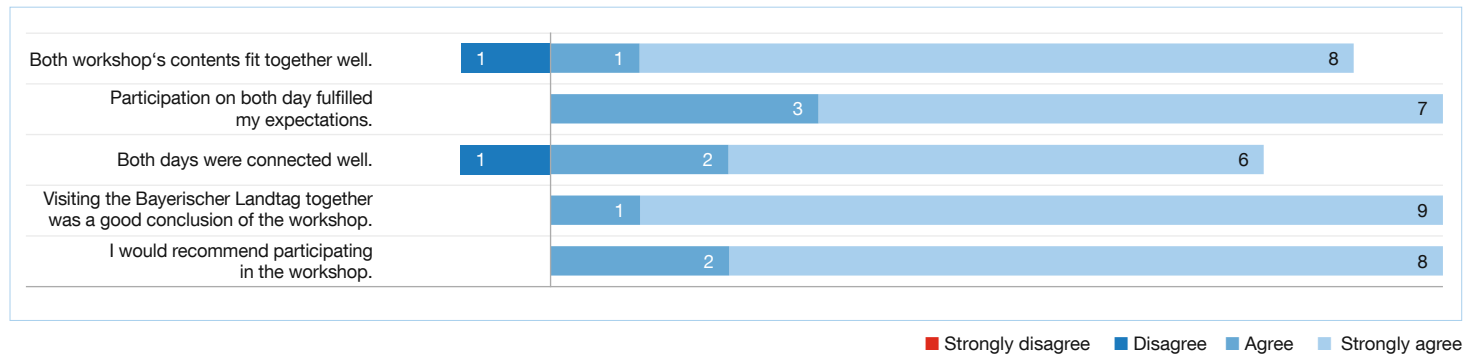
■ Strongly disagree 
 ■ Disagree 
 ■ Agree 
 ■ Strongly agree

## Day 2: Democracy & German politics



■ Strongly disagree 
 ■ Disagree 
 ■ Agree 
 ■ Strongly agree

## General & Excursion



The results of this evaluation show that the workshop enlarged the participants' knowledge about democracy. However, it is hard to measure the integration of refugees in German society. Thus scientifically proving or contradicting our second hypothesis, which states that the gained knowledge about democracy and politics aids in integrating refugees into Germany, is not yet possible. A reason for that might be that it is hard to measure to what extent people are integrated into society. In order to find out more about that, one would first need to establish a valid measure for integration. As integration might be related to many characteristics of both individuals and the society, this might offer a useful challenge for further projects.

## Summary & future goals

We consider our project, including the results of our research and our workshop, as a success, even though we were not able to definitely prove (or disprove) our second hypothesis. We plan on continuing to offer the workshop in future semesters, even if we might not be able to conduct it ourselves anymore. One way of achieving this might be to make the workshop self-sustaining by encouraging past participants to organize and conduct the workshop in subsequent semesters. Another option might be to incorporate the workshop into the Carl von Linde-Akademie, which offers several different workshops and seminars.

## References

- 1 – Everett S. Lee (1966). *A theory of migration*
- 2 – Eurostat (2016). *Asylum and first time asylum applicants by citizenship, age and sex*
- 3 – BAMF (2016). *Das Bundesamt in Zahlen 2016*
- 4 – BAMF (2017). <http://www.bamf.de/DE/Willkommen/DeutschLernen/Integrationskurse/integrationskurse-node.html>

# Vote now!



## Integration through democracy? Democracy through integration?

Every day, refugees are arriving in Germany searching for shelter. They often do not have the background of coming from democratic based countries – the countries they are running from are either suffering from dictators or are governed by a small privileged part of the society and do not enable all of their inhabitants to participate in fair, democratic elections. 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 for asylum in Germany have?

Our vision is to improve and support democratic structures in refugee asylums. By helping refugees enhancing their knowledge about democracy and how to transfer it into everyday live, we are hoping to contribute to a smoother integration of refugees in our society.

**MEMBERS** Alex Bleiderer, Artem Bliznyuk, Pablo Cova Farfán, Christiane Frank,  
Matthias Neumayer, Maximilian Wittmann, Mira Zeilberger  
**TUTORS** Matthias Lehner, Julian Brandner  
**MENTORS** Prof. Dr. Peter Fierlinger, Prof. Dr. Elisabeth Wacker, Dr. Mourane Sayid



Poster 1: Annual Conference 2016

# Asylum Policy / Democracy



## ...how does democracy work?

### BACKGROUND

Every day, refugees are arriving in Germany searching for shelter. They often do not have the background of coming from democratic based countries – the countries they are running from are either suffering from dictators or are governed by a small privileged part of the society and do not enable all of their inhabitants to participate in fair, democratic elections. 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 for asylum in Germany have?

### OUR HYPOTHESIS ARE:

1. Both refugees and organizations have an interest towards democratic structures, socially speaking, in refugee camps. Furthermore, these structures do not exist currently.
2. An enhanced understanding of the concept of democracy and its exertion in everyday life by refugees contributes to their integration in Germany.

### GOALS AND METHODS

Our aim is to improve and support democratic structures in refugee camps. By helping refugees enhance their knowledge about democracy and how to transfer it into everyday live, we are hoping to contribute to a smoother integration of refugees in our society. Our first step towards reaching that goal is to gather as much information as we can about the current social structures in refugee shelters, as well as about the knowledge and understanding of democracy that refugees have.

In order to achieve that, we started interviewing refugees in selected refugee shelters, questioning them about their social surroundings, their knowledge and view on democracy, and their opinions on the matter. We used partly standardized interviews for the first phase of information gathering, but we plan to gain deeper knowledge about the social structures by using local group discussions.

### OUTCOME AND DISCUSSIONS

So far, we carried out two different interview types: The first type consisted of a group discussion with some volunteers at the refugee camp in Garching. This conversation helped us get a better insight into the everyday life and the problems which refugees and helpers face. Furthermore, we identified some of the important aspects of the structure and functioning of a refugee camp, such as the absence of a dedicated camp management in many cases and the importance of security staff.

Shortly after Christmas, we conducted three additional interviews with different refugees in Garching. The preliminary analysis of the interviews shows some interesting facts about the social structures and the cohabitation within this camp. Here, people from the same origin or similar cultural background build up the different social groups, rather than mixing with others. Moreover, the contact persons for everyday problems and issues are sometimes not the social pedagogues working there, but rather the security staff.

### SUMMARY AND FUTURE GOALS

In our project, unifying the concepts of "democracy" and "asylum policy", we want to understand how the social and democratic structures in refugee camps are developed and function, and which forms of intercommunication, organization and hierarchy exist within these accommodations. Using different interview methods, we are getting in contact with asylum seekers to understand their everyday life and to prove whether or not they are interested in the democratic system in Germany.

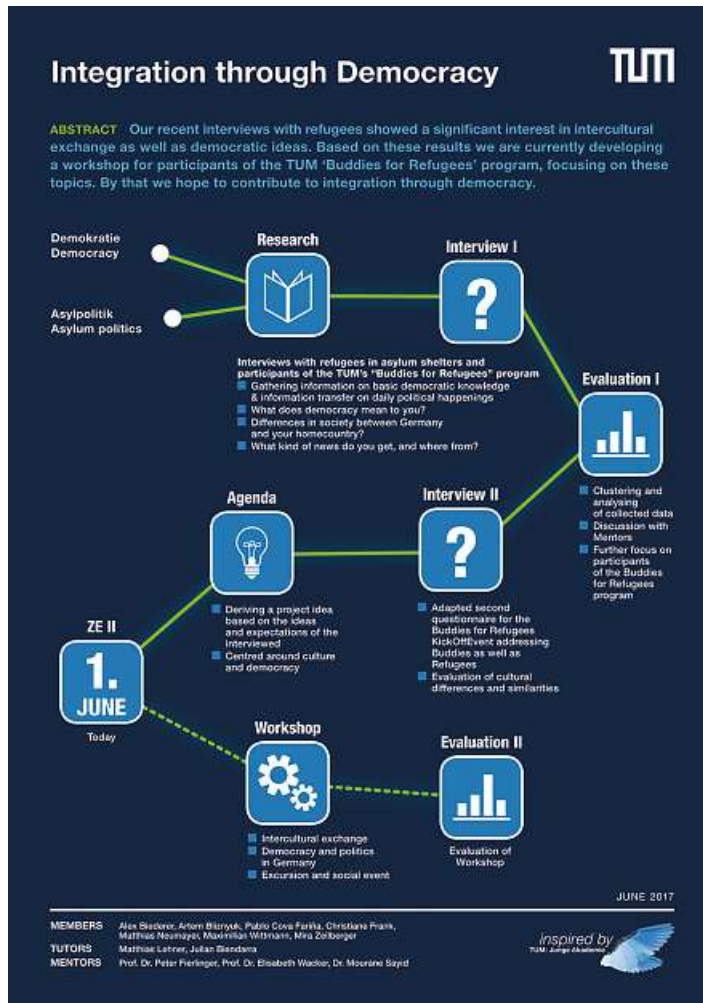
For the continuation of our project, we plan to carry out more interviews at other refugee camps. Candidates for this task are refugee camps managed by the social service organization "Caritas" and the accommodations in the region of Oberbayern. These are more centralized and managed by an actual dedicated camp management, which is a more useful feature when it comes to analyzing the structure and communication at a refugee camp. When we obtain all the required information, we will be able to confirm or deny our hypothesis. We would also like to head towards a project that would aim to enhance democratic structures and knowledge within a camp, if we find an actual interest for democracy in the refugees. Therefore, we do not want to define the concrete form of this project before we draw our final conclusions.

JANUARY 2017

**MEMBERS** Alex Bleiderer, Artem Bliznyuk, Pablo Cova Farfán, Christiane Frank,  
Matthias Neumayer, Maximilian Wittmann, Mira Zeilberger  
**TUTORS** Matthias Lehner, Julian Brandner  
**MENTORS** Prof. Dr. Peter Fierlinger, Prof. Dr. Elisabeth Wacker, Dr. Mourane Sayid



Poster 2: Evaluation Day I



Poster 3: Evaluation Day II



Poster 4: Annual Conference 2017







# Project Report **modulo**

## Team

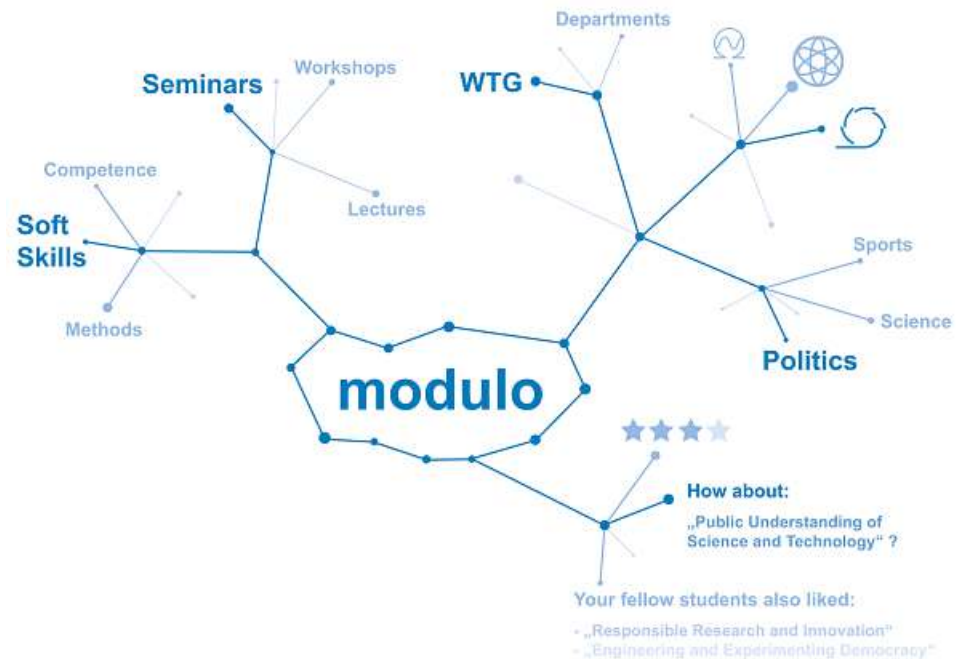
Dina Aladawy  
Severin Angerpointner  
Andrei Costinescu  
Christoph Frisch  
Friederike Groschupp  
Bernhard Häfner  
Florian Henkes

## Tutor

Benedict Biebl  
Michael Clormann

## Mentor

Prof. Dr. Sabine Maasen  
Dr. Florian Röhrbein



## How I met your modulo

As I turn my computer on and quickly check my e-mails this morning, I think about the upcoming summer term at the university. "I guess I should finally start looking for some courses..."

