The potential of in-train crowdsourcing

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ABSTRACT
Nowadays passenger carriers are improving their services by offering IT-services within their carriers. This paper describes a design science study on whether or not we can let the company crowdsourc activities using these systems and, by doing so, provide the customer a better experience.

As test environment the Dutch Railways (Nederlandse Spoorwegen, NS) new in-train information systems were used. Artifacts were created and adoption was researched utilizing a survey. Some interesting conclusions are drawn on the feasibility of adoption and implementation of crowdsourcing in a moving environment. Adoption is more likely to occur when serious applications are used, as opposed to entertainment applications.

Keywords
Crowdsourcing, trains, transportation industry, onboard information systems, Dutch Railways, NS, digital customer interaction.

1. INTRODUCTION
Trains play an important role in the public transportation system in many countries [3] [4]. Dutch Railways (Nederlandse Spoorwegen, NS) is the principal passenger railway operating company in the Netherlands, with every day more than one-point-two million people (out of a population of 16 million) traveling their trains. NS operates the core railway network in The Netherlands, including parts with a night service, and some of the secondary lines [23]. The Dutch railway network in the highest utilized network in Europe, not surprisingly in a country where 75% of all inhabitants live within 5 kilometers distance of a railway station. 62% of the Dutch utilizes the train at least once a year. To give some more insight in numbers, numbers for 2005 show 14.73 billion passenger kilometers that year, which makes up 30% of the seat kilometers made [19]. This thus means that NS on average transports 70% empty seats. Central in NS’s strategy is making the train an even better alternative to the car. Better services are key herein [18] [17]; for example the provisioning of good journey information, but also deploying the capacities where needed – which also can have direct financial impact by reducing cost. Transporting empty seats comes to a prize.

With the introduction of a new IT-infrastructure in trains, named OBIS (OnBoard Information Services), a system that is currently being rolled out over the largest part of the NS (intercity) fleet, new possibilities arise. At the moment OBIS offers passengers two services: namely (automated) journey information on screens and through loudspeakers, and internet access through an in-train Wi-Fi hotspot. Having Wi-Fi onboard trains means that interaction with (individual) passengers can become a reality, something that were never possible before. How can NS benefit from interaction with passengers in trains, and tap their minds. How can passengers benefit in terms of service by interacting with NS using their mobile phone, tablet or laptop in and around the train? In fact, this means we are considering the potential of (in-train) crowdsourcing for NS.

This paper started off by the ambition to explore the potential crowdsourcing offers both NS and its customers. Crowdsourcing was first coined by Howe [9], when he described a new web-based business model that harnesses the creative solutions of a distributed network of individuals. Crucial to crowdsourcing is the use of an open call format and a large network of potential laborers [1].

This paper follows a design science approach exploring the potential of in-train customer interaction. We look into what new services have potential, what customers want and when they intend to use it for a longer period. This was conducted using expert interviews, creating artifacts and validated by a survey. We will show the adaptability of different crowdsourcing applications, and create a by doing so set a first step towards adoption of crowdsourcing in transportation industry. The current OBIS infrastructure is used as a starting point for our research, and provided a realistic research environment.

2. LITERATURE BACKGROUND
To understand the state-of-art in in-train crowdsourcing we review literature on crowdsourcing as well as in-train internet application. We broaden our scope beyond the sole potential application at NS. A quick insight we got is that the topic is relatively new and undocumented in literature; not many railroads or other large infrastructure providers are currently deploying crowdsourcing techniques.

2.1 Crowdsourcing
The word crowdsourcing was born from the two contributing words outsourcing and crowd. Crowdsourcing represents, as defined by Howe [8]: “the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call”. Examples of crowdsourcing include Wikipedia, or news communities with active user participation (such as in The Netherlands NUfoto and Tweakers.net [1]), but also companies outsourcing their
product design (ranging from t-shirts at Threadless [2] to skis at Dynastar [5]).

