

railway station; customer satisfaction; customer service; improvement

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ANALYSIS OF CUSTOMER SERVICES IN RAILWAY PASSENGER STATIONS USING A HOLISTIC METHOD - APPLICATION TO NEWCASTLE CENTRAL STATION

Summary. In this paper, we look at the level of customer satisfaction as well as customer services in a passenger railway station. Specifically the objective of this paper is to develop and employ a simple method for analyzing the customer satisfaction in railway stations to help us identify ways for improving both the customer service and the station design. The method developed is applied for the purposes of Newcastle Central rail station. After having studied different approaches we used a survey to collect the necessary data for analysis. A comparison of the opinions of different categories of rail station users has been undertaken. As a result different areas for improvement have been identified. This paper can be seen as a starting point for further research on a detailed customer satisfaction analysis for Newcastle Central.

ANALYSE DER KUNDENSERVICE EINES PERSONEN-BAHNHOFES IM ZUGVERKEHR MIT EINER GANZHEITLICHEN METHODE – ANWENDUNG FÜR DEN HAUPTBAHNHOF VON NEWCASTLE UPON TYNE

Das Resümee. In dieser Arbeit werden wir mit Blick auf die wachsende Nachfrage im Personenzugverkehr einen Bahnhof auf Kundenservice und Kundenzufriedenheit untersuchen. Das Ziel dieser Arbeit sind die Entwicklung einer vereinfachten Methode, um die Kundenzufriedenheit zu analysieren, und Optimierungspotentiale zu identifizieren. Die entwickelte Methode wird im weiteren auf die Fallstudie des Hauptbahnhofs in Newcastle upon Tyne angewandt. Nach der Verbindung und Vereinfachung verschiedener Ansätze verwenden wir in Umfrage, um die notwendige

Informationsbasis für einen Vergleich mit dem gewählten Ansatz zu gewinnen. Wir erwarten die größten Bereiche mit Optimierungsbedarf herauszustellen und konkrete Maßnahmen zur Verbesserung vorschlagen zu können. Diese Arbeit kann als Basis für weiterführende Forschung oder eine detailliertere Kundenumfrage am Hauptbahnhof in Newcastle upon Tyne dienen.

1. INTRODUCTION

It's been almost 190 years since the first railway connection in the UK has been built connecting Stockton and Darlington, which was used only and exclusively for hauling minerals. In result the Great Britain railway system is one of the oldest systems in the world. Nowadays, Great Britain railway system has a system consisting of approximately 15,754 kilometres railroad track and over 2,500 stations managed mainly by different infrastructure managers such as Network Rail, East Coast, First Great Western, South West Trains or Virgin Trains (Office of Rail Regulation, n.d). The privatization of British Rail, in 1993 separated subjects in infrastructure and operations, so British Rail was divided in rail track (responsible for the infrastructure, i.e. the track, stations and depots), and residual operating company to run all the other services until they were sold or franchised. This privatization had as main objective the market division in order to keep the stations competitive and focus in customer service, since the demand was also growing. In fact, the flow of people from one place to another has experienced a significant growth. Within the last twenty years rail passenger journeys doubled- from 740 million of passengers in 1993-94 to approximately 1588 million of passengers in 2013-14 (Office of Rail Regulation, n. d.). As the demand rises, it becomes more and more important to manage and develop an adequate infrastructure.

“Railway stations play a vital role for passengers, non-travelling users and the communities in which they are located. They serve the growing needs of an increasingly mobile population and are used by a wide range of users.” [1]

This diversity of users and functions in a station led to new needs, not yet covered by the previous design and management. The expectations towards the quality and services of a railway station have experienced a shift. While the initial service of providing access to a transport mode moved to the background, people perceive a railway station and especially a central station in the first place as a mall or a social sphere and a place to spend free time. The passenger's first interest in the train station is still the journey itself. People use train stations primarily as means of access to the railway, but also to meet family, to shop, to work or just for entertainment while they are waiting so the station needs to be adapted to that activities. Today people want to feel welcomed and good in public places. Obviously, not all the stations need the same level of modernization because that wouldn't even be feasible, but all of them need to be able to answer its passengers' (and other entities') expectations

Beyond that, an integrated approach is mandatory for the improvement of the whole system and in order to avoid 'Gap' Stations¹ or non-integrated solutions. Both the growing demand and requirements, led to the need of having better organized stations and networks. In order to achieve that, it started to appear big distribution centers, providing distribution and long distance services. Hub's definition is raise on that concept of big center. Hubs are connected between them with spokes and they ensure the correct circulation of the flows (information, materials, people...). For a relatively large train station, it is mandatory to work like a hub, having different types of connections with other hubs or small centers, in order to make full use of the available resources.