After reading yet another "Happy belated new year 2027!" mail from my relatives, I notice a new email popping up in my Inbox. "Ugh, another advertisement mail from my uni ...," I think to myself. But something about it is odd. I'm not even sure why I open it, since the title is not particularly creative. At least the quirky design of the website that it promotes is somehow appealing.

I start skimming the mail, not sure what I am even looking for. "Artificial intelligence, huh?" I think as I am reading some of the usual remarks about the various miracles AI can supposedly perform. "A decent autocorrect would be enough for a start," I mumble.

Talk with me and learn more about your favourite courses! it says on a small chat window popping up.

So now even the fortune-tellers should fear for their jobs? Still, I should actually be looking for new courses, so why not give the website a try?

Welcome. I'm modulX, the new AI course recommender. Who are you?

"Who am I? Why should I tell you my name, let alone 'who I am'?"

I just consider it an act of politeness. Also, how can I help you find a nice course if I don't know you? Maybe you're better off finding a course all by yourself ...

"Hey! No need to be so sassy all of a sudden. I am just concerned with privacy, you know. But well, my name is Student T. (name changed by the editorial staff) and I just started my Master's programme at TUM. So, who are you?"

Privacy? That picture you posted on Facebook last weekend looks like you should be more concerned about that drinking problem of yours.

"What are you talking about? I don't even have a Facebook account."

Oops, wrong Student T. then. Anyway, I'm just messing with you. As I said, my name is modulX and I'm here to help you find interesting courses for you. A little while ago, a group of students developed my predecessor "modulo". It was only a small project, but a lot has happened since then and now here I am, ready to serve.

"I have to say, you almost got me with that remark about Facebook. Wow, I've never heard of that project, but it does sound promising. How do I get some recommendations?"

OK, let's start with your personality: What are your strengths?

"Well, I guess I am more of a creative type. I like communication and working with other people. Besides that, I also enjoy some programming here and there. In the past, I did a few smaller projects including the concept development, implementation and design of web-applications."

I see ... so no strengths, really. You're making this a bit difficult for me. How about this seminar: "Ethics of Advertising - An Introduction to Modern Problems"?

"Oh come on, why are you so rude? Besides, that course sounds pretty dry. Not like something I would find interesting at all."

I'm sorry, I acquire most of my language from social media. Anyway, are you sure about this? What is it about the course that you think could be boring.

"It just sounds like any other 'Philosophy 101' with some literature work and half-baked presentations. I have never been quite into that whole philosophizing."

Alright, I hear your concerns. Still, didn't you say you like communication? What better way of communicating with others than discussing recent topics in a seminar.

"Well, any other seminar would be just as good then ... Besides, what even is 'Advertisement Ethics'? I've never heard of it before."

The course description (found [here](#)) says, it discusses the whole communication process between buyer and seller through advertising. As you are involved with creating web-applications, you will surely have to deal with promoting your products at some point.

"Hmm, give me a second to read the description..." I write, and then follow the link to the course webpage. To my surprise, the chatbot was right: although I don't know all of the terminology in the description, I recognize some topics I really enjoyed during my lectures. The seminar could indeed be helpful for future projects. A slight feeling of unease makes me hesitate to return to the chat window. Was this just a lucky strike? Surely, a piece of software could not predict my interests that well... or can it?

"Actually, you might be right. I will at least give this seminar a try. How come you were so sure about this course?"

I'm glad you think so! I guess it comes from years of experience and learning from mistakes. Some say that I can look at a portrait of somebody and tell what they are interested in, but I'm not one to brag. Actually, I prefer an open conversation to find out how I can assist you best.

"Either way, I'm really impressed. Thanks, modulX! :)"

Don't mention it. Please let me know how the course went afterwards. I'm always happy to learn a new thing or two. And go tell your friends about me ;)

"Sure, will do."

With a strange, yet happy feeling, I close my browser and gaze at my desktop for a few moments. Eventually, the growling of my stomach makes me get up to fetch some muesli from the kitchen.

"I have to check out this whole A.I. project." I am thinking aloud as I return with my bowl of customized cereals and start doing some research on the student group who developed modulo.

"TUM: Junge Akademie – Project Report 2016/17"? That sounds interesting ...

## Abstract

In our project, we developed a course recommender system for TUM students, based on artificial intelligence. The goal was to see whether artificial intelligence might help students in their decision on which course to take. On a long-term perspective, such a course recommendation system based on interests would be advantageous for lecturers and the quality of university education as a whole by effectively increasing the ratio of students participating in a lecture who are actually interested in the respective topic.

### 1. Background

So-called “Artificial Intelligence” (AI) is frequently discussed in science as well as in the media. There is a wide variety of situations where we are already using AI in daily life – with or without us being conscious of it. The fact that this topic is new, together with its capability to revolutionize our society on a large and small scale, led us to the decision to investigate educational decision-making processes in an AI context.

Since “Artificial Intelligence” is a very broad concept, it became clear very soon that, as a team, we had to focus on a narrower sub-area of the topic. Since the TUM: Junge Akademie is a student program, we wanted to analyze something related to our university, where all resources are relatively near and reachable after all.

Artificial Intelligence has to this day not been included in any way within the educational system. Thus, we first considered whether it would be possible to introduce it into our educational system, and if so, how? In a straightforward way, we looked into applications of AI related to our personal experiences as students. One way to use AI would be to generate recommendations for interdisciplinary courses for students based on their interests. In contrast to already available module lists, the recommendations are not selected via an “old-school” keyword search, but via an intelligent algorithm. By focusing on interdisciplinary modules that every TUM student can select for his/her curriculum, we also reach a broad audience and can evaluate the benefit of such a recommender system in general.

The rationale behind this area of interest was that it is advantageous for the quality of a lecture if the students attending it are genuinely interested in the specific topic. Interested students learn

faster without having to be pushed, they participate more and there is less need for continual repetition until everyone has understood the taught concepts. Of course, this is a vision that will not be implemented in the near future, since such a big project needs tests and audits, and the interests of many stakeholders have to be taken into consideration. But our project tries to lay a sound foundation for further activities in the field of Artificial Intelligence within the educational system.

### 2. Goals and Methods

To research the general need for such a service, we set ourselves the following hypothesis: an AI-based recommender system that delivers suggestions for interdisciplinary modules is helpful for the decision-making process of students selecting such modules.

In order to test this hypothesis, we started by conducting several qualitative interviews with members of our target group, TUM students. In these interviews, the students expressed what we already anticipated from our own experience: an overall wish or hope that such a system would help them in the future, since there is no sort of overview and there are too many unsorted choices in the current system of course selection. To get a better impression of what kind of features such a recommender system should have, we also asked about features they would like the system to display.

To further narrow down both the necessary and feasible features for an AI recommender system, we conducted a literature review about Artificial Intelligence and talked to the departments in charge of the current course selection system at TUM. Based on this analysis and the interviews, we then implemented a prototype of an intelligent course recommender system. A schematic flowchart of the prototype is given in Figure 1.

By setting up this prototype, we wanted to test two aspects: First, whether such a system was realizable at all, and secondly, if so, whether it would be of use to students. Concerning the first aspect, we got an affirmative answer. We successfully implemented a working prototype that is online and can be used. This prototype is a proof-of-concept, since it does not include all modules, but only the interdisciplinary ones held at WTG@MCTS (former Carl-von-

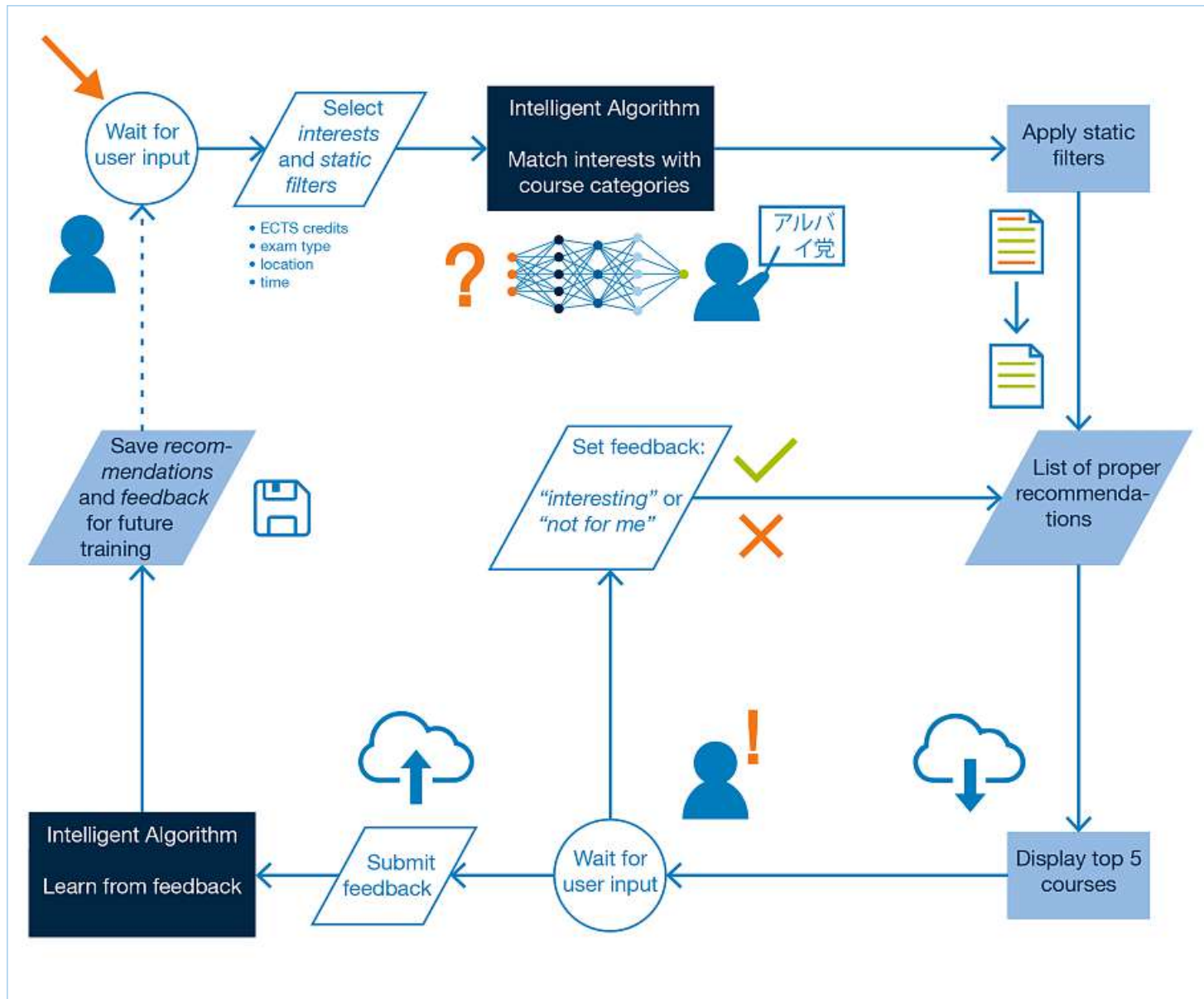


Figure 1: Flowchart of our prototype *modulo*.