In this research we perceive the topic of crowdsourcing as an contribution to the conduct of business by the customer, using IS-infrastructure offered by the business, with or without the direct intention to do so. Business wise, this means a customer will commit a task for free, if the infrastructure is offered to do so. When making use of crowdsourcing, new difficulties arise. One has to create an environment, both technically and social, in which users are likely to adopt the system. With prospect to this, Walter [21] (as a side-effect of his research) that monetary reward is not always the incentive to participate, but also incentives as getting mentioned by name, being part of an expert-community or collecting knowledge. Recently Borst [1] derives to similar conclusions.

Although some tasks are performed better by other persons than a company's own personnel [22]. It should be noted that “sometimes a crowd can return a vast amount of noise that may be of little relevance” [11]. Important to be aware of, considering the example of a train that gets stuck for a longer period of time, and passengers that let off their steam using the information system.

2.2 In-train services

Little scientific literature can be found on the exact subject of our studies: in-train crowdsourcing, or to make it a little wider value-added digital services offered in trains (or airplanes). Websites from different railroads and airlines do however mention some services offered. The French railway SNCF has a free on-board dating service in their newest TGV-trains [13] and Virgin Atlantic Airlines has chat functionality in their onboard multimedia portal [10]. No direct examples of crowdsourcing, better described as additional (digital) services to passengers.

Let us therefore review the state-of-art of internet implementation and usage in trains, as more is known about that. An extensive survey of in-train internet offerings across Europe and Northern America reports on a series of larger scale implementations in Sweden (SJ), the UK (GNR and Southern Trains), Germany (ICE service of DB), and EU-wide at Thalys [6]. Furthermore, pilots are taking place in several other countries. At most railways the internet is a paid add-on service, sometimes offered for free in the first class coaches. Lannoo [12] studied business models for paid internet access, and strongly recommends making internet freely available, at least in the first class. It makes train journeys more attractive, eventually having a positive result on the amount of travelers. Indeed, Fokum [6] points at a study dating back to 2004 that found that 72% of business travelers were more likely to use trains than cars or airplanes if Wi-Fi access was available on trains. This study also found that 78% of these business travelers would use Wi-Fi access if it was made available on trains. However, railways have to be aware that “passengers are beginning to use 3G-capable hardware to connect to the cellular infrastructure directly from within trains’.

A large difference between time spent in trains and other modes of transportation is that many people in the train convert their travel time in activity time [14]: en-route people get involved in activities to be undertaken. This is less the case for people utilizing the car, and far less for people traveling by bus. People perceive time in the train as time well spent – this concept is referred to as the “value of time”. Interestingly enough this perspective is increasing even more with modern ICT’s being introduced.

A 2007 study [14] revealed large differences in the digitalization of (groups of) train passengers. Looking at the adoption of mobile phones they report on an 85% percentage for people between the age of 16-25, and only 26% for people 65 and above. Furthermore there is a difference between the purpose of journeys: for men they measured 68%, for women only. An interesting observation is that 65% of all passengers carrying a laptop are not using them while enroute. This is in line with the percentages for people using mobile phones or paperwork in train. They report an important difference between 1st and 2nd class passengers: 1st class passengers are much more likely to use their phones and laptops.

The study reports on 40% of the work related passengers working in train (10% always, the entire trip, 30% for part of the trip), increasingly this work takes place with a laptop. However, also passengers not seeking for work while in train increasingly take electronic means (such as laptops and smartphones) for leisure purposes, such as playing games, chatting, or typing e-mails or other messages.

3. PROBLEM STATEMENT

Central in the vision of Dutch Railways is the ambition to transform their passengers travel time into valuable own time. Providing maximum comfort is core in this ambition: train passengers should find an environment that offers them everything to work, communicate and relax [18].

3.1 Understanding

NS’ ambition is to make a growth in passengers with 40-60% between 2010 and 2020 [17]. Better trains and improved information provisioning and services are elements to help achieve this. However, it is necessary to better understand what is taking place in operations and how passengers behave.