In this work, the research did not go as far as that, but the first step in Newcastle Central Station has been set and his paper provides the analysis of the single station and its requirements in a customer oriented approach.

¹ 'Gap' stations are those that distinguish themselves negatively among others. That distinction could happens in terms of facilities, services provided, maintenance costs or other characteristics.

This research project aims to display the improvement potential of the central station of Newcastle upon Tyne. After identifying the areas with room for improvement this work displays concrete measures to reach this potential for a better customer experience.

The objective of this research is to identify a method for analyzing customer services in railway passenger stations using a holistic approach, in order to improve the station's way of work and customer's satisfaction, guaranteeing quality in customer's service and facilities. Especially the focus on intermodality plays a major role in the development of railway stations.

After researching existing methods, approaches and benchmarks relating the customer service of a railway station this work uses a merged and simplified combination of the related approaches. Based on this we define our method and approach for this work and the case study. The necessary information base and date is provided by a customer survey in Newcastle upon Tyne. After analyzing the results of the survey and comparing the results with the mentioned benchmarks in other publications.

Using the method explained above, it is expected to be possible to identify potential improvement and to give concrete examples to improve the customer-orientation. At the moment the station has been refurbished and therefore the level of satisfaction should be relatively high. However it can be expected that there are still unmet needs and that the analysis will show concrete areas with improvement potential.

2. CURRENT SITUATION

Newcastle Central Station (NCS) opened in 1850 in order to replace three other smaller stations. It is the most important station in the East Coast Main Line between London and Edinburgh and it has been updated within the years in order to properly respond to the customer's needs [4]. In the last ten years the population moving to and from the central station registered a significant increase from approximately 5.7 million in 2004/2005 to almost 8 million in 2011/2012.

In order to answer the increasing demand, the train station is under construction since 2013 in order to improve customer service (more ticket machines, replacing the existing travel centre) and facilities (improved toilets, signage, parking lot and cycle park, waiting rooms, lifts). The construction works are ongoing as the surrounding area needs to be redeveloped as well. Apparently the operator Network Rail will take over the central station by the year of 2015 and will face the challenge of satisfying the customers and pursuing their vision of the central station.

3. METHOD

3.1. State-of-the-art

This works methods are based on three different works that are related to the analysis and the design of railway stations: The 'Guide to Station Planning and Design' from railway operator Network Rail [1], the review on 'Better Rail Stations' by Green & Hall [2] and the 'National Rail Passenger Survey Autumn 2013 Main Report' [7]. The approach used in this work combines elements of all papers in order to form a suitable method for these concrete case study. The National Passenger Survey hereby will be used as a benchmark.

The Guide to Station Planning and Design [1] explains which matters should be considered in order to assess an existing station or design a new one. According to the Guide, station buildings should have the following characteristics:

- Welcoming;
- Safe to use;
- Easy to navigate;
- Contribute positively to the overall journey experience.

In order to get that characteristics to a building, several actions can be provided affecting passengers, operators and management needs. The Station design has to meet the needs and aspirations of all affected stakeholders. This compromise demands a clear differentiation and prioritization. According to the Guide there are two different priorities (spatial priorities and user priorities) and three different users (clients, station managers, operators). They have different motivations, but the expectations towards the station are similar.

They expect the station to be clean, efficient, safe and secure, and providing reliable services. They want their activities to be efficient, either in financial terms or social or individual terms. Spatial priorities are related to the physical design that need to be adapted to the user's needs and tasks. In spatial terms, it is possible to split the station area in three different zones (Access and Interchange Zone, Facilities Zone, Platform zone) sometimes not clearly defined, with different requirements and characteristics [2].

The separation of user and spatial priorities is often not possible. Disregarding the priority orientation the Guide proposes a framework approach based on the four following perspectives:

Usability	Consider safety, security, legibility and accessibility in the station design
Operability	Planning and care about the management and integration between operations
Quality	Incorporates system performance, accessibility and function
Value	Value for money, environmental and ecological impacts

Inside each theme, there are some design principals, which include one or more criteria, depending on the stations itself. The evaluation then highlights the areas with need for improvement based on a traffic light system.