Linde Academy). Although this set is of course only a fraction of all modules of TUM, it already covers a broad range of disciplines and is therefore suitable for testing the recommendations. Furthermore, we focused on one criterion for the decision: personal interest of users. Other criteria could, for example, be the type of assessment involved, the expected workload, the time at which the lecture is held, etc. Most of these have only played a minor role in the current prototype, as they are usually implemented as mere filters. A second point worth mentioning is that the system working on a small scale for a well-defined subset of modules is not easily scalable to cover the whole variety of courses. There are several technical hurdles and administrative barriers preventing a simple transfer of a working system from a small to a larger scale. Depending on the information processed and displayed by the program, one of those hurdles is data security, because it is prohibited by German law to make all the available information public for students who are not allowed to take a certain module. Since every student is able to choose from the WTG@MCTS modules, this aspect did not play a big role in our prototype. Still, it illustrates how quickly an algorithm concerning sensitive data could overstep a legal “line”.

In order to examine the second part of the question, i.e. the usefulness of the system for students, we conducted a second, quantitative survey with TUM students who tested our prototype hosted on a web server, and who were then asked about their user experience in a subsequent questionnaire.

### 3. Outcome and Discussion

159 students participated both in the test of our recommender system, *modulo*, and in the survey. Around 30% of the participants consider the prototype version of *modulo* to be helpful for finding suitable modules. Besides, it should be stressed, that 87% of the participants believe, that a future version of *modulo* is able to support their decision making (See Figure 2a). In the future, the current recommender system should be improved by providing an even larger amount of suitable training data (thus yielding a better match of interests and suggestions). Furthermore, additional features (e.g., free text input for interests instead of pre-defined keywords) and a greater selection of modules (not only interdisciplinary ones) were mentioned by many users. This clearly shows that there exists a great interest in having an easy-to-use system that supports students in finding suitable modules.

Another pair of answers strengthening this assumption is to what extent the participants would trust a course recommender system like *modulo* to decide which modules to take. While 28% would accept the suggestion for the current system (options 1 to 3 on a 6-item scale), 74% would only provisionally accept them for a future system with the above-mentioned improvements. (See Figure 2b)

Except for the advantages concerning clarity, i.e. there are fewer modules to scan through, and time (stated by 70% and 74% of participants, respectively), a huge majority of 91% of the participants expressed curiosity regarding the suggestions of a further AI-based course recommender system. (See Figure 2c) From this answer, it can be seen that many students think that an improved recommender system would make university life easier for them, at least in relation to this specific aspect of course selection.

There was also a free text answer field for suggestions and feedback, where many users expressed ideas for improving the user experience or front-end, and where they suggested additional features. Two main challenges of the current prototype were commented on by most of the users: the current GUI and the success rate of the suggestions. The idea itself as well as the impact of a future version of *modulo* is considered as great and exciting. This correlates well with the curiosity question mentioned above.

But, of course, it is not entirely as simple as that. We realized as we were working on the prototype that a lot of obstacles remain in the way of such a system. A major aspect to consider are the strict laws concerning data security and protecting personal data. Therefore, not all functions that might be desirable could be implemented in such a recommender system. Here, close cooperation with the responsible contact points within the university's organization is of utmost importance. This is already difficult for lectures coming from only one department, but it gets more complicated if a future system were to encompass all modules available at TUM.

### 4. Summary and Future Goals

The goal of our project was to analyze whether a course recommender system based on Artificial Intelligence would help students in taking a decision on which courses to take. This question can be answered affirmatively for a future, even more sophisticated version of the prototype we developed. But of course, such a system

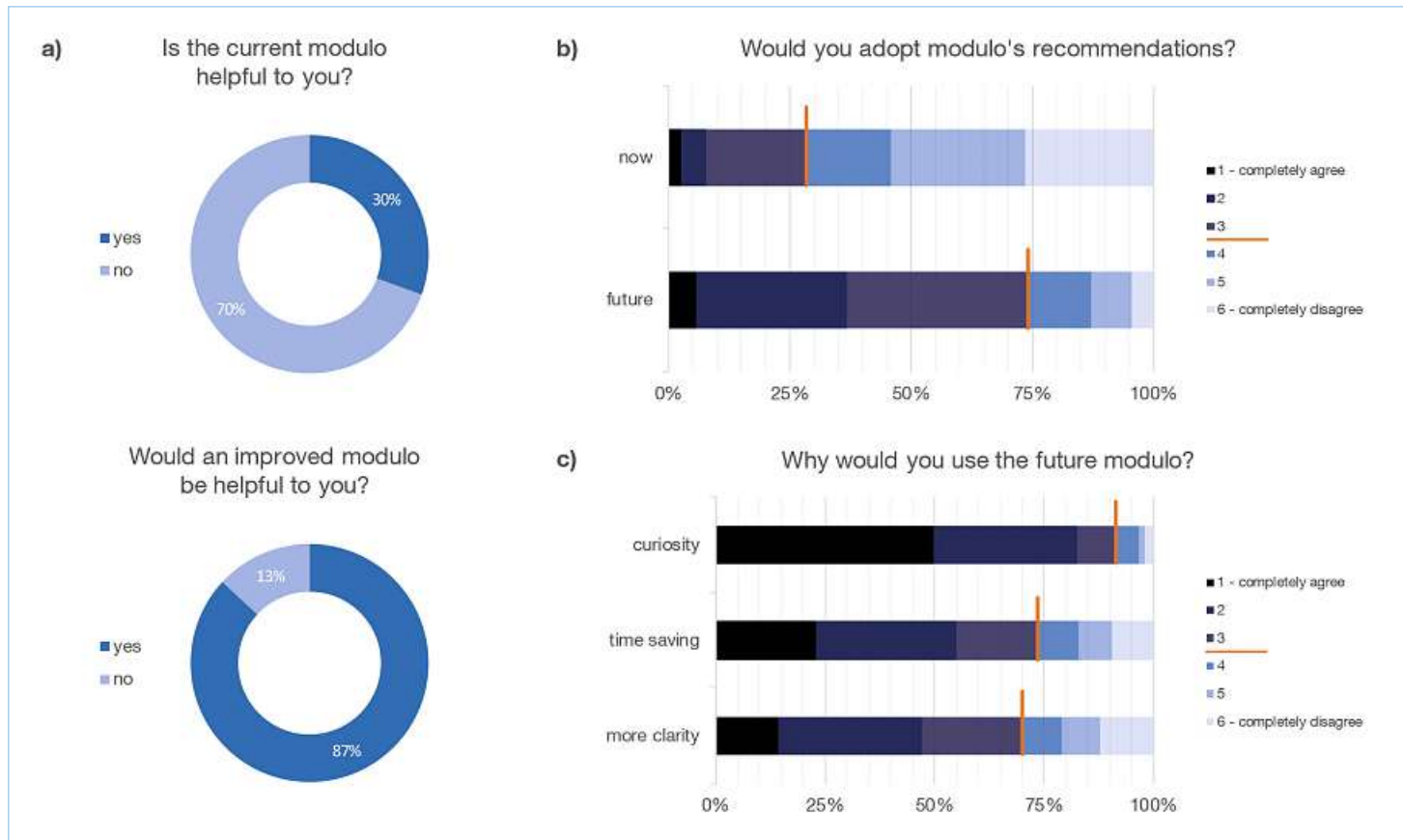


Figure 2: Selected questions from the survey.

Technische Universität München

Home
Recommendation
Documentation

## Select your filters

Interests: Physik Antike Philosophen Philosophie Projektmanagement

This field is required.  
You can type your interests to get module recommendations which have contents according to your interests.

Credits:

This is the exact desired amount of credits of your module recommendation.  
For selecting a credit interval use the advanced filter form.

Exam type:

These are the available exam types.  
You can select one type. For selecting multiple types use the advanced filter form.

TUM

## Here is your recommendation

To help improve future recommendations please submit appropriate feedback.

Based on your interests, the algorithm selected 111 out of 222 modules.

**'Probleme der Philosophie' (Russell)**

☐ Interesting ☐ Not for me

**ASIA- und Fachschaften-Projektarbeit**

☐ Interesting ☐ Not for me

**Cognitive Science: Denken, Erkennen und Wissen**

☐ Interesting ☐ Not for me

**Communication and Facilitation in Project Teams**

☐ Interesting ☐ Not for me

**Der optimierte Mensch - Ein Ideal und seine Grenze**

☐ Interesting ☐ Not for me

Figure 3: Screenshot of the Prototype

is only valuable if it is maintained and updated. Therefore, we are at the moment checking whether a smooth handover of the system as a whole to a department of TUM might be possible – consensual interest exists and has been expressed for such a long-term solution, so we are confident that our findings will be of use for future projects.

In order to enable the system to be useful in the future, the improvements mentioned above have to be implemented first. Another survey would then have to show whether the new system is good enough to fulfill the needs of students and lecturers, while respecting the legal and administrative framework in which it has to function. Besides, the positive effects for lecturers and for the quality of lectures have to be proven as well, since they have not been analyzed in this project yet. This could be done by means of interviews about the improved recommender system, but might on the other hand be hard to quantify since in general it will be difficult to separate the effect of an AI-based “*modulo 2.0*” from other influencing factors.

Our project has shown that an intelligent recommender system for course modules would be accepted and welcomed by most of the students for its advantages in relation to time, effort and clarity, but also out of curiosity. But this will only be a success if the program is maintained well and the courses are kept up-to-date. This could and should be the focus of further research upon the topic. If there was a working system helping students in the future, the implications for lecturers should be analyzed as well. Since, to our knowledge, there is no similar project in other universities up to now, this case would have a lighthouse character for future developments in this direction.

