Fachhochschule Köln
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case study

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Abstract

This documentation is the direct result of the group work of three Master students attending the Controlling / Performance Management course. This course is a part of the Masters Program in Web Science at the Cologne University of Applied Sciences. This term paper tries to apply concepts for data capturing, segmentation and interpretation of quantitative and qualitative data to the web service Airbnb in a degree to which they contributes to a set of possible business objectives.

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1 Introduction

Airbnb is a "trusted community marketplace for people to list, discover, and book unique accommodations around the world – online or from a mobile phone" (Airbnb 2014a).

It is one of those new services that allows people to **share assets** over the internet - and is part of the growing "sharing economy". Based on a **peer-to-peer marketplace** owners with space to spare and interested **people from all over the world** can directly interact with each other on the site. This allows the service to **operate on a large scale** and **reduce transaction costs** by doing so. Though it has just been founded in 2008 it already operates in more than 192 countries, offering places in more than 30.000 cities and processing circa 2 mio. transactions per year (Economist 2013).

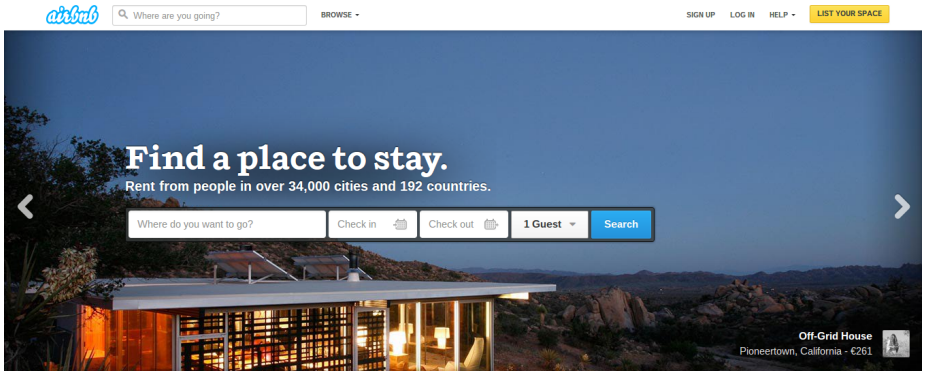

Figure 1: Airbnb Homepage
(Airbnb 2014b)

Beside offering standard accommodations the service also provides **unique, extraordinary places** to stay. Those special locations are one of the major USP of Airbnb and will be advertised as such on the homepage. Another USP is the **ease of use** of the service. As there are lot of places available there has to be an easy way for the interesting person to find what she is looking for – based on her current location, her preferences and/or booking history.

As the booking of accommodations takes place on the internet one of the main issues they have to deal with is **building a trusted relationship** between the owner and the renter of an accommodation. As people are interacting with each other directly without involving a 3^{rd} party it could happen that: the **quality of the accommodation** is not as announced, the booked housing is not available, the owner is not friendly and open hearted, the renter behaves rude or something gets broken down during the stay of the guest.

As the service is operating on a large, world-wide scale those problems are likely to take place frequently and they will have to **manage and deal with customer complaints** and inquiries rapidly.

2 Objectives

The objectives of a company can be explained top-down on three different levels: the strategic, the tactical and the operative level. The strategic level is the highest level. It contains the **future strategy or vision** of the company. The tactical level on the other hand describes the actual steps in terms of **application of methods, principles and other approaches** that are needed to achieve this vision. Placed on the lower end of the spectrum the operative level is describing the needs for successfully doing the **day-to-day business operations** (Boundless 2014).

Following we will list the potential business objectives of Airbnb on each of those levels to understand what are their **short-term and long-term goals** and derive from this findings what they will possibly use to measure their success. The mind maps will show the hierarchy of the objectives

2.1 Strategic Level

On the strategic level Airbnb tries to:

1. establish a trusted peer-to-peer marketplace, that is
2. available to and usable by a worldwide community, which
3. enlist unique, attractive accommodations and
4. provide a convenient booking experience
5. leading to loyal, satisfied customers.

2.2 Tactical and Operative Level

To establish a **trusted peer-to-peer (p2p) marketplace** Airbnb has to build a verified, trusted relationship between the owner and the renter, who have never met in person before.

Make the service **usable and available to a worldwide community** requires not only operating the web-based system on a global scale but also to adapt to local requirements as needed e.g. tax/legal regulations and translation of the web interface. Additionally it has to make the web-based system known to a larger web community to participate on the network effect. That is the more user are using the service the more content will be available that in fact will attract additional users to sign-up.

An USP of the service is the huge list of **unique, attractive accommodations** that are offered by the marketplace. Airbnb has to build up long-term partnerships with owners of extraordinary places to have them available on their platform only. Additionally those special locations have to be advertised as such and placed on an own separated place on the homepage, so that they can be found and recognized with ease. Making sure that the potential customer figures out the special features of such an accommodation at a glance will also help to promote them.

Nevertheless a large part of the user community just wants to figure out a nice place to stay in an **easy, convenient way** based on user preferences or current location. Providing a mobile application is therefore a key to reach this objective. Based on the mobile device the web-based service could figure out the exact location of its user and provide a list of nearby accommodations.