Not surprisingly Dutch Railways is interested in better understanding their customers and better knowing what is happening in trains. The application of digital customer interaction techniques and crowdsourcing concepts might be a possible approach herein. This provides a basis for improved customer service and savings in operations. NS’ customers, the train passengers, are likely to adopt new technology if it provides them added value in one way or the other.

This study looks into crowdsourcing information retrieval utilizing the in-journey information systems, trying to provide a better customer experience and new or better information sources for Dutch Railways.

3.2 Relevance to the field

There are ample opportunities for the use of new information technology in and around trains. Passengers increasingly get access to better information about their journey. Reverse, for public transport companies it would be useful to know more about their customers, their behavior and travel plans, for example by getting information from the crowd of passengers. The NS could consider to respond to gathered information, by feeding back information (around the follow up), or through incentives such as a loyalty program or consumption reduction coupons. Reduction coupons are not necessarily costing money, as these tend to lead to extra consumption generating more profit for NS.

Furthermore, the Dutch Railways want to provide better customer experience over the entire journey, from door to door and attaining more customers overtime [18]. One of the ways to accomplish this is to provide relevant information throughout
the whole journey. Furthermore, the Dutch Railways want to facilitate this with modern trains [17].

3.3 Relevance to science
It is a new approach for companies to involve large groups of customers feeding information in their operations [2], known as crowdsourcing. To our best knowledge, little research has been done on the particular setting we concentrate upon in our research: crowdsourcing in moving trains (or other carriers) and traveling customers. Therefore, we expect this research to deliver novel and useful insights, both for practice and science. We furthermore expect especially the airline industry to be a source for inspiration.

3.4 Main research question
For conducting this research, the main research question is formulated as following: How can we extend the current in-train information systems offered by Dutch Railways in such a manner that Dutch Railways gets access to a stream of (valuable) information provided by its passengers, and the passengers experience better customer service from Dutch Railways?

3.5 Detailed research questions
For helping answering this question, a couple of sub research questions are deduced. Each sub question is covered by a part of the research. The sub research questions are:

SQ1: What information does NS want from its customers?
SQ2: How can we get customers to interact on a regular basis with NS?
SQ3: What information, application or service does the customer want from NS?

4. RESEARCH APPROACH
To investigate this set of research questions, we applied the design science principle. The Information Systems Research Framework from Hevner et al. [7] is used as a framework for the research. First interviews were held for input, then a design science cycles was conducted, including an evaluation by a survey.

4.1 Interviews
In the first stage, semi-structured expert interviews were used based on the methodologies named by Yin [24]. They were used to gather knowledge about the technical and social environment in which the research was conducted. Next to that the interviews served the purpose to collect input for artifact creation. The interviews led to a long list, found in appendix A, of potential crowdsourcing applications. Each item on the list got rated by the number it was mentioned, expected adoption potential and relevance. The top three artifacts were chosen to examine further using artifacts.

4.2 The artifacts
Based on the results of the expert interviews and the literature review performed, three artifacts are created as input for a feasibility study. The architecture from the current NS applications was leading herein. The artifacts are presented in the form of artificial screenshots, containing the information needed to interpret the application, not offering any real functionality.

4.3 Evaluation by survey
In the last phase, the artifacts are evaluated, utilizing a structured user survey. The survey was executed in trains (that will be) equipped with OBIS systems. First we considered interviewing potential users at stations, but decided to do it in-train, as this concerns the exact environment future usage will have, and as important, passengers have the time while travelling to answer questions and consider the three artifacts, a situation that is different at the station when people tend to be in a rush. As Yin [24] suggest, we made a careful selection of interviewees. Frequent as well as less-frequent travelers of different profiles are questioned about the artifact and about the intentions to adopt these on a regularly basis if these were in place.

After the user surveys no redesign was conducted, as this was not the primary purpose of the study: it is more of an exploration study. Results were used to derive conclusions about potential adoption and to answer the main research question.