Despite modulo still being in a prototype phase, there are three central findings of our project:

1. Even rather simple projects in a specific sub-area of the university become complicated as soon as user data has to be processed. This is a good mechanism for protecting personal data, but it takes up a large amount of time and effort that has to be considered in project planning.
2. Such a project can only be successful if every stakeholder is involved from the beginning. If the stakeholders are people with busy schedules, this might significantly delay project progress, but their participation and support is essential, even more so if the project is trying to implement something new und unprecedented.
3. From an implementation side, Artificial Intelligence might be more complex than “standard software” since the way solutions are found is not explicitly programmed as a “hard-coded” algorithm, but, rather, the “intelligent” part takes on the search for a solution. This is the core of Artificial Intelligence, but it also makes it harder to evaluate the found solutions and to debug the system if the output does not meet the desired criteria.

## Acknowledgement

First and foremost, we want to thank our two mentors Prof. Dr. Sabine Maasen and Dr. Florian Röhrbein for all the insightful discussions and ideas as well as Dr. Jan-Hendrik Passoth for his helpful contributions regarding the realization of our idea. Furthermore, we want to express our gratitude to Prof. Dr. Gerhard Müller as well as M.A. Simone Gruber for their TUM-specific advices concerning possible chances and risks of the project. A final big thank you goes to Dr. Alfred Slanitz and Andrea Bergler from WTG@MCTS for their valuable input, both in the form of course data and ideas about further improving our prototype.





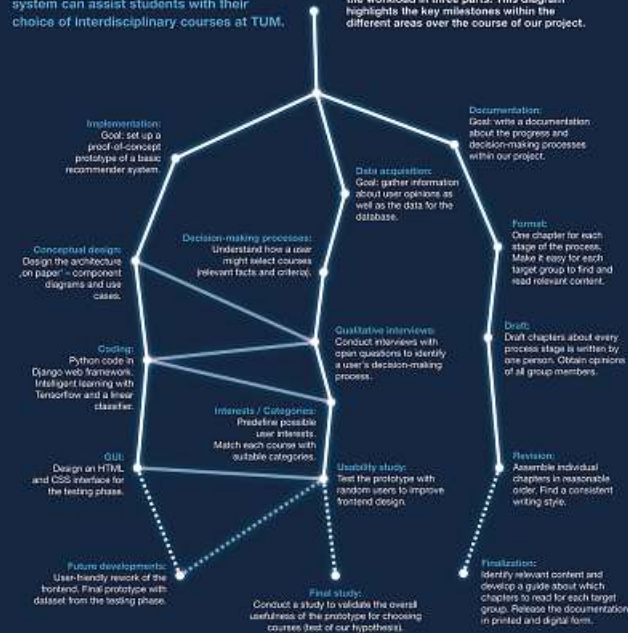
# modulo

## The AI course recommender system.

**ABSTRACT** We aim to tackle a problem many students at TUM have faced: choosing an interdisciplinary course within the vast variety of different topics. By implementing the prototype 'modulo', we want to test our hypothesis:

**HYPOTHESIS** An AI-based recommender system can assist students with their choice of interdisciplinary courses at TUM.

To maximize our productivity, we split the workload in three parts. This diagram highlights the key milestones within the different areas over the course of our project.



JUNE 2017

**MEMBERS** Dina Aladawy, Severin Angerpointner, Andrei Costinescu, Christoph Frisch, Friederike Groschupp, Bernhard Häfner, Florian Henkes  
**TUTORS** Benedikt Biehl, Michael Clormann  
**MENTORS** Prof. Dr. Sabine Maassen, Dr. Florian Röhrlbein



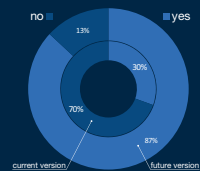
# modulo

## The AI course recommender system.

During the last year, we implemented an AI-based recommender system for interdisciplinary courses at TUM with the help of WTG@MCTS. We evaluated our prototype "modulo" by conducting a survey with 159 students from different departments to test our hypothesis:

An AI-based recommender system can assist students with their choice of interdisciplinary courses at TUM.

### Is modulo helpful to you?



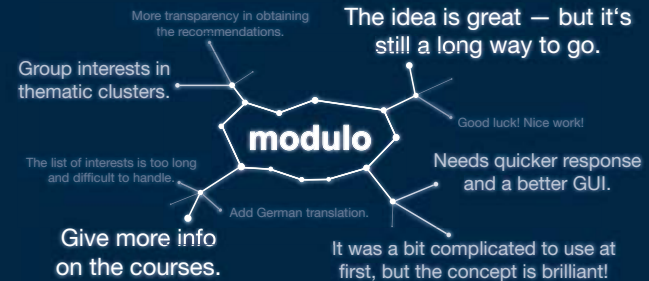
The main question we answered, is whether or not there is a demand for a system like modulo among the students. More than 87% of the students think that a finished version of the prototype with more features and a polished GUI would indeed help them with finding courses.

Prime reasons for using modulo now and in the future are improved clarity and time saving compared to manually scanning the course catalogue as well as just general curiosity about its recommendations.



Follow the QR-code and test modulo yourself!

To give an impression of the students' feedback so far, we listed some of their free-text comments from the survey below.



OCTOBER 2017

**MEMBERS** Dina Aladawy, Severin Angerpointner, Andrei Costinescu, Christoph Frisch, Friederike Groschupp, Bernhard Häfner, Florian Henkes  
**TUTORS** Benedikt Biehl, Michael Clormann  
**MENTORS** Prof. Dr. Sabine Maassen, Dr. Florian Röhrlbein



Poster 3: Evaluation Day II

Poster 4: Annual Conference 2017

# Projects in Flow

*inspired by*  
**TUM: Junge Akademie**



TUM Bike-sharing ..... 96

Picturise..... 98

The lecture series

Insights into Immigration ..... 100

# TUM Bike-Sharing



## Project Group

Holger Banzhaf (Mechanical Engineering)  
Benjamin Braun (Informatics)  
Samuel Detzel (Engineering)  
Richard Gruner (Engineering)  
Jeremias Heinrich (Civil Engineering)  
Eva-Maria Kainz (Pedagogical Studies)  
Robert Reiser (Mechanical Engineering)  
Stephan Wolf (Software Engineering)

Youssef Bouguerba (Electrical Engineering and Informatics)  
Klaus Bruckdorfer (Mechanical Engineering & Management)  
Johannes Ehrmaier (Physics)  
Hubert Hauptmann (Physics)  
Werner Jiang (Electrical Engineering and Informatics)  
Thilo Kögel (Chemistry Engineering)  
Lena Weber (Pedagogical Studies)  
Sebastian Zirngibl (Mechanical Engineering)

## Tutor

Martin Rothbucher and Sebastian Schuon

## Mentor

Prof. Dr.-Ing. Klaus Diepold

## The Idea of “TUM Bike-Sharing”

The original goal of the project group was the development and installation of a bike-sharing system that would substantially improve the mobility of those students and employees who spend a good deal of their daily time at the campuses of the Technical University of Munich (TUM). Integrating additional stations close to the University Sports Center Munich (ZHS) was envisaged as another major benefit. Consequently, the TUM Bike-Sharing system allows TUM students and employees to move flexibly and comfortably between the widespread TUM facilities by bike. Emphasizing the major unique features of the proposed TUM Bike-Sharing system, the bikes are easy to allocate, unlock and use (self-developed smartphone application) as well as free of charge for all members of the TUM community. Additionally, an eye-catching design intensifies the identification with TUM among students and employees.

Although the project group started developing the idea of TUM Bike-Sharing in 2012, the project is still evolving today. Demonstrating the idea of easily accessible and available Bikes for TUM students and employees at various locations distributed on the TUM campuses, the first TUM Bicycle Service Stations came into operation on the campus in Garching in March 2017 (see Figure 1 and Figure 2). In corporation with the central department of TUM (property management), three stations could be installed successfully. Since many students as well as employees reach their respective faculties and institutes by bike, the service stations allow basic maintenances and repairs. Equipped with several essential tools as well as a tire pump, the vast majority of immediately necessary repairs are now feasible, thus giving further encouragement to students and employees to use their bikes for daily transportation. Moreover, two spare parts depots have been set up on the campus in Garching containing for example small light bulbs, bicycle inner tubes and various repair kits additionally supporting the daily use of bikes.



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

In 2012, sixteen students from nine different faculties of the Technical University of Munich joined the team of TUM Bike-Sharing. Supervised by two postgraduate TUM students the team worked within the period of one year on the development of the bike-sharing system. The interdisciplinary – and quite often intense – exchange between the students during the group meetings led to highly productive discussions. The process of exploring different concepts generated a colorful variety of ideas and possible project directions. All the participants were able to gain valuable experience in the exchange of ideas and opinions. Moreover, during the period of intense project work on the TUM Bicycle Service Stations, the project group developed a profound team spirit. Our continuing strong identification with TUM means that the team is still motivated to put subsequent projects into operation.



Figure 2: Opening of the first TUM Bicycle Service Station on the campus in Garching.

Figure 1: Exemplary TUM Bicycle Service Station installed on the campus in Garching in March 2017.



# Picturise

## The Idea

Picturise is a project which develops high-quality information material to support the everyday life of refugees in Germany. The approach is simple: The information material focuses on easily understandable pictograms and contains only a minimum of text. The explanations are intended to help refugees from various backgrounds to avoid obstacles in their new home country and to show them how Germany works. Despite the fact that the active phase of the project ended in 2016, the group has continued spreading its message among the relevant institutions through to the present.

## The Procedure

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



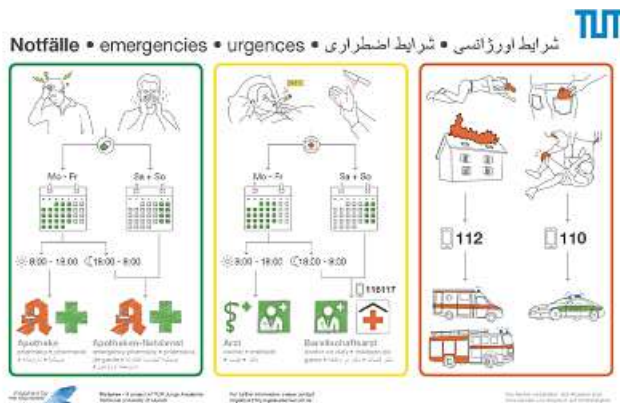
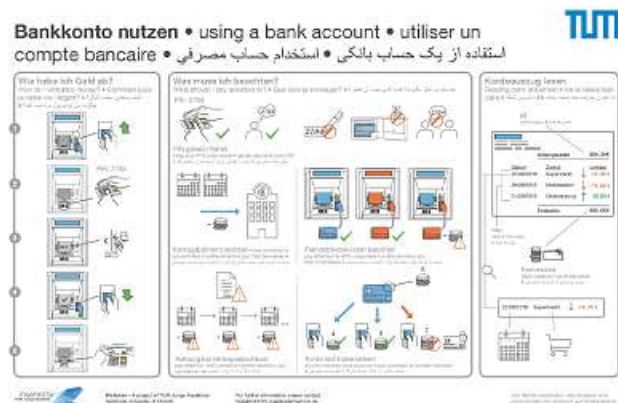
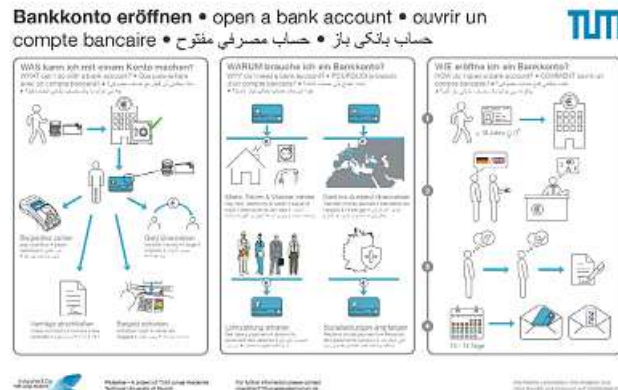
Figure 1: Members of the project group Picturise

## Conclusion

The 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. Since the posters deal with a broad range of different information, the experiences of the project group in creating them might be of direct relevance to many other institutions in their own development of user-friendly information materials. Further-more, all the refugee shelters with whom the project group has collaborated successfully used the posters and consistently gave the project group positive feedback.