Green & Hall proposed different four areas that a train station should focus on: access, information, facilities and environment in future franchises. They established minimum station standards that should be used in a station in order to assess its performance. Disregarding the size of the station they propose an overall satisfaction of 80 % as a target to reach. Further they explain an optimization as a tool for improvement measures. That plan should provide specific measures and the implementation strategy. In a next step regional property teams and the station management are cooperatively responsible for the implementation of the plan.

Twice in a year *PassangerFocus* [7] – an independent public body set up by the Government - makes a survey about satisfaction in passenger. The results in Spring 2014 (this is the latest benchmark in terms of trains services overall satisfaction) were very promising for rail operators: overall satisfaction by Train Operation Companies (TOC) varied between 72% and 96% and reviled an overall satisfaction of 82 - the overall satisfaction developed accordingly. The standards should cover the following issues:

Access	Should be easy for all the transport modes connected to the train station directly or not (signalling, assistance ...) taking into account that train journeys aren't door-to-door as car journeys; efforts to transfer car drivers to cycling, walking or public transports
Information	Scheduling and timetables, as well as inconveniences, delays, prices and integration with other modes of transport
Facilities	Should incorporate activities and places to stay during waiting periods, basic needs, ability to communication
Environment	Safety, security, energy and green design

That same survey [7] revealed that the areas with the lowest score (below 50%) were facilities for availability of seating (46%), the choice of shops/eating/drinking facilities available (47%) and facilities for car parking (49%).

In 'Future Railway Investment: Consultation paper summary of responses', conducted by the Department for Regional Development, there are some conclusions that can be integrated in this matter. Respondents agreed that the main direction of future investments should be to maintain present network and train fleet to the highest possible standard, but also improve passenger capacity on the existing network. It is also said that there is a need to remove bottlenecks in the system in order to improve or maintain journey times, and it introduces more halts [3].

3.2. Method implemented for the purpose of this study

The methods suggested in these three approaches were the starting point for the analysis approach of this work. As the short period of time and the limited resources allow no analysis on a detailed level such as the approaches in these papers the methods were merged and simplified for this case study. The new and lean approach will use the following steps and elements:

1. Definition of the main areas
2. Survey design and development
3. Survey analysis
4. Conclusions and recommendations

In the first step it was necessary to define the main areas, in order to assess if, in customer's view, the station fits its purpose. Those areas are:

Information	To assess if the information provided is enough, if it is useful and if there are any barriers that prevent the free flow of information
Infrastructure	To assess how people feels about the overall environment, if there are enough seats, litter bins, toilets, shops
Design	To assess is people think the station is comfortable
Accessibility	To assess if the other modes of transport are well integrated, if there are any problems reaching other modes
Peak times	Performance and capacity during busiest hours

In the second step, the main goal was to keep the questions as simple as possible. The open and closed questions are designed to be easy to understand and to avoid limited options to answer.

Main goals of the survey analysis are to monitor the sample profile and to evaluate the overall satisfaction and areas with room for improvement.

To identify these areas a comparison with the previous mentioned benchmarks and perspectives is an offer a foundation. In a final step the combination of the open and closed questions form the conclusion and basis for the recommendations.

It should be noted that the methods applied in this case study are limited, since their perfect description would require much more resources that the ones which were available. Although that, this analysis can be a good starting point for a more advanced study in this area in the future.

4. APPLICATION

The analysis is based on a customer survey that was carried out in several places with a random sample. The survey differentiates the respondents regarding their age, their gender, as well as their

travel frequency to the central station of Newcastle and their basic transport mode from and to the station. A combination of closed and open questions analyses the opinion of the respondents. The questions targeted the opinion regarding the main areas that were explained in the previous chapter. The closed questions offered the different answer options yes, no or I don't know. In addition the respondent was able to state room for improvement and give concrete examples of unmet personal needs. The target is a combination of quantitatively evaluable answers and qualitatively evaluable statements or recommendations.

4.1. Sample profile

The survey was answered by 156 people within the age range of 13 and 80 years and with an average age of 36,2 years. Compared to the average age in Newcastle upon Tyne of approximately 36,9 years the sample pictures a realistic sample of the population in Newcastle [5]. With 49% female and 51% male respondents, the sample is close to the actual situation in Newcastle of 50% male and 50% female residents [6]

The following charts show the differentiation of the sample in travel frequency to the central station and in the different transport modes from and to the central station.