5. EXPERT INTERVIEWS
Interviews were held with a set of NS employees in the last week of October 2010. The interviews were conducted at the headquarters of Dutch Railways in Utrecht, the normal working environment for the interviewees. Before the interview the interviewees received a short explanatory written or vocal briefing on the subject for the interview and the larger objective of the research.

The interviewees were explained that the prospected artifacts should be usable in the particular environment of the Dutch Intercity trains with OBIS-systems. The goal of this was to be aware of limitations of the implemented systems (both OBIS and the wall-system RITA) as well as to answer sub question one, concerning what information NS would like to get from their passengers.

Another goal of the interviews was retrieving ideas for crowdsourcing solutions in this particular context that could be offered to customers. To gather these, a more open form of interviewing was used to stimulate creativity and prevent blocking of ideas.

The choice was made for a judgment sample of experts, in contrast to random sampling, as this provided us a maximum utilization of available knowledge in minimal time [16].

In total ten people were interviewed, in seven sessions. The people are working in the following functions:

- Head of the business information development, together with a business information consultant
- Lead architect OBIS project, together with an operational manager of the IT-operations department
- Lead developer of the OBIS project group
- Manager from the Customer Insight department
- R&D manager Logistics Information
- OBIS program manager
- Product manager travel information trains, together with the delivery manager OBIS

5.1 Feasibility
The information gathered over the interviews resulted in a list of possible in-train crowdsourcing/passenger-interaction applications. However only artifacts of which the experts expected technical feasibility were designed for further research. As no real implementation is done in this research, the real implementation cannot be tested. However, a survey was conducted to get insight in the possible adoption.

In-train location-discovery of a customer who uses the onboard information systems is one example of a technical possibility
used in the artifacts designed. This is a functionality currently not in use, but something that might be relatively easy to add by automatically determining the exact Wi-Fi hotspot/antenna to which a customer is connected.

5.2 Chosen ideas
Based on the interviews three artifacts were chosen for further examination. A ranking and grouping system is used to do so. Each idea is ranked with the frequency it was mentioned by the interviewees. A list of all mentions can be found in appendix A. In order to do so, ideas that showed a large overlap were grouped. These groups were then ranked for the expected value for the Dutch Railways. This list gave ground to choose three ideas for further development as (research) artifacts, based on their expected added value, uniqueness and their differentiation. The choice was made for three artifacts, which are Train chat, Train meeting service and Sentiment measurement, which will be explained in more detail hereafter.

6. STUDIED ARTIFACTS
In consistency with Hevner et al. [7] artifacts were used to do research. As previously explained, three artifacts were created and validated by a survey. Each artifact consists of one or more screenshots of mockups showing the proposed application and an in advance defined oral explanation by the researcher of the concept. All artifacts were designed for in-train usage, building on top of the existing OBIS platform and offerings.

6.1 Three artifacts
First, a chat-application with location-based chat. Passengers can chat with people in the entire train, or only with the own carriage. Also personal chat functionality is offered. One of the images made of this artifact is shown in Figure 1.

Second, a meeting service, offering more specific selection methods, like age and gender. An option is available to let somebody declare his location. One of the images made of this artifact is shown in Figure 2.

Third, a sentiment measurement is designed. Three buttons presenting a feeling (positive, neutral, negative) are available at the portal and, optional, it is offered to explain why one is feeling as such. One of the images made of this artifact is shown in Figure 3.

6.2 Privacy
To omit difficult privacy issues, it was chosen to only create artifacts not asking for a login and not otherwise storing private, stateless, data. A login would be difficult to offer in this environment within the complex Dutch privacy regulations. All data used in the intended applications can be made anonymous easily by not storing personal information that could make the user traceable. For the first two applications users can themselves decide what they would like to reveal about themselves, but they should know that this data is not stored for focused – traceable – data mining.

6.3 Crowdsourcing
Each artifact delivers a different data-stream to NS. This information can be added to currently used information streams, or contains information not yet available to NS, or perhaps not in real time. NS can retrieve information and crowdsource activities to their travelers by delivering these applications. The expected information streams are as follows.