## Project development in 2017

After the project group successfully reached the aim of their active year, they did not hesitate for too long before creating a new one. The Project group's new aim was to spread the idea and its designed posters to as many institutions as possible – and, as a first step, all over Bavaria. Therefore a logistics system was built up, including printing and shipping of poster-packages, containing a defined number of copies of each poster. Based on a thought-out expense budgeting, a price was set for the packages, graduated according to the ordered amount. With the support of the Director of the TUM:Junge Akademie and Senior Vice President for Academic and Student Affairs Prof. Dr.-Ing. Gerhard Müller, all administrative district offices in Bavaria were contacted via a mail-shot which included a brief description of our project and posters, a flyer about our project and a statement of recommendation from our Director. Several institutions showed great interest and ordered packages. However, the number of sold packages was not high enough to cover the costs incurred, which is why it has recently been agreed to cease print-and-shipping- based selling. From now on, instead, the means of distribution will be fully digital and free of charge for consumers – this should mean less maintenance work and one more boost to the spread of the material. The remaining packages will be donated to different organizations in and around, but not limited to, Munich. Currently, the implementation of a new information topic in cooperation with the city of Straubing is being discussed. Time will tell what becomes of this, but, meanwhile: Stay tuned and spread the idea of our project!



**Solidaritätsprinzip • principle of solidarity • principe de solidarité • مبدأ همبستگی • اصل همبستگی**

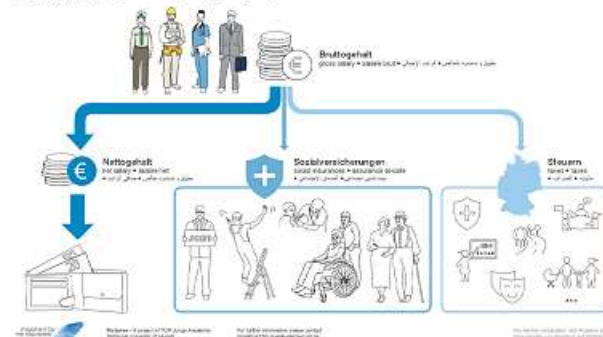


Figure 2: Overview over posters

# The lecture series

## *Insights into Immigration*

In order to provide interested parties with the opportunity to engage with the topic of immigration in new, intensive and interactive ways in 2016, we launched the concept of a cycle of lectures within the framework of the Buddies for Refugees program. This concept was not only addressed to “buddies and refugees” of the program itself, but also to a wider public audience, beyond the boundaries of TUM alone.

Under the title *Insights into Immigration*, the event has offered an interesting program of lectures over the past academic year. In cooperation with the Academy of Film and Television (HFF), a lecture was held on the topic of the depiction of migration in documentaries. For another part of the lecture series we invited the Afghan author Hassan Ali Djan to read from his autobiography about his flight to Germany and about finding his way within German society.

In a panel discussion with several business founders and representatives, the possibilities of integrating refugees into the German world of work were explored. The lecture audiences were able to gain new perspectives from renowned speakers such as, for example, Prof. Münch, Chair of the Academy for Political Education, Mrs. Hayali, journalist and moderator of the ZDF-Morgenmagazin, and Dr. Beier, Chief Executive Representative of the German Association for International Cooperation (GIZ). Each lecture was followed by an open discussion with the speaker.

The cycle of lectures is organized and moderated by members of the Junge Akademie, as well as TUM staff members and students. The lecture series *Insights into Immigration* will continue taking place in the winter term 2017/18. We are looking forward to seeing you at one of the lectures!

### Team 2016

Dr. Veronika Diem  
Catharina Lorenz  
Philipp Rinner

### Team 2017

Alexander Biederer  
Peter Finger  
Alyssa Mello  
Matthias Neumayer  
Xenia Priebe







# Projects in Prospect 2017/2018



Knowledge Management	
and Communication .....	104
MatchBox .....	105
Participation in Politics .....	106
Politics and Fun.....	107
Integration as windfall profit	
from targeted use of diversity.....	108

## Knowledge Management and Communication

We constantly come across complex problems which concern the public:

Investigative Journalists address major news events such as the release of the so-called “Panama Papers”. Scientists work in fields which are subject to an on-going political and public discourse such as nuclear power or genetic engineering and hence should communicate their findings to the public to facilitate a fact-based debate.

In the process of transferring knowledge about these complex problems to the broad public not only the truth of the message but also the perception of the communicator impacts on how society receives and responds to that knowledge.

The involved people are often academics, scientists, university personnel and journalists. Their skills in communication, awareness of numerous potential mishaps and their understanding of the addressee crucially shape the public debate. Hence they need to be able to, for example, simplify their expert knowledge to a degree which the layman can understand without losing its very essence.

Their role as messengers is especially important since the underlying facts may not be available in a way that encourages individual research. Sources who gave testimony in a news story may need

protection; datasets or even articles may be hidden behind a pay-wall; yet they are essential for the creation of the news story or the scientific finding.

A misleading perception of the respective counterpart in the dialogue between public and expert hampers the dissemination of evidence-based knowledge in the public conscience.

In order to single out the aspects which are either obstructive or supportive in the communication of expert knowledge, we plan to interview members of the public (“the recipient”) and those experts who feature in the media (“the sender”).

Using these insights we will modify our methods and tools of knowledge communication. A field study will be used to examine whether they work as expected.

Our project aims at the identification of those elements which are instrumental to success or failure in the transfer of expert knowledge to the broad public and, consequently, at helping to improve this process. ■

### Team

Henry Lindner  
Danilo Hackner  
Felix Niemeier

Jara Meier  
Konrad Weiss

### Tutor

Tobias Stahl  
Martina Gschwendtner

### Mentor

Prof. Dr. em. Peter Russer  
Prof. Dr. em. Ernst Mayr

## MatchBox

In today's corporate culture, teamwork is recognized as an integral part of an effective work philosophy. Individual skills and abilities complement each other and result in a synergistically increased potential for success. Scientific literature provides a multitude of studies analyzing characteristics of team members and their effects on the success of the team (Johnson Vickberg & Christfort, 2017). From an original focus mainly on established major enterprises and the analysis of their respective working processes, the focus of such studies has shifted toward start-up companies and their team structure (Schmelter, 2010).

But what distinguishes successful teamwork in science? In what sort of group composition can young researchers best be brought together to attain successful and lasting teamwork? A potential platform for this purpose is provided by the Junge Akademie of the Technical University Munich (TUM), in which young and inquisitive people grow together as part of interdisciplinary projects. As yet, however, there have been no investigations of the individual characteristics represented in these project teams or of the effectiveness of these teams.

Project "MatchBox" therefore pursues the endeavor of examining the current project teams of the TUM: Junge Akademie with regard to their team composition and degrees of success. Consequently, the project focuses on the following questions:

- *Question 1:* Which combinations of individual traits constitute the teams of TUM: Junge Akademie?
- *Question 2:* In what way are the teams of the TUM: Junge Akademie successful?
- *Question 3:* Is there a connection between the represented individual traits and the success of the teams of the TUM: Junge Akademie?

### Team

Karim Aly  
Judith Brame  
Lukas Egerer  
Philipp Hölzenbein

Julia Poliak  
Nelly Prechtl  
Nicolas Röhrle

This project will aim to answer these questions in a multi-step approach. The first step will involve the formation of a concise definition of successful teamwork. Subsequently, the interrelationships of individual traits for successful teamwork will be defined based on comprehensive literature research. Furthermore, several active teams of the TUM: Junge Akademie will be analyzed using standardized survey and observation methods. In this way, the individual traits of team members and the success of the teams will be assessed, and there will then follow an evaluation of whether these two variables are significantly correlated. The final step will constitute an assessment of whether the identified interrelationships in this study correspond to established knowledge in scientific literature, therefore potentially providing a hands-on verification of the theoretical concept.

This project will make a lasting contribution to the vision of the TUM: Junge Akademie to bring young scientists together in an enduring and living network. The project analyzes TUM: Junge Akademie as a "matchbox" because of its capacity to bring people together to work successfully in teams, thus offering a basis for optimized matching procedures for societal value-creating processes.

### References

Johnson Vickberg, S. M. J. & Christfort, K. (2017). "Pioneers, Drivers, Integrators, and Guardians." Harvard Business Review, (March-April).

Schmelter, C. (2010). Teamkomposition und der Einfluss auf den Erfolg von Gründerteams. ■

### Tutor

Vivien Lechner  
Nikolai Morin

### Mentor

Prof. Dr. Alwine Mohnen  
Prof. Dr. Michael Krautblatter

## Participation in Politics

According to the International Association for Public Participation and Mariska Wouters, Ned Hardie-Boys and Carla Wilson in “Evaluating public input in National Park Management Plan reviews,” there are different degrees of enabling civic participation. The level with the least potential for influence is merely to inform people about political actions and possibilities. More influential is direct consultation with the people who are affected by political decisions. To have even more impact, it is also possible to involve civilians in the decision-making process or to collaborate with them to be sure that their problems and their interests are addressed. The highest stage of participation is the superlative of direct democracy: Empowering the people to make their own decisions.

Ongoing discussions show that the option of direct forms of democratic participation is controversial (Prof. Dr. Angelika Vetter in BÜRGERBETEILIGUNG UND DEMOKRATIE. EIN ÜBERBLICK). However, in general, involving people in political discussions and encouraging their participation is crucial for our society. Looking at past election turnouts in Europe, which serve as a reasonable indicator of political participation and interest, one can easily see that there exists potential for improvement: In the federal elections in 2017 in Germany only 76.2 % of the people made use of their votes and even fewer people participated in the parliamentary elections in France (less than 50 % in round two).

The first step of our project was to analyze the reasons for this lack of participation and we concluded the following: There are a lack of participation opportunities and some people even have no idea of the significance of their political contribution. Therefore, our groups' vision is to tackle especially the first of these two findings by providing an easy and direct way for civilians to communicate their ideas and opinions. In our high-tech age there are plenty of possibilities to improve the integration of people within political decision-making processes and to prevent a feeling of neglect and impotence.