2.3 Hierarchy of Objectives

The following mind maps visualise the hierarchy of objectives. The black node represents strategic levels, the blue nodes tactical levels and the green nodes operative levels.

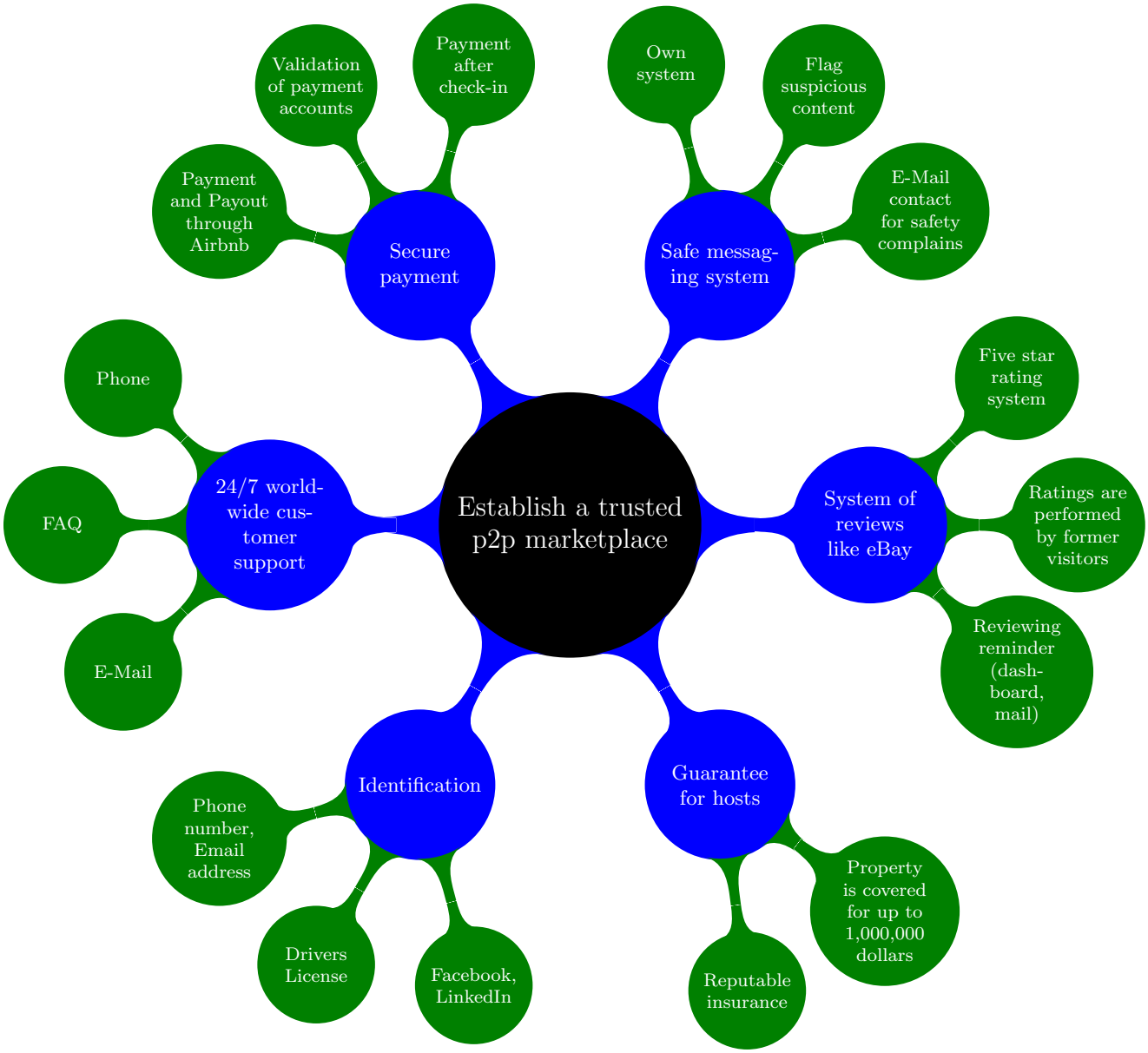

Figure 2: Mind map: Establish a trusted p2p marketplace

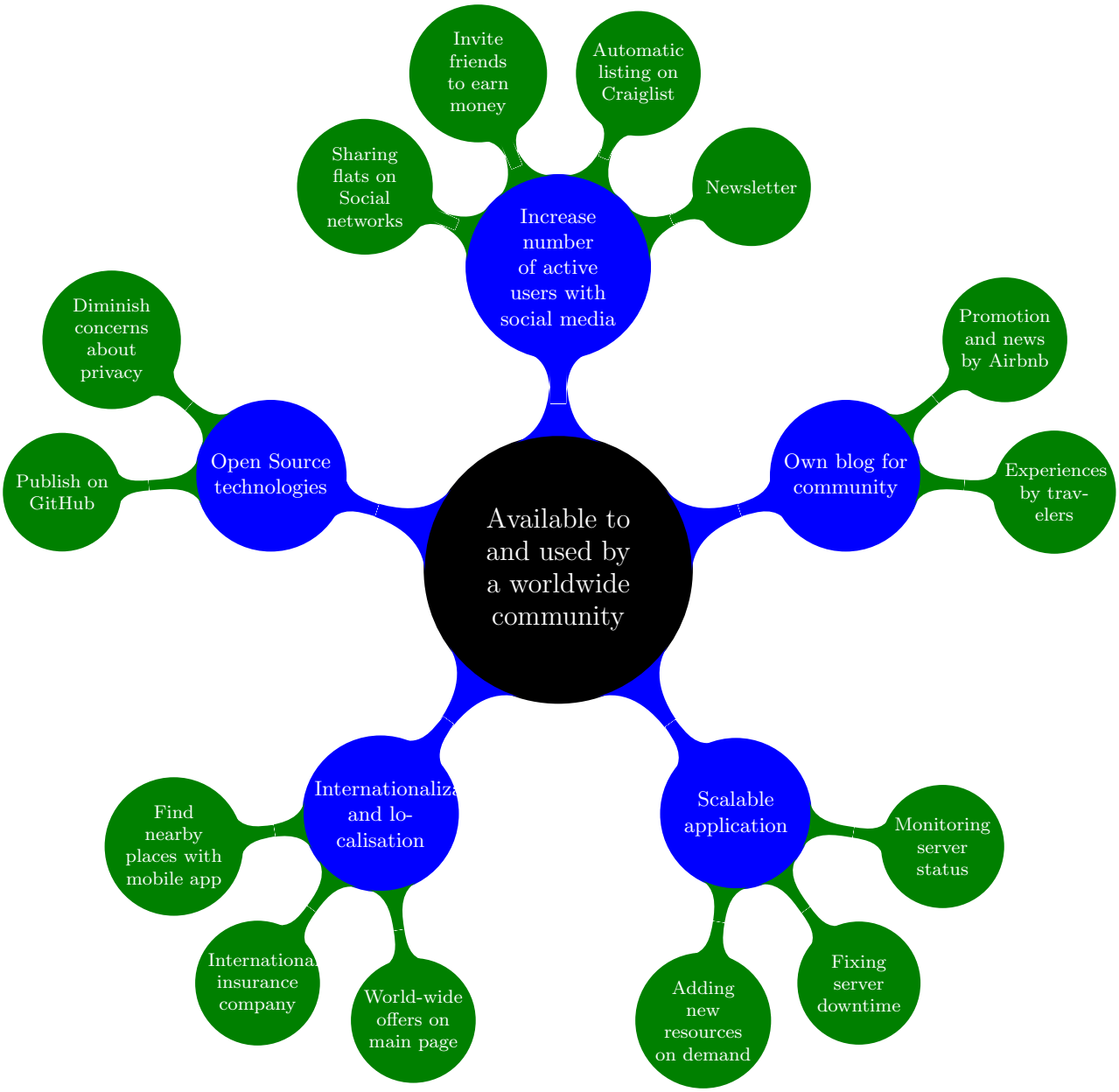

Figure 3: Mind map: Available to and used by a worldwide community

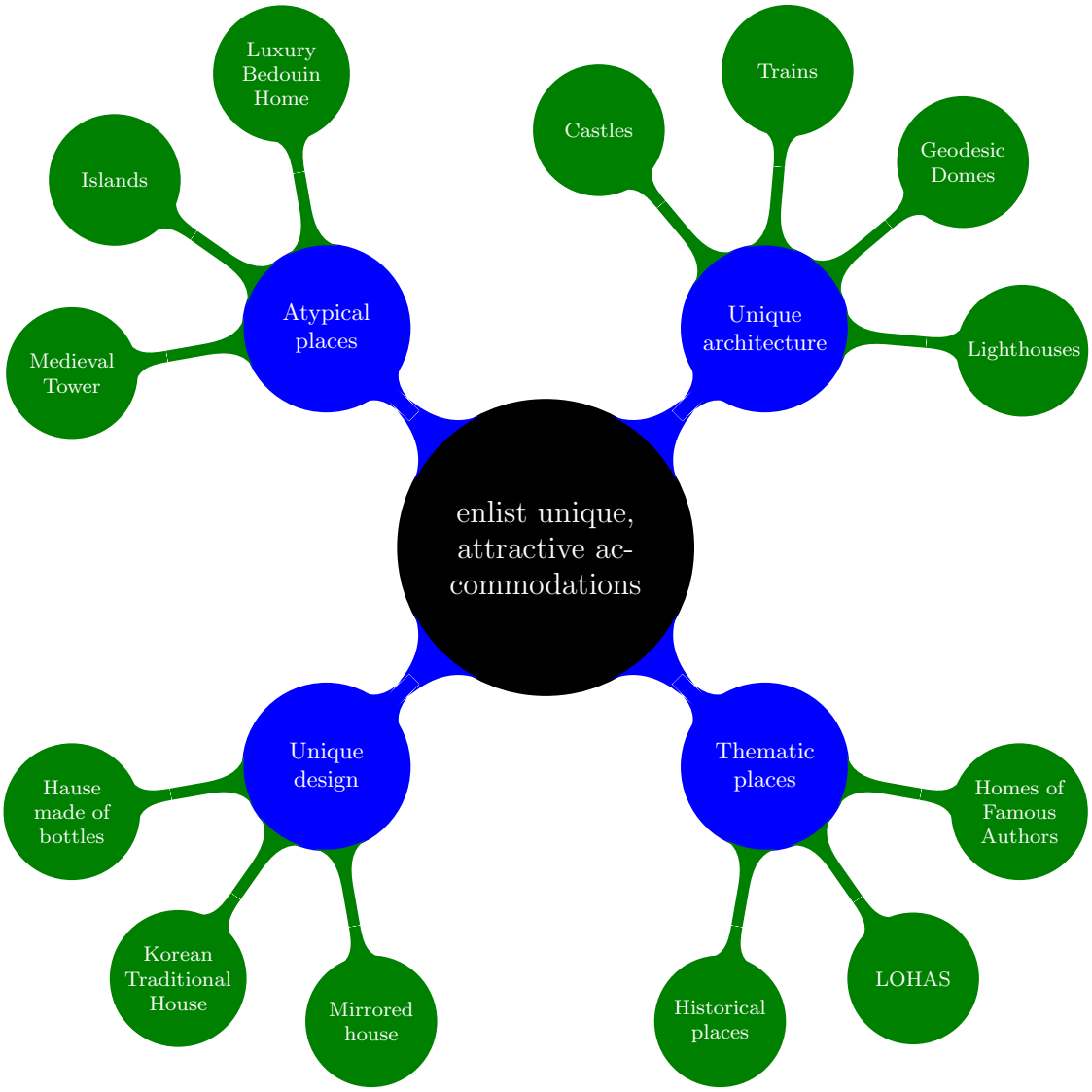

Figure 4: Mind map: Enlist unique, attractive accommodations

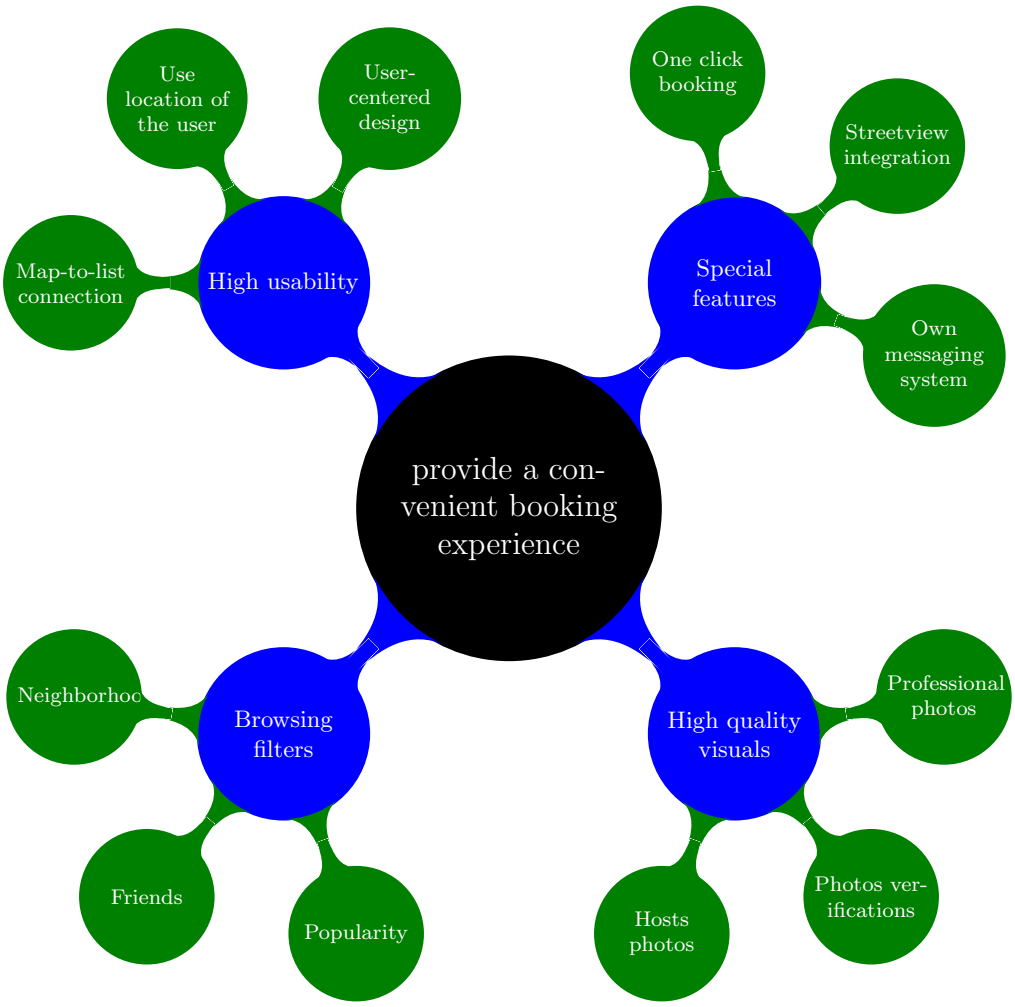

