



Project Report **dare2share**

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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.

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

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..

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 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

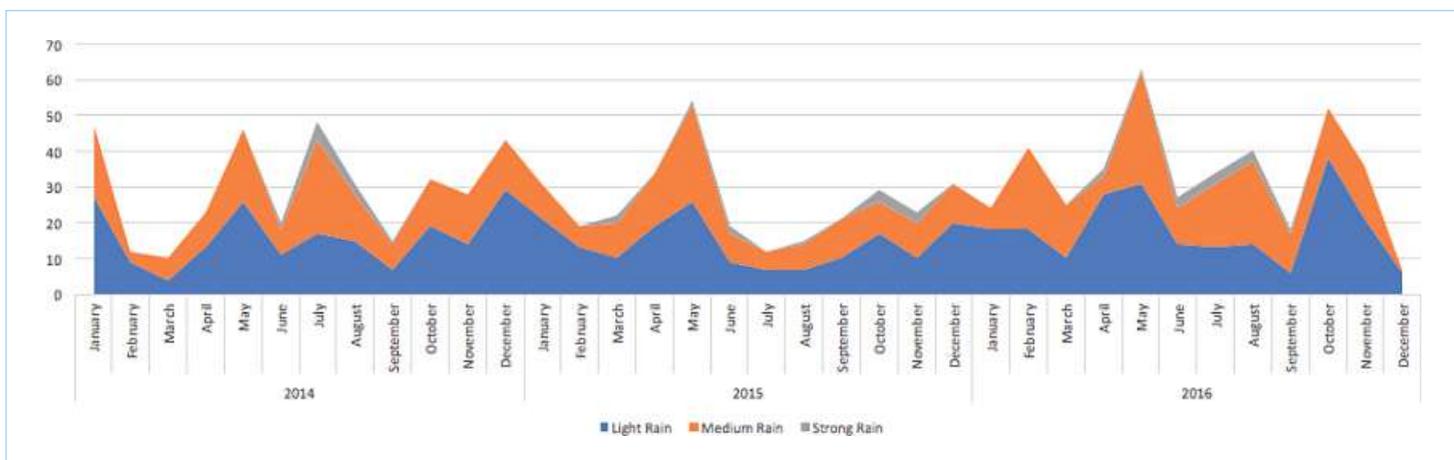


Figure 1: Rainfall analysis Munich 2014-2016, (in millimeter)

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.

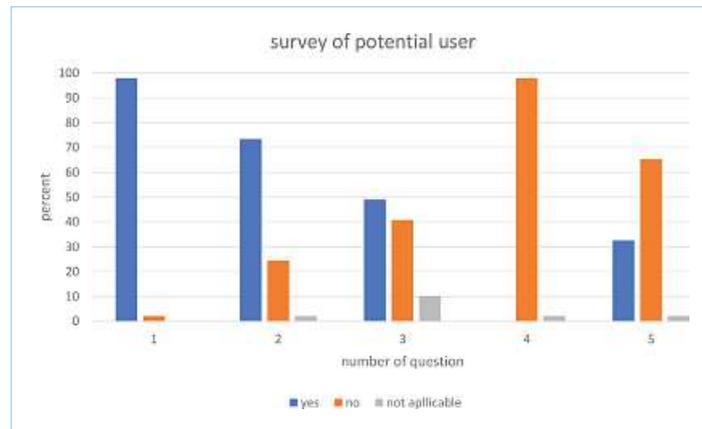


Figure 3: survey of potential user

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.

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- TUTORS** Simon Herzog, Carolin Thiem, Stefan Tippelt
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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.

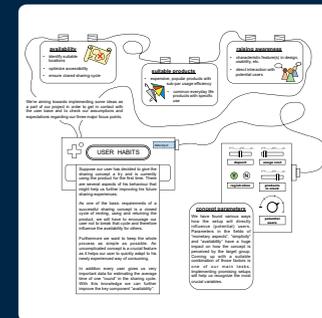
As our sharing cycle, consisting of the three major stations renting – using – returning, can drastically improve the efficiency of a product when operated properly, one of our key goals was to find crucial criteria for initial and lasting success. We came up with three groups of requirements that are 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 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

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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

PROJECT TIMELINE

Umbrella as Sharing Object
Based on the feasibility determined key components of a successful sharing concept - availability, suitability 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 umbrella sharing principle and station network are comprehensively explained with concise process and pictograms.
The project should convince a majority of the sharing system and increase the 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 joint-ownership in sharing models to responsibility in usage. Furthermore direct input of design ideas is actively encouraged.

RESULTS & 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 that 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.

TUM

Umbrella Design
Walking-stick umbrellas: Most people prefer this type for use. As there is no need to kneel post 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.
Uniqap umbrellas: People will recognize them to be part of a sharing system.

Station and Network Design
The 2014 project summarizes aamern's terms are introduced as umbrella sharing stations. In intermediate bottoms and scaffolding bars inside the Dorets, ensure proper outdoor of water and ordering of umbrellas.
The station locations are chosen such that the walking routes between major buildings, the subway stations 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 Beacons in yellow nearby umbrellas.
The 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

inspired by
TUM Junge Akademie

Poster 3: Evaluation Day II

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.

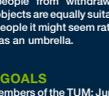
TEAM STRUCTURE & PROCESS
Our team consisted of in total 14 team members from highly different academic backgrounds, two Junge Akademie affiliated and experienced tutors and three mentors, two with a design and one with an engineering and development background. Throughout the entire project phase this 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 force 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

TUM

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 withdraw 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

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Poster 4: Annual Conference 2017