6.3.1 Chat application
The chat-application delivers a valuable stream of text-data about what people are up to during their journey. By counting
words and making statistics out of it, Dutch Railways can get insight in the sentiment and subjects of current interest to their customers. Discussions might for example take topics such as the quality of the service given by NS, the state of maintenance of the train, the friendliness of the conductor, the quality of the information provided to the passengers, et cetera. However, gathering knowledge from these chat lines requires smart technology to signalize discussion topics, and to build patterns from it.

6.3.2 Meeting service
The meeting service offers the customer the ability to file his age, sex and other personal characterization. This information can be used in an anonymous form for getting a better picture of customers in the train (at specific times and specific trajectories). One should be aware that such a meeting service would not be of interest to all passengers – however, referring back to the research performed in the UK by Lyons et al. [14] [15] it might still be of interest to a relatively large group of travellers.

6.3.3 Sentiment measurement
Currently NS is conducting surveys for getting knowledge about their customer satisfaction. With the sentiment measurement this can partly be changed by crowdsourcing this to the passengers. It gives real-time and aggregated insight in the sentiment of people in a particular train at a particular trajectory. Enroute, it could be used as a source for information provisioning to this train / these passengers. Aggregated data provides valuable insights about patterns on particular trajectories or in particular trains, that can be a source for targeted improvement programs. Over time, it provides insight in developments in customer satisfaction, also capturing the effects of improvement programs.

7. ADOPTION SURVEY
For testing the possible customer adoption, formulated in sub research questions two (durable adoption) and three (desired services), a survey, as shown in appendix B, was used [16]. A survey, containing the artifacts, was performed to gather both the quantitative and the qualitative aspects. Most important results are shown under section 8.1. The mixed study was conducted in the real world environment, moving trains from Dutch Railways: the future intended application domain. Passengers in the train were approached with the question whether they would like to cooperate in a research exercise. Most people that were approached were willing to cooperate. The surveys have been held on spread over four different days, including weekend days. Both people in first and second class were approached.

8. RESULTS
Thirty people cooperated in the survey. We show the results regarding the expected user adoption from this survey (n=30) here. Combining the results found before with the interviews, we can later answer our sub research questions, and by doing so, answer our main research question.

8.1 Chat application
The expected customer adoption of the chat-application is low. Most people (20 out of 30) mentioned that they like the idea to some extent, but most are not willing to use it. 10 out of 30 people didn't like the idea at all. For further details see Figure 4. Also the expected use of the application is not very high, as Figure 5 illustrates. 15 people mentioned they would not use it at all.

In the open questions, some (8) people mentioned that although they didn’t see any added value in the service, but said that if they were bored, they still might be using it.

8.2 Meeting service
The expected customer adoption of the meeting service is medium. Most people noted that they do like the idea, as can be seen in Figure 6, but only a few are willing to use it (Figure 7). Even less are willing to use it on a somewhat regular basis. A lot of people liked the idea, but said it would better suit somebody else.

8.3 Sentiment measurement
The expected customer adoption of the sentiment measurement is high (Figure 8 and 9). A lot of people are willing to participate and give their opinion (Figure 9), as long as they get a certain amount of feedback on their responses. Some people noted that they would only use it for negative emotions, but others mentioned they would use it whenever possible.
Furthermore the results suggest that the adoption of applications with more serious characteristics, or closer to business, will have better adoption. However, the question whether this is indeed the case cannot be proven for sure: people might not want to tell they will use an application for entertainment or dating. This phenomenon is referred to as “socially desirable” answering.

9. DISCUSSION

Combining the results of our research, we can conclude that crowdsourcing in the train has potential, however several things have to be taken in mind. First, getting real qualitative and clean data out of the three artifacts/sources researched seems hard. Only the sentiment measurement service has real potential for qualitative data gathering, although further insight is needed to understand how passengers in fact utilize such a service in real practice. Do they only provide feedback, as some mentioned, in case they are dissatisfied?