Figure 5: Mind map: Provide a convenient booking experience

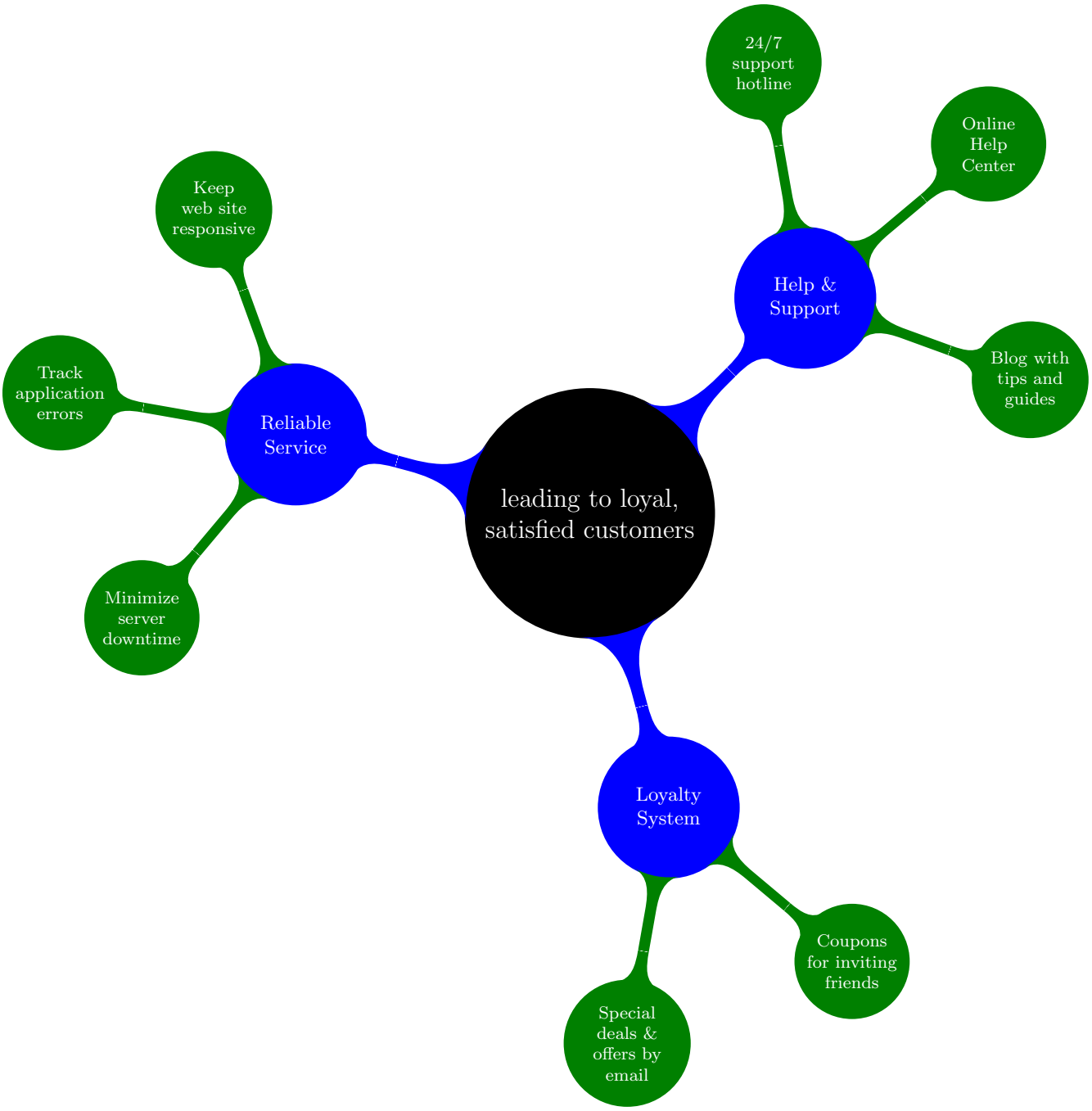

Figure 6: Mind map: Leading to loyal, satisfied customers

3 Data Capturing Methodologies

In this chapter will be a discussion about the methodologies, that can be used to capture analysable data of a web based system. We will evaluate four methodologies and decide which ones are beneficial for our purpose.

3.1 Web Logs

Web Logs contain information related to the interactions between web server and client, e.g. page name, IP address, browser and date time. On the upside these Web Logs are easy accessible, since little preparation has to be initiated. On the downside, the information value is insufficient due to the fact, that they are designed to capture technical information and partial invisibility of traffic by page caching. Nevertheless, these logs do have an indisputable advantage over other methodologies like JavaScript tags: They can be used to analyse search engine robot behaviour and therefore measure the success of our search engine optimisation efforts. This is the result of lacking JavaScript execution, when search engines crawlers visit our websites. Because this is the only information that we cannot retrieve by other more sophisticated methodologies, we constrain the usage of web logs to this purpose.(Kaushik 2007, p. 26-27)

Using scenarios of Web Logs

- Analyse activities of search engine robots to ensure, that search engines are up-to-date. This enables the possibility to control the availability of new content to the worldwide community, because 80% of Internet traffic starts with a search engine(Kaushik 2007, p. 147)