The respondents cover all possible transport modes and customer types regarding the travel frequency to and from the station. In summary therefore, it can be said that the sample offers a valid base for analysis and a detailed differentiation. It is a realistic sample of the overall population in Newcastle upon Tyne and represents a diverse set of customer segments.

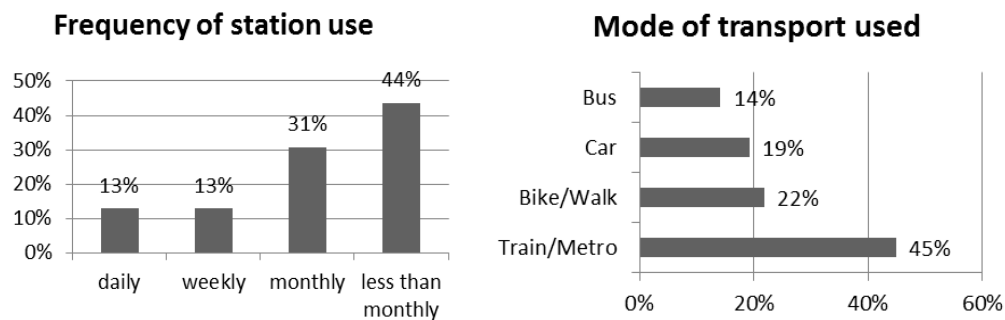


Fig. 1. Sample profile in terms of frequency of use and mode of transport used to access the station
 Diag. 1. Profil der Stichprobe in Bezug auf die auf Reishäufigkeit und das bevorzugte Transportmittel

4.2. Results analysis

The following charts (Fig. 2-6) and evaluations show the results of the customer survey. Every question is presented with its proportional and quantitative outcome.

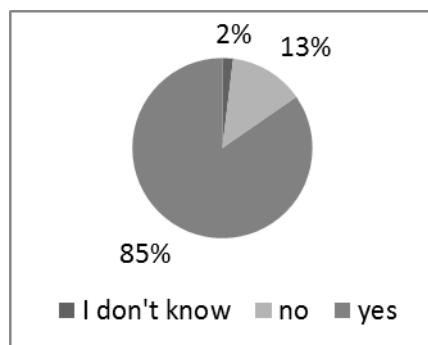


Fig. 2. Survey, Question 1
 Diag. 2. Umfrage, Frage 1

Question 1: Do you think there is enough information provided at the central station of Newcastle upon Tyne?

Out of our sample 132 people answered *yes*, 21 people answered *no* and three people stated that they *don't know*. Despite the people who walk or cycle from or to the station (76% *yes*) all other groups of travel frequency of transport modes show results for *yes* above 80%.

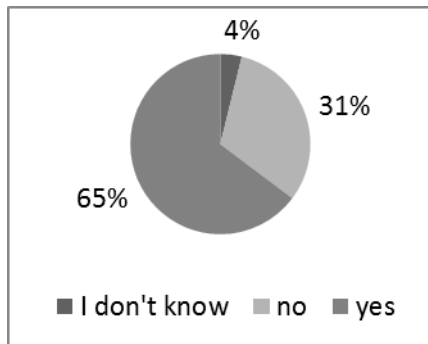


Fig. 3. Survey, Question 2
 Diag. 3. Umfrage, Frage 2

Question 2: Do you think the infrastructure of the central station of Newcastle upon Tyne is sufficient?

Within our respondents 101 persons perceive the infrastructure as sufficient, 49 persons see room for improvement and six people answered neutral with *I don't know*. The most concrete examples of room for improvement targeted this area.

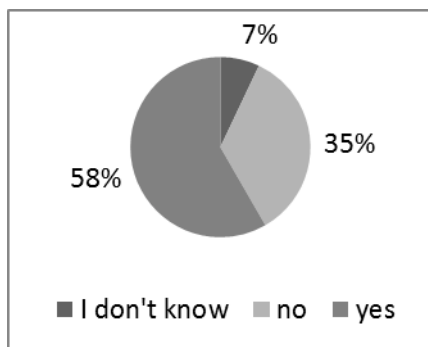


Fig. 4. Survey, Question 3
 Diag. 4. Umfrage, Frage 3

Question 3: Do you like the Design of the central station of Newcastle upon Tyne?

Asked for their opinion on the recently refurbished design only 91 people mentioned that they like the look of the station and answered *yes*. While eleven people were not sure, 54 people do not like the Design.