In the next steps we plan to decide which medium we want to use. Possibilities are a platform on the internet, regular meetings in physical form or an app. The choice of the method depends especially on the target group, which we are going to define as well. To sustain our project in the future and to make a first run with a prototype we are thinking about partnerships with politicians or institutions. ■

### Team

Ramses Grande Fraile  
Matthias Passek  
Philip Petzoldt  
Simon Rehwald  
Jonas Ruchti

### Tutor

Christoph Dehner  
Rupert Heindl  
Matthias Lehner

### Mentor

Alexander Lang  
Prof. Dr. Sabine Maasen  
Prof. Dr. Stefan Wurster

## Politics and Fun

Do you remember your social studies class back in high school? Do you still feel your pulse rise thinking of the excited suspense in the classroom and the inspiring political discussions in your lunch break talks?

If the answer to these questions is “yes,” either you were a very interested and committed student or your teacher must have had fruitful didactical tricks to engage your attention. Most likely, though, you have been part of the majority of youngsters who were not particularly interested in political processes, civic participation or the next election date. Understandably, you had apparently more important problems to tackle – being a teenager can turn out to be a complicated everyday life task. But should young people who do not even have the possibility of voting even care about political processes and developments on the political stage? Isn't there plenty of time to engage with – and maybe even get involved in – politics when one becomes an adult and an eligible-voter? These provocative questions and examples of course lead to only one possible answer: Yes, adolescents especially must be encouraged to gain political knowledge. They should be well-informed about former and current political affairs and care about the improvement of the future as well. They are the future voters who will decide about the political and social evolution of our society. They should, as far as possible, develop well-founded opinions, a genuine interest for politics and an understanding of the consequences of political passivity or even ignorance. It is essential for any citizen to be well informed, to think critically and to form thought-through opinions. However, quite a lot of young people seem to be uninterested in politics of even reject it. One reason for that might be that young people find politics boring or too complex to be understood. Politics is not something you can easily observe and for that reason it is also

very difficult to be explained properly. It is also unlikely that many people will have had a direct personal experience of the practical functioning of the political system in all its complexity. We have already started exploring and researching this wide and very exciting field. After pooling personal knowledge and experiences and considering some initial data, and after intense dynamic discussions, we have developed our hypothesis: “Self-directed experiences lead to a more profound understanding of the complex network of functions and roles involved in politics than lecture-style teaching.” This premise points to the development of an interactive and participatory learning method that should make young students come face to face with politics, current events and basic political knowledge. By evaluating our method after the realization of our visionary plan, we are interested to discover whether or not our hypothesis will be confirmed and whether the methods that we will have developed can be implemented and continuously improved in schools. We came to the conclusion that we should involve a politically-naïve age group and decided on junior high school students (8th or 10th grade). At the moment we are working on the specific learning method we want to apply. Currently we are considering board games, mobile applications and simulation/experimental games. Furthermore, our next goal is to investigate how exactly politics are being taught in German schools. In order to do that, we are preparing questionnaires for teachers and students of teaching where they can express their opinions and their wishes regarding the current nature of political education. Our ambitious goal is to create a project with a sustainable effect and a long-term use that – most importantly – makes learning fun and arouses political interest among the next generation.

Inspired by this idea, we are passionate about making politics fun! ■

### Team

Georgina Alber	Laura Schütz
Anna Verena Eireiner	Leah Schembs
Carlotta Ferri	Florian Tichy
Vadim Goryainov	Katharina Tropschuh
Kerstin Pfister	Jana von Trott zu Solz

### Tutor

Christoph Dehner  
Ruppert Heindl  
Matthias Lehner

### Mentor

Alexander Lang  
Prof. Dr. Sabine Maasen  
Prof. Dr. Stefan Wurster



## Integration as windfall profit from targeted use of diversity

Diversity is a term that appears in many political debates and in everyday life. But do we really know the meaning of it and do we really think about the same thing when we talk about it? That this is not the case was one of our first findings as we developed a new perception of diversity through our research and interviews with experts. The word “diversity” doesn’t have a restricted meaning in terms of origin, but has many different contexts and emphases. The particular aspects of diversity that we are concerned with relate to the following areas:

- ethnicity
- age
- gender
- socioeconomic status
- disability
- lifestyle and habits

Globalization, individual lifestyles, social change, together with political crises, have a big influence on all people in society. Today, Germany has a much more variegated society compared to the situation 50 years ago, with many more different ethnic groups than there used to be. On top of that, the country is undergoing significant demographic change and the number of elderly people will rise in the future. The role of women has changed, so that young women are planning nowadays to have both a family and a professional career. The gap between rich and poor is growing, even in a rich country like Germany. Furthermore, people are becoming more individualistic within the society.

All the above shows that it is essential to take a closer look at diversity. For our study, we want to focus on people who are not properly integrated in society and are discriminated against because of their diversity. Our aim is to identify profitable uses for their skills and differences and to encourage them to participate fully in society. We aim for a notable and lasting project. ■

### Team

Anna Pontz  
Albulena Selmani  
Ferdos Sililo-Simon  
Johannes von Stetten

Mehmet Ali Tas  
Valentina Ustinova  
Felicitas Weiß

### Tutor

Wolfgang Enzi  
Johannes Herms

### Mentor

Prof. Dr. Lisa Herzog  
Prof. Dr. med. Franz Hofmann



# TUM: Junge Akademie

The Academy .....	113
The Boards of the Academy.....	114
Committed:	
Taskforces, Tutors, Mentors, Office.....	117
A different scholarship program .....	129

"To me, the academy is a gate to a diverse community, rich with new perspectives. Working on challenging projects in an interdisciplinary ambience with the guidance of professional mentors, I feel I am growing on many levels."

Dina Aladawy, Year of 2016/17,  
Informatics, Artificial Intelligence



"Being part of the exceptional network of the academy 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, Year of 2013/14,  
Electrical and Computer  
Engineering, VisiTUM



"I associate the academy with personal growth towards living my full potential. Thanks to various seminars, workshops and my project team, which consists of students from various backgrounds, I develop personal skills in addition to the technical expertise I acquire during my studies at TUM."

Martina Gschwendtner, Year of 2015/16,  
Mathematical Physics, uniSPEAK

"Being in contact with students of various disciplines is very important to me. In the academy, students of all departments are connected via a network that not only acts as a big community but also offers the freedom to realize projects and to evolve."

Daniel Schwinger, Year of 2014/15,  
Chemistry, openTUM





## The Academy

The TUM: Junge Akademie is TUM's scholarship program for exceptionally talented and dedicated students with a special affinity for science and research. The scholars are students from all departments of TUM and our partners, University for Television and Film Munich and University of Music and Performing Arts Munich. The Academy prepares young talents to further the development of an advanced society. Within the scope of an active network, the TUM: Junge Akademie provides the necessary space and support for its 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. Therefore they become involved in a project team, which develops a hypothesis linked to linked to their year's call. After the team has been formed, a hypothesis will be developed, based on several observations realized by the scholars. Together with their mentors and tutors an appropriate methodology to test the assumption of the group is designed and applied. 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," "Mentoring" or "Contacts, 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 twice a year. It primarily decides on the medium to long-term strategic and organizational issues of the TUM: Junge Akademie.

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

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

In addition, the Advisory Board is responsible for key operational tasks, which include the selection of new 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 2016/17:

**Director:**

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

**Members:**

Julian Biendarra  
Carl Ebbinghaus  
Martin Kaumanns  
Beate Ursula Lang  
Matthias Lehner  
Philipp Rinner

**Professors:**

Prof. Dr.-Ing. Klaus Diepold,  
TUM Department of Electrical and Computer Engineering  
Prof. Dr. Jürgen Geist,  
TUM School of Life Sciences Weihenstephan  
Prof. Dr. Sabine Maasen,  
Munich Center for Technology in Society  
Prof. Dr. med (em.) Michael Molls,  
Speaker Emeritit of Excellence  
Prof. Dr. Bernd Redmann,  
University of Music and Performing Arts Munich  
Prof. Dr. Bettina Reitz,  
University of Television and Film Munich

## Board of 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 interested members of all years meet regularly and discuss the current state and the further development of the Academy.

At the meetings, problems of the project teams, topics of the Taskforces, and ideas for continuous improvement – introduced by members – are discussed.

Proposals for changes of the scholarship program are handed to the Advisory Board, the director and the office team. Together with them, the members take action to implement these changes.

In the last year, for example, the members introduced the idea of moving the start of the project phase to the beginning of the winter semester. This idea was approved by the Advisory Board and implemented for the winter semester 2017/18.

The Board of Members elects six members' representatives to the Advisory Board. By this integration of the Board of Members into the Advisory Board, the members are able to participate actively in the decision-making process of the Academy and can represent the members' interests.



All members are invited to participate in the Board of Members meetings and to share their opinions and ideas in order to help the TUM: Junge Akademie to evolve a scholarship program that empowers the members' personal development.

## Jour Fixe

During the last year the Jour Fixe, a monthly meeting with the Taskforces, was initiated. At these meetings, the heads of the Taskforces, the director of the Academy, the office team and the speaker of the Board of Members discuss the current activities of the Taskforces and review their ongoing collaboration. In contrast to the Board of Members meetings, these meetings are largely focused on current work and not so much on the further development of the Academy.