3.2 Web Beacons

Web Beacons are usually small transparent pictures, that are hosted by a third-party server. Every time the website is requested, the Web Beacon will be downloaded, too. The Data Collector (on the third-party server) captures information like visitors, IP address, view time, previous setted cookies (if third-party cookies are allowed) and more. Web Beacons can also be used in emails to verify, that an email had been read. This can be beneficial, because Java Script is rarely activated in email programs. But sometime images are also deactivated and therefore no request will be executed. Web Beacons cannot capture much data, but are very easy to use and can be used over multiple websites. The most common examples are to track how many people saw a banner, that is placed on multiple websites or to control, if an email had been read.(Kaushik 2007, p. 28-30)

Using scenarios of Web Beacons

- Measuring the area of influence of banner advertising by counting the amount of people, who saw the banner and clicked the banner. The latter has to be recorded by URL parameters, that identify the source page. These information can be used to rate the success of banner campaigns, that should increase the users of our international network

- Web Beacons will help us to analyse how successful the email newsletter campaigns are. At least we can figure out how many people actually read the newsletter. People who read the newsletter will probably activate images to increase the reading comfort. Therefore the standard adjustment of clients to de-active images in emails should not be a problem

3.3 JavaScript Tags

JavaScript Tags are currently the state-of-the-art method to collect an huge amount of data on the web. The main benefit of JavaScript tags is that data serving is separated from data capturing. The latter process can also be outsourced to specialized 3^{rd} party vendors. It requires little effort for the business to implement JavaScript tagging as well. Most of the time it will be sufficient to just add a small amount of JavaScript code to the footer of the HTML document to enable capturing the requests. (Kaushik 2007, p. 30-33)

Using scenarios of JavaScript Tags

- JavaScript Tags are easy to use an offer a lot of functionality to track user visits. Therefore it can be assumed that this mechanism is widely used on the World-Wide Web. With the availability of 3^{rd} party data collection services – e.g. Google Analytics, the whole process of data capturing and analysing can be outsourced to such a web-based service. As a result the business can focus on it's main objectives.
- Setting up an in-house JavaScript Tagging solution might be of benefit if the business has a large amount of data already at hand – e.g. customer or product information, that it want to be included into the data analysis on its web site.
- JavaScript Tags will be best combined with another data capturing mechanism like Web Logs to get also data about users who has JavaScript disabled in their browser or to retrieve data from special request (e.g. like download of files or redirects to other web sites).

3.4 Packet Sniffing

Packet Sniffing is a low-level approach to capturing data of web traffic. It works on the physical layer of the network connections. Instead of sending a request to the web server directly it will pass a packet sniffer – either hardware or software-based, upfront. This utility will capture the raw messages that are send over the wire to the server as well as the replies from the server that goes back to the clients. (Kaushik 2007, p. 33-36)

Using scenarios of Packet Sniffing

- Packet Sniffing is quite complicated to set-up and use. On the other hand it gives us a lot of information that are otherwise not possible to collect. We will be using Packet Sniffing to profit from this advantages, e.g. to identify server errors, bandwidth usage and other technical data.

4 Objectives and KPIs

To track the progress toward the operational and strategical objectives of a company it has to define and monitor **quantifiable** measures. Those measures have to be able to show the success or failure of certain targets. There might be some common industry key performance indicators (KPI) but nevertheless to get most out of the KPIs you use to monitor your web site's success they have to be synchronised with the company's strategy (Kaushik 2007, p. 347-349).

4.1 Establish a trusted p2p marketplace

To figure out if the users still have trust in the p2p marketplace we need to collect information about the number of customer complaints, how many of them could not be solved directly as well as the *transaction throughput* on the system. This will give us also hints about the *customer satisfaction* and allows us to see a decline in the usage patterns of the platform more rapidly. In addition we can get feedback from our customers about our *problem solving strategies* in case they are facing issues with the host.

Possible KPIs

- No. of returning customers 2+
- Quality survey about "have you at some point felt like you won't be receiving your money" or "have you at some point felt like your host won't be showing up?"
- Rating of host in survey
- Ratio of mitigated to unmitigated conflict cases
- No. of transactions processed per period
- Amount of transactions processed per period
- No. of revisits per period

4.2 Available to and used by a worldwide community

As one of the main objectives of our service is to establish a platform that is used on a global scope we have to measure the number of customers per region, the number of customer registration per region as well as a ratio of places available to book in various cities around the world. This will provide us with information if we succeed to *attract new users* and *to enlist additional outstanding places*. As our platform relies on a *network effect* to continue to grow we have to continuously attract new users who might recommend the system to their friends or might also offer some interesting places to stay.

Possible KPIs

- No. of cities with more than 20% places to book
- No. of new customers from one country
- No. of countries with more than N customers
- Track origin of requester
- Ratio of visitors to population of the country
- No. of visitors from particular country

4.3 Enlist unique, attractive accommodations

Just having a large pool of accommodations in place might not be sufficient to keep the offers on the platform attractive. We will have to constantly measure the actual set of offerings to figure out if they still *fit the client expectations*, if the *quality of the service* at the location is either steadying or growing or whether we *missed out some regions* in a country that are of interest to our user base.