9.1 Validity

With respect to the validity of our research we can ask ourselves a couple of questions.

Are our used methods good and did we do a good job by using mixed design methods?

According to Yin[24] and Van Aken[20] mixed design methods are according to a good way to examine the whole picture, as the separate parts of the research complement the other parts. Furthermore the research framework from Hevner et al.[7] as used is an accepted framework for design science research.

Marshall[16] notes that a small number of cases in a survey is not particularly bad, as long as the questions don’t need to have a big number of participants because of the complexity. We think our

Is our literature research covering enough?

Although we performed an extensive literature search, a literature study performed in limited time can never provide a complete examination. However, we tried to get as complete as possible. Since crowdsourcing is a relatively new phenomenon, little research is published on it. In train interaction between railway and its passengers seems to be an even newer and unexplored domain.

Are our interviews methodologies correct and useful?

Interviews were taken in a semi-structured form to get as much as possible information (unstructured part), but to also get a clear view of all aspects (structured part). Yin[24] proves that this is a good option for this kind of research.

Are our artifacts clear and singular interpretable?

Most people interpreted the artifacts as intended. For some people this was not the case. With the chat-application some people saw the application as a way to meet friends, not for entertainment. Although this might be a good application as well, the application as designed is not directed in this exact direction, and should perhaps be extended with a (secure) login, and friends-list. However, that comes close to established instant messaging platforms that offer exact this functionality.

In some artifacts text was used, meant as an example on how it can be used. This, however, could have influenced one's opinion about the intention of an application and pointed them in a particular direction. It cannot be measured if and how many times this is the case.

Is our survey data correct and useful?

To avoid that data gathered got biased, the spoken text during the survey was clearly defined before and written out in a protocol. If asked for a further or clearer explanation, information provision was minimized in order to provide all interviewees the same data.

As we are working with n=30, we could assume by the central limit theorem that our data is normal distributed. It is however doubtful this is true: young people were more eager to help and therefore more represented. Higher educated people are also more represented than can be expected. A possible explanation is that Dutch students make a lot of long-distance
train journeys due to the fact that they all have a public transport card (as heard in the interviews).

As we were trying to answer rather simple questions, the sample size of 30 cases should be big enough to derive to a set of conclusions [16]. More certainty could be gotten by using a larger sample, but it might not be necessarily.

10. CONCLUSIONS

10.1 Interviews

SQ1: What information does Dutch Railways want from their customers?

The interviews let us conclude that the most valuable data for Dutch Railways is understanding better who is travelling their trains and what trajectories they are traveling. Within the train environment, feedback on the sentiment of the journey, the attractiveness of the train environment, and the feeling of safety are most sought for. This is in fact qualitative data about the sentiment and feelings of the customers.

10.2 Survey

SQ2: How can we get customers to interact on a regular basis with Dutch Railways?

The highest ratings on the sustainability-questions were answered for the sentiment-measurement. Most people also clarified that if they felt that it was useful, they would likely keep using the application. For the entertainment applications (chat, meeting service) the survey did not provide proof that a durable and stable adoption can be expected.

SQ3: What information, application or service does the customer want from Dutch Railways?

Customers are most likely to adopt applications that provide them the feeling they contribute to something worthwhile. Also applications closer to the core business are more likely to get adopted. There is however a group of customers who want entertainment services. These customers are not likely to adopt the more serious applications.

10.3 General conclusions

Crowdsourcing in the train and its adoption is feasible. Higher adoption can be expected when more serious applications are developed. The research revealed that a precondition for successful adoption of any application is feedback to the customer on the use (or not) of the data.

Dutch Railways (NS) can retrieve real-time information, currently not available, to detect a social or technical problem in specific trains. Furthermore they can enrich their current information streams with the information from these systems.

10.4 Future Research

Future research can be done in a couple of ways. As this research explored the feasibility and likeness of adoption of three different artifacts, deeper research can be done. However, the recommended next step would be real implementation of a couple of applications and make a working test-environment. A living lab environment with short development and test cycles.