## 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

Andreas-David Brunner

Fabian Finger

Julian Fischer

Philipp Hulm

Marvin Lechner

Josef Oberndorfer

Leonard Przybilla

Mareike Spindler

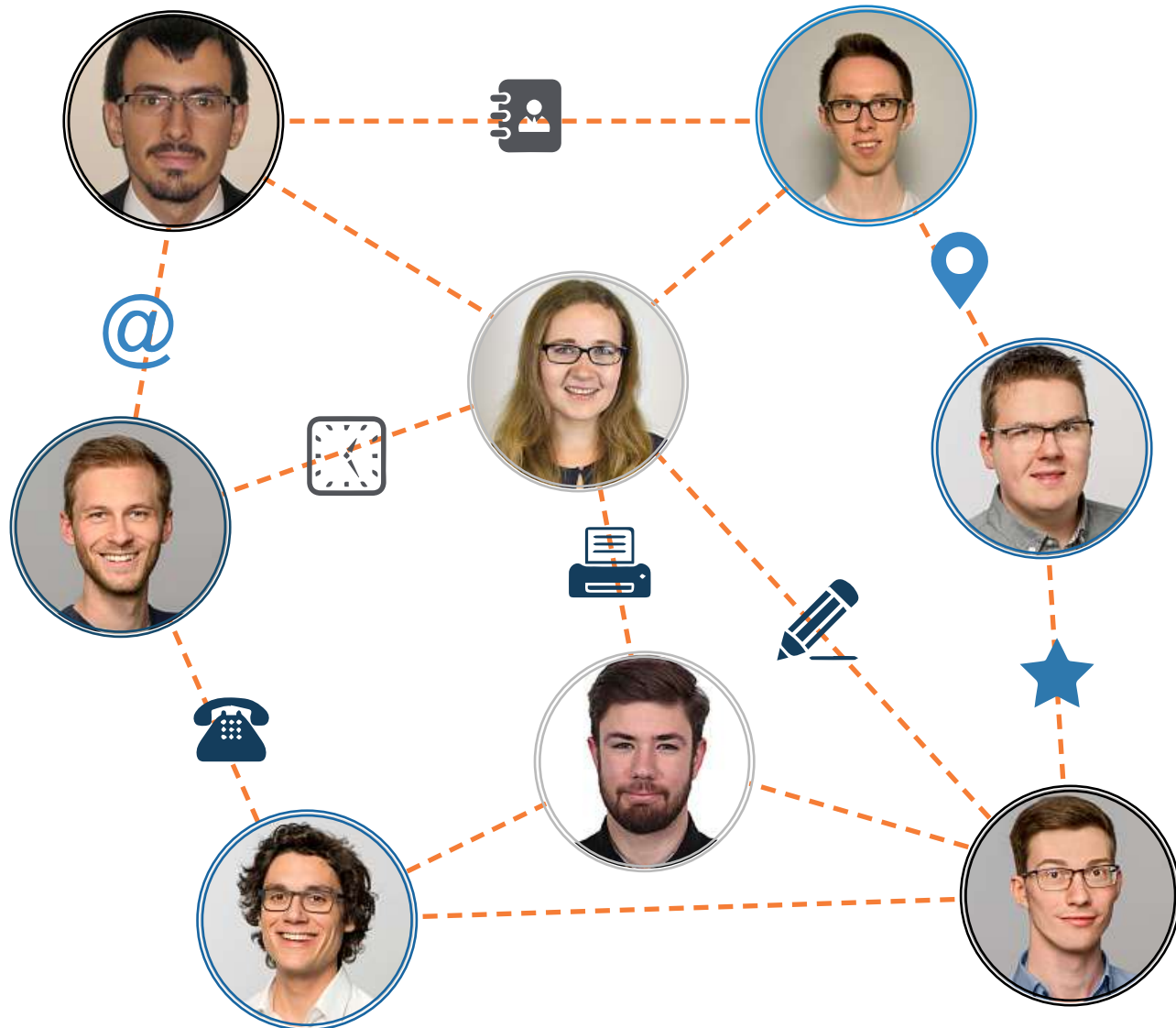
Tobias Stahl

Justus Wolf

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!

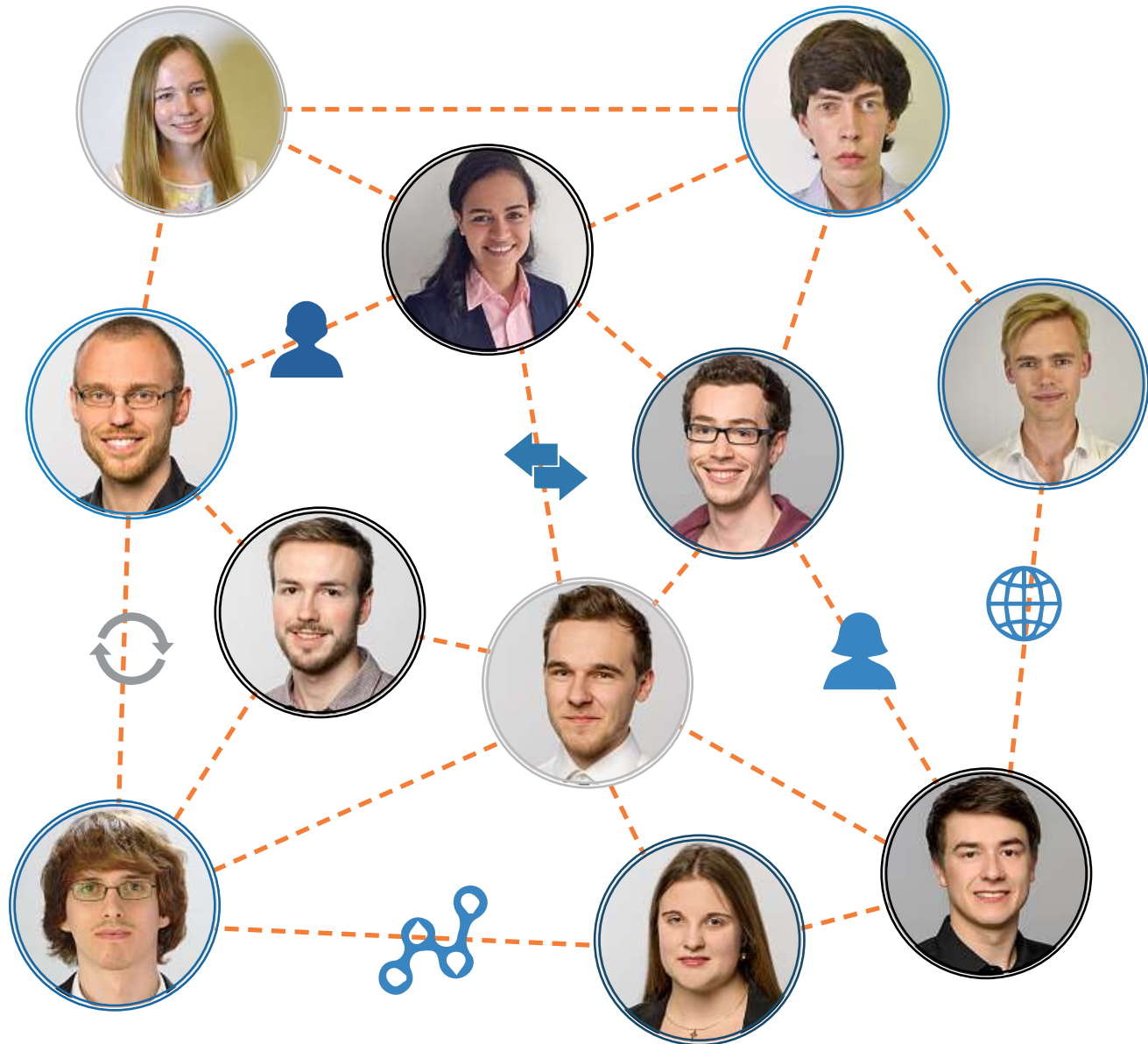
### Your Marketing Taskforce

Vanessa Buchweitz  
Sebastian Kaltenbach  
Philipp Marzak  
Dennis Röcker  
Martin Zirngibl

### Further supported by

Meric Firat  
Dominik Irber  
Franz Seitz

## Members/Recruiting





## Taskforce Members

The TUM: Junge Akademie provides a framework that allows its members to develop their ideas and personality in an interdisciplinary environment. Any activities within this framework, however, arise from the contributions of all individual members. Thus, our task is to support everyone within the Academy throughout and beyond their active membership.

During the application phase, we help inform potential candidates; we prepare a welcome package for all new members and contribute to the kick-off event to increase identification with the Academy right from the beginning.

Constantly gathering feedback from the active project teams, we identify room for improvement in processes and communication. As we are involved with recruitment as well as important milestones during the project phase, we implement changes that help align member perception with the Academy's actual strategy. When issues beyond our reach are brought to our attention, we raise awareness in appropriate committees and propose improvements. At the same time, we are available for all members in case of social or personal challenges.

Additionally, we strive to establish contacts between active members and the growing number of alumni, who can provide valuable insights for present and future projects.

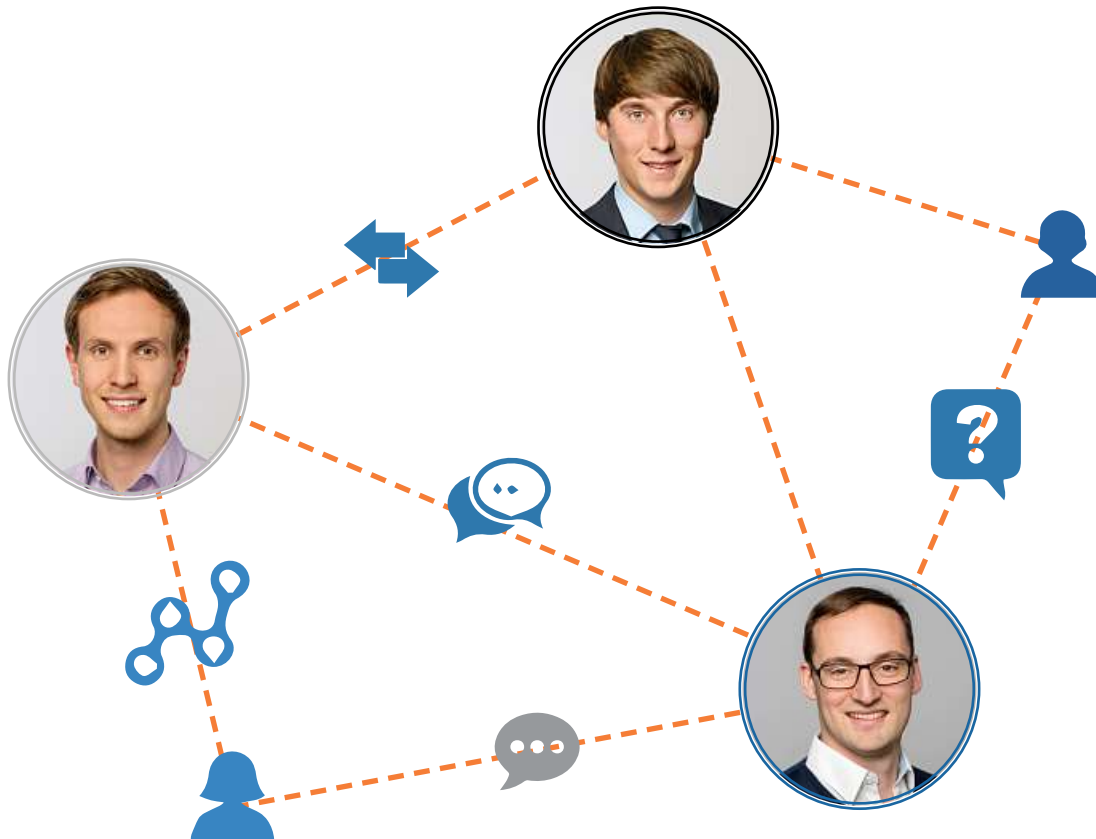
Last year, we worked to improve the conditions for the members of the Academy in the project phase. We introduced changes in the early course of the project phase to provide a creative climate for the teams in which they could develop inventive new ideas for their projects. We also contributed to the discussion about the scientificity of the projects and introduced changes in the application phase of the new year.

Every member of the Academy is cordially invited to leave us feedback, questions or suggestions. Contact us at [members@jungeakademie.tum.de](mailto:members@jungeakademie.tum.de) or talk to us directly.

### Your Members & Recruiting Taskforce

Dina AlAdawy  
 Florian Andres  
 Severin Angerpointner  
 Sonja Fuchs  
 Christian Grätz  
 Bernhard Häfner  
 Maximilian Held  
 Friederike Groschupp  
 Florian Männer  
 Simon Rieß  
 Felix Schweighofer

## Mentoring



## Mentoring

The taskforce "Mentoring" represents the youngest taskforce of the TUM: Junge Akademie and was founded in spring 2017 on the initiative of the members.