Possible KPIs

- Location of accommodations (GPS coordinates to figure out distribution over a region)
- Ratio of special "stop words" that are used in descriptions/reviews
- Rating of accommodations in customer survey (satisfaction, uniqueness)
- No. of sharing of accommodations on social networks (recommendation of place through the customer)
- No. of likes per accommodation on our own platform

4.4 Provide a convenient booking experience

The *ease-of-use of our platform* is important to speed-up the process of finding and booking a desired place for the customer. So we measure how long it takes for a customer to finish the process, how long they stay on each site, which steps they take on the site to reach their goal as well as the number of aborts and cancellations, whose can give us hints if the process or the web site itself might be to complicated.

Possible KPIs

- No. of unsatisfied customers (complaints & refunds) per 1000 bookings
- Increase conversion ratio of visitors who booked a place
- Increase conversion ratio of visitors who became hosts
- No. of booking problems (aborts, cancellations, bouncers, ...)
- Major conversion rate
- Minor steps taken to book a place
- Time it took from visiting the site till the booking
- Time spend on each page

4.5 Leading to loyal, satisfied customers

From a technical point of view we want to make sure that our platform is *always available* for the customer and there are *zero down-times* due to server or software errors. Additionally we want to make sure that the system *does not slow down* with an increasing number of concurrent users accessing it. Beside those technical issues we also want to make sure that the existing customers are well served and get help immediately if it is required.

Possible KPIs

- No. of concurrent users
- Network latency
- Page load time (due to amount of processes)
- No. of 404 pages
- No. of 5xx pages (server errors)
- Server down-time/up-time
- No. of users reacting on mail campaigns
- No. of users utilizing the help system

5 Questionary

Not all the desired information can be caught by Web Logs, Web Beacons, JavaScript Tags and Packet Sniffing. There are clickstream holes, that can be easily filled by a methods like questionaries. For example: Website analysts try to find out how someone became aware of a website, but browser settings, wrong redirects or something weird in the links to the website prevents to obtain the referring URL. In this case, a surveys can help find answers to this questions. (Kaushik 2007, p. 64) It is important to know the advantages and disadvantages of website and post-visit questionaries. Website surveys are more effective in retrieving thoughts, that are given during the visit. Post-visit surveys are more effective in getting information of an experience, that happened after a website visit.

Invitations to post-visit questionaries are usually send out via email to the customer after a certain amount of time has passed after the transaction or visit on the web site. On the other hand website questionaries are offered to the user of a web site at the time he is actually interacting with the site. (Kaushik 2007, p. 65-66) We need both kind of questionaries to paint a complete picture. On the one hand to get ratings about the usability and onsite experience, on the other hand to retrieve information about the stay in the accomodation.

5.1 Website Questionary

Not every visitor uses all the available features of Airbnb. We do not want to ask questions, that the user cannot answer. Therefore we will track which pages the user visited and only show questions about subjects, that he can know about.

After the booking process

Do you agree that comments from other people influenced your decision?
Strongly disagree — 1 2 3 4 5 — Strongly agree

Do you agree that rating of the place influenced your decision?
Strongly disagree — 1 2 3 4 5 — Strongly agree

Do you agree that photos influenced your decision?
Strongly disagree — 1 2 3 4 5 — Strongly agree

Do you agree that to find an appropriate place was easy?
Strongly disagree — 1 2 3 4 5 — Strongly agree

Ask this question only if we tracked the visitor used neighbourhoods
Rate your experience of neighbourhoods:
Very Bad — 1 2 3 4 5 — Very good

Did you have any problems during booking?

- No, booking was easy.
- Yes, _____

Rate the overall impression of the Airbnb service?

- Everything was fine.
- I had few difficulties. I'll explain in the comments.
- Experience is bad, my remarks are in the comments.
- Comments: _____

5.2 Post-visit Questionary

We use open questions in order to make qualitative analysis and find out problems which we were not expecting.

After the stay in an accomodation

Did you have any problems getting to the place?

- No, it was easy.
- Yes, _____

Were there any inconsistencies between the place and it's description?

- No, the description is accurate.
- Yes, _____

Were there any inconsistencies between the place and comments on page?

- No, comments are accurate.
- Yes, _____

Was the process of negotiation with host comfortable for you?

- Everything was fine, I had no problems.
- I had few difficulties. I'll explain in the comments.
- My Experience was bad, I'll tell you in the comments.
- It was a disaster! I'll tell you in the comments.
- Comments: _____

Did you have any problems while staying?

- No, it was great.
- Yes, _____

6 Segmentation

This section describes the segmentation, that will be used to provide a usable database to analyse the collected information. The segmentation is divided into larger segments, that covers the three main interests for analysis: acquisition related information, behaviour on the website and the outcome of the users activity.

6.1 Acquisition

The first one is "Acquisition", which tries do identify general information about the visitor like demographic and technical parts. With this information we might for example interfere for which countries, genders etc. we need to improve marketing and also which technical settings might cause errors. But also important for the analysis are the origin of the visitor in regards to identifying if a marketing strategy worked (e.g. which search engine, which keywords etc.). In order to identify, if our website was interesting enough for people to revisit, we will also view at revisits.