This research might be of help to NS in further designing services for the double-decker trains currently in renovation, that are going to get an opposite of the silence compartment, a relax compartment for people willing to meet and talk.

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12. REFERENCES


APPENDIX A: LIST OF MENTIONED APPLICATIONS

This appendix contains a list of the applications mentioned in the expert interviews held as part of the research. Lists are sorted by a field of information they can provide, and ranked by the number of mentions. Common ideas are grouped.

Chosen ideas are marked italic. Location information and services(*) is not chosen, but used as part of an artifact indirectly anyhow.

A.1 Measurement and customer profile
5. *Sentiment measurement*
4. Notice and complaint form
3. Community of shared interest
2. Tips & tricks on how to travelling
  2. Survey
  2. Counting people
  1. Travel information
  1. Safety measurement
  1. Adapted advisory

A.2 Infotainment
5. *Meeting services*
3. *Chat*
3. Social networks
3. Location information and services*
3. Games
  1. Webcam of destination train station
  1. Weather services
  1. Speed
  1. Narrowcast
  1. Follow a friend
  1. Broadcast on the screen

A.3 Retail
1. Top 10 of products
1. Special offers (food)
1. Selling of e-books
1. Retail of long distance train tickets (NS HiSpeed)
1. Offering VoIP
1. In-train brainstorm
APPENDIX B: QUESTIONS OF THE SURVEY

B.1 Common knowledge about the questioned person

- Hoe lang is uw gemiddelde reisduur? (minuten)
- Maakt u wel eens gebruik van het internet in de trein (via OBIS)? (Ja / nee / nee, maar ooit geprobeerd)
- Wat is de reden van uw reis? (Woon-werk, zakelijk, sociaal-recreatief)

B.2 Explanation and questions for each artifact

For each artifact an explanation was given, as follows. Thereafter the same set of questions was asked every time.

B.2.1 Train chat
- Chatten met mensen in alle treinen, uw trein of uw treinstel
- Met iedereen, of 1 persoon

B.2.2 Artifact meetingservice
- Chatten met mensen in alle treinen, uw trein of uw treinstel
- Iemand ontmoeten om mee te praten
- Zoeken op kenmerken

B.2.3 Artifact sentimentmeting
- Direct en simpel uw ervaring met de reis aangeven

B.2.4 Common questions
- In hoeverre vindt u dit een leuk idee? (Helemaal niet, 1 tot heel erg, 5)
- Waarom vindt u dat? (open)
- Zou u deze toepassing gebruiken? (Nooit, 1 tot dagelijks, 5)
- Hoe vaak verwacht u het te gebruiken (ten opzichte van uw treingebruik)? (in procenten, per 10%)?
- Zou u het blijven gebruiken? (Helemaal niet, 1 tot heel erg, 5)
- Waarom zou u het wel of niet blijven gebruiken? (open)
- Verwacht u een bericht of informatie van de NS na het gebruik? (Helemaal niet, 1 tot heel erg, 5)

B.2.5 Demographic questions
- In welke leeftijdscategorie valt u? (18-24, 25 – 40, 40 – 60, > 60 jaar)
- Wat is uw geslacht? (Man/vrouw)
- Wat is uw hoogst genoteerde opleiding, of opleiding die u momenteel volgt?
  - geen
  - lagere school/basisonderwijs
  - lager begroeps- en beroepsonderwijs (LBO), voortbereidend beroepsonderwijs (VBO)
  - lagere/middelbaar algemeen voortgezet onderwijs (mavo)
  - middelbaar beroepsonderwijs (mbo)
  - hoger algemeen voortgezet onderwijs (havo, vwo)
  - hoger beroepsonderwijs (hbo)/kandidaats
  - universitair
- Vindt u dat u handig met techniek bent? (Helemaal niet, 1 tot heel erg, 5)
- Wat is meestal de reden van uw reis? (Woon-werk, zakelijk, sociaal-recreatief)