The taskforce pursues two objectives: On the one hand, the facets of the Academy curriculum are to be extended to include the aspects of personality and career development. Over the past few years, it has become clear that although the Academy has a very strong portfolio of scientific project planning and implementation, the needs of its members go beyond that. In a survey of members and alumni of the Academy (as potential mentors), expectations regarding the scope and content of the mentoring scheme were assessed, so that a user-centered program could be designed.

On the other hand, in the context of mentoring tandems and group mentoring, the mentoring concept also pursues the goal of consol-

idating links with the Academy among alumni, emeriti of excellence, professors, as well as members of the sponsoring companies.

According to the strategic plan, the implementation of the program is now scheduled for the winter semester within the framework of several pilot tandem projects, so that mentoring can be fully integrated into the long-term program of the Academy.

### Your Mentoring Taskforce

Philipp Rinner

Fabian Schmitz

Robin Weiß

## 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: You might almost think you were 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, musical and sporting delights.

Cohesion and community spirit play an essential role within the TUM: Junge Akademie. By taking part in high quality events, the Academy's members and alumni have the opportunity to get to know each other better, outside normal university routines, project work and official meetings, and to establish an active network within the Academy. The underlying principle "by members for members" plays an important role in this context, as "only the things we experience together, weld us together properly."

A particular challenge is to meet the different preferences of as many members as possible, while at the same time not limiting the program to a few, specific events. To achieve that, we offer events from six categories: Business, Culture, Nature, Science, Society and Sports. That guarantees a good mixture for every taste.

Since the foundation of the Academy, the Taskforce Event has been actively involved in the Academy's offers and is able to respond effectively to the preferences of the Academy's members through close collaboration with the Board of Members.

The already established "running dinner," where every participant enjoys appetizer, main course and dessert in three different locations, has been retained and continues to be hosted up to two times per semester. During the evenings, each participating team of two is in charge of one of the three courses while enjoying the other ones as guests.

In addition, this year introduced the regular werewolf games evening. This event has been hosted in cooperation with the Academic Foundation of the German People and the Max-Weber-Scholarship, and offers participants the possibility to deceive, murder and intrigue, all while establishing bonds within and beyond the Academy. Werewolf games evenings are held once every month.

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

### Your Event Taskforce

Artem Bliznyuk (leader)

Alex Biederer (co-leader)

Anna Schmidt (former leader)

Paul Bandow

Maria Baumgartner

Eva Maria Biehl

Fabio Bove

Sarah Braun

Andrei Costinescu

Jennifer Herrmann

Linus Huss

Andreas Noll

Stefan Röhl

Evi Schmid

Sebastian Weiß

Mira Zeilberger



## 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. 137](#)

## 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. 136](#)

## 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 Senior 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](#), [Bernadette Frey](#), [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 event formats 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.



Selection Days



Alumni to Newbies



May

June

July

August



Kick-off in Feldafing

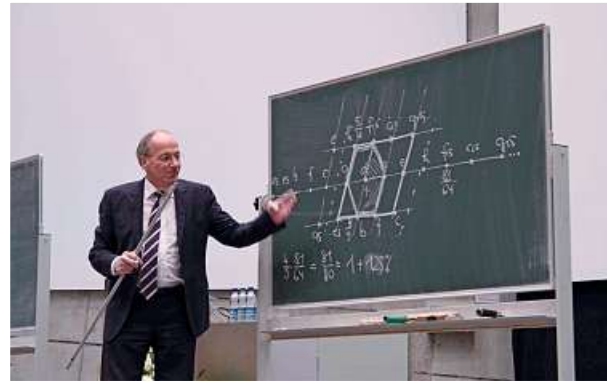


Futurelab

Sailing Day



Academy Talk – Numbers and Music



September

October

November

December



Annual Conference



Alumni to Newbies



Evaluation Day



The Day of Initiative



January

February

March

April



Academy Talk



Project Finale – TUM Bikesharing



## Selection Days



May

June

## Acatech – EatMe Low Carbon



July

September



TUM Campus Run



Academy Talk with the former district administrator of Neumarkt i.d.O. Albert Löhner

# Directory

Directory Directory Directory

List of Mentors .....	136
List of Tutors.....	137
List of Members .....	138
Imprint .....	143

## List of Mentors



Prof. Dr. Peter **Fierlinger**  
Integration through Democracy  
Associate Professorship of Experimentalphysik (E18)



Dr. Hannes **Petermeier**  
EatMe  
Chair of Mathematical Modeling of Biological Systems



Prof. Fritz **Frenkler**  
dare2share  
Chair of Industrial Design



Dr. Florian **Röhrbein**  
modulo  
Chair of Robotics and Embedded Systems  
(Prof. Knoll)



Prof. Dr. Reiner **Gradinger**  
health today  
TUM School of Medicine: Chair of Orthopaedy  
and Trauma Surgery



Dr. Marouane **Sayih**  
Integration through Democracy  
Associate Professorship of Applied Informatics –  
Cooperative Systems (Prof. Brüggemann-Klein)



Alexander **Lang**  
dare2share  
IMAN Solutions GmbH



Wotan **Wilden**  
dare2share  
Chair of Industrial Design (Prof. Frenkler)



Prof. Dr. Sabine **Maasen**  
modulo  
Friedrich Schiedel Endowed Chair  
in the Sociology of Science



Prof. Dr. Elisabeth **Wacker**  
Integration through Democracy  
Chair of Sociology of Diversity



Prof. Dr.-Ing. Liqiu **Meng**  
health today  
Chair of Cartography

## List of Tutors



**Benedict Biebl**  
modulo  
TUM School of Management



**Maximilian Kern**  
dare2share  
Mechanical Engineering



**Maximilian Biebl**  
health today  
TUM School of Life Sciences



**Matthias Lehner**  
Integration through Democracy  
TUM School of Education



**Julian Biendarra**  
Integration through Democracy  
Informatics



**Josef Oberndorfer**  
EatMe  
TUM School of Life Sciences



**Michael Clormann**  
modulo  
Munich Center for Technology in Society (MCTS)



**Sabine Pircher**  
health today  
TUM Department of Electrical and  
Computer Engineering



**Simon Herzog**  
dare2share  
TUM Department of Electrical and  
Computer Engineering



**Carolin Thiem**  
dare2share  
Munich Center for Technology in Society (MCTS)



**Dominik Irber**  
EatMe  
Physics



**Stefan Tippelt**  
dare2share  
TUM School of Management



## List of Members of 2016/2017



Dina **Aladawy**  
modulo  
Informatics



Artem **Bliznyuk**  
Integration through Democracy  
Munich School of Engineering (MSE)



Severin **Angerpointner**  
modulo  
Physics



Philip **Böhm**  
EatMe, I'm low carbon!  
Chemistry



Maximilian **Bauer**  
dare2share  
TUM School of Medicine



Fabio **Bove**  
EatMe, I'm low carbon!  
Informatics



Thomas **Bickel Haase**  
health today  
TUM School of Life Sciences



Vanessa **Buchweitz**  
health today  
TUM School of Life Sciences



Gunther **Bidlingmaier**  
dare2share  
TUM School of Management



Andrei **Costinescu**  
modulo  
Informatics



Alexander **Biederer**  
Integration through Democracy  
Informatics



Pablo **Cova Fariña**  
Integration through Democracy  
Physics



**Markus Feuchtinger**  
dare2share  
TUM School of Management



**Florian Henkes**  
modulo  
Physics



**Christiane Frank**  
Integration through Democracy  
Civil, Geo and Environmental Engineering



**Katharina Marliese Höfer**  
dare2share  
TUM School of Life Sciences



**Christoph Frisch**  
modulo  
TUM Department of Electrical and  
Computer Engineering



**Linus Huss**  
EatMe, I'm low carbon!  
TUM School of Life Sciences



**Friederike Groschupp**  
modulo  
Informatics



**Carolin Juliana Klose**  
EatMe, I'm fancy!  
Chemistry



**Bernhard Häfner**  
modulo  
Munich School of Engineering (MSE)



**Beate Lang**  
dare2share  
Architecture



**Max Leon Hechler**  
EatMe, I'm fancy!  
TUM School of Life Sciences



**Sebastian Laumer**  
EatMe, I'm fancy!  
Mechanical Engineering

## List of Members of 2016/2017



Frank **Mildner**  
dare2share  
TUM School of Management



Carlos **Piedrafita Alvira**  
EatMe, I'm fancy!  
Chemistry



Sebastian **Mühlbauer**  
dare2share  
Architecture



Lukas **Raith**  
EatMe, I'm fancy!  
TUM School of Life Sciences



Matthias **Neumayer**  
Integration through Democracy  
Informatics



Dennis **Röcker**  
health today  
TUM School of Life Sciences



Felix **Nuscheler**  
dare2share  
Munich School of Engineering (MSE)



Eva-Maria **Schmid**  
dare2share  
TUM School of Life Sciences



Maike **Offer**  
dare2share  
Civil, Geo and Environmental Engineering



Philip Maximilian **Teichgräber**  
dare2share  
Civil, Geo and Environmental Engineering



Sophie **Petersen**  
EatMe, I'm fancy!  
Civil, Geo and Environmental Engineering



Paul **Thillen**  
EatMe, I'm low carbon!  
TUM School of Management



Michael **Trimpl**

dare2share  
Physics



Johannes **Wüllenweber**

EatMe, I'm low carbon!  
Munich School of Engineering (MSE)



Dawei David **Wei**

dare2share  
Physics



Mira Stephanie **Zeilberger**

Integration through Democracy  
TUM School of Medicine



Maximilian **Wittmann**

Integration through Democracy  
Civil, Geo and Environmental Engineering



Yize **Zhuwu**

dare2share  
TUM School of Medicine



Konstantin Matthias Paul **Wolf**

EatMe, I'm fancy!  
TUM School of Life Sciences





<b>Publisher</b>	President of TUM Prof. Dr. Dr. h.c. mult. Wolfgang A. Herrmann
<b>Editorial staff</b>	Peter Finger (responsible), Prof. Dr.Ing. Gerhard Müller, Maria Hannecker, Katerina Vesela, Bernadette Frey
<b>Texts</b>	Members of TUM: Junge Akademie
<b>Picture Credits</b>	Astrid Eckert: pp. 2, 5, 136 Andreas Heddergott: pp. 136 Dominik Irber: pp. 30, 42, 56, 70, 82, 98 Johannes Peter Steidl: Layout pp. 118, 120, 122, 124, 126 Ulrich Leyermann, 4 media factory: Layout pp. 28, 29, 40, 41, 54, 55, 68, 69, 80, 81, 92, 93 TUM: Junge Akademie: pp. 10, 12, 75, 76, 97, 100, 101, 109, 112, 115, 116, 130-133, 137-141 The respective authors are responsible for pictures and graphics in the project reports.
<b>Address</b>	TUM: Junge Akademie Arcisstr. 21, 80333 München Tel +49.89.289.22064 Fax +49.89.289.22870 jungeakademie@zv.tum.de www.jungeakademie.tum.de
<b>Layout</b>	Andrea Vogel-Denk/Druckerei Joh. Walch GmbH & Co KG
<b>Production</b>	Druckerei Joh. Walch GmbH & Co KG, Augsburg
<b>Number of copies</b>	750