- demography
  - country
  - city
  - age
  - sex
- origin of traffic
  - email campaign
  - paid search
  - generic search (including search terms)
  - ads
  - social network
- technical information
  - operating systems,
  - browsers,
  - screen resolutions,
  - browser language,
  - mobile vs. desktop users
- new / returning visitor / former customers

6.2 Behaviour

The segment "Behaviour" covers the actual activities on the website except for some outcome related information. The segmentation of the verifying process and the used search options allow to identify features, that are highly used or rarely used. Based on this information it is possible to substitute particular features or improve them.

- verifying user profile
  - Facebook
  - Google Plus
  - Linked In
  - e-mail
  - mobile phone
  - passport
- find accommodation
  - by neighbourhoods
  - by current location (mobile GPS service)
  - by regular onsite search (including search terms)
  - comparing places
  - communicate with host
  - make a reservation request
- type of visitors
  - hosts
  - customers
  - host and customer
- list accommodations
- promote accommodations
  - on social networks
    - Facebook
    - Twitter
    - Linked In
    - Google Plus
  - invite friends service
  - wishlists
- payment preferences
  - PayPal
  - credit card

  - bank transfer
  - direct deposit

- managing booking
  - get letter of approve
  - refund money
  - cancel

6.3 Outcome

In this section we measure the artefact's of the customer's visit. What is the real value for the site we obtained after the visitor left? Measuring of the following parameters would be important from the KPI calculation point of view. The data must be connected to other gathered parameters via the session information.
We want to save this list of Actions:

- list a place
- delist a place
- rate a booking/accommodation
- abort/cancel a booking
- promote on social nework
  - Facebook
  - Twitter
  - Linked In
  - Google Plus
- complain about a booking
- added a booking to wishlists
- invite friends in service

Also we want to save this list of parameters:

- time to make a booking
- amount of clicks to make a booking
- conversion rate of promotion

7 Results

As the chapters above have shown there are very different aspects that a company like AirBnB wants to collect and analyse from it's active users. These aspects can be summarised into the following categories of the Trinity Approach:

- **Behavior**: First of all they will collect clickstream data to figure out about the behavior of visitors of their site. This massive amount of quantitative data will allow them to better understand how their users interact with the site and infer their intentions.
- **Outcomes**: Based on that information AirBnB can also analyse what the visitors were finally doing on their site and if they have completed their task successfully. The most important part of the outcome analysis is the conversion rate and the profit. AirBnB needs to identify, if the user behaviour lead from the intention of booking to the certainty of booking, because it is the main source of income and thereby the purpose of the website from an economical point of view.
- **Experience**: Although visitors might be able to complete the task on the site successfully the user experience on the site might not be optimal. Users could not find the available options at the specific point in the workflow or might not even know how to proceed on the site. At the end this could lead to unsatisfied customers that will loose interest in using the site. To prevent this worst-case from happening AirBnB will also qualitative data from surveys, interview and usability tests to figure out if and how to improve the experience on the site.

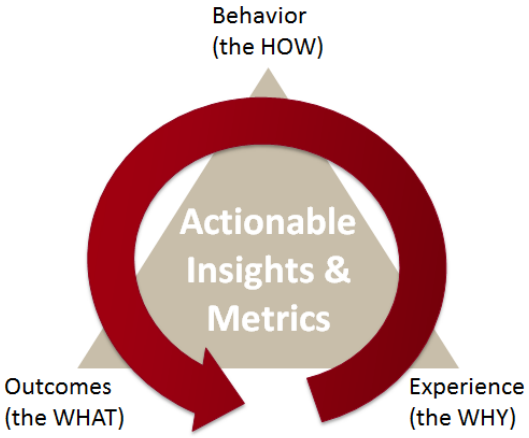

Figure 7: Trinity Approach

All those points are strongly related to one another and can be seen as an never-ending circle (Figure 7). Without the clickstream data of the behavioral model (resembling the "how" user interact) it would not be possible to check for the outcomes (showing the "what" they have achieved at the end). These information are of huge benefit to design the questionaires and usability tests to

figure out the "why" they might succeed or fail in specific tasks. Based on those results AirBnB can further improve their web site and start this process anew to check if the changes will make any difference to the user behavior, outcome and experience.

8 Workload

Name	**Workload in percent**
Andreas Gerlach	33.33%
Iaroslav Popov	33.33%
Oliver Weiss	33.33%

Table 1: Individual Duration

References

Airbnb 2014a
AIRBNB: *About Us*. https://www.airbnb.com/about/about-us. Version: 2014. – Last accessed 23rd April 2014

Airbnb 2014b
AIRBNB: *Homepage*. https://www.airbnb.com. Version: 2014. – Last accessed 23rd April 2014

Boundless 2014
BOUNDLESS: *Levels of Control: Strategic, Tactical, & Operational*. https://www.boundless.com/management/boundless-open-textbook/control/types-of-control/levels-of-control-strategic-tactical-operational/. Version: 2014. – Last accessed 23rd April 2014

Economist 2013
ECONOMIST, The: *The rise of the sharing economy*. http://www.economist.com/news/leaders/21573104-internet-everything-hire-rise-sharing-economy. Version: März 2013. – Last accessed 23rd April 2014

Kaushik 2007
KAUSHIK, Avinash: *Web Analytics*. 1. Wiley Publishing, Inc., Indianapolis, Indiana, 2007. – ISBN 978-0-470-13065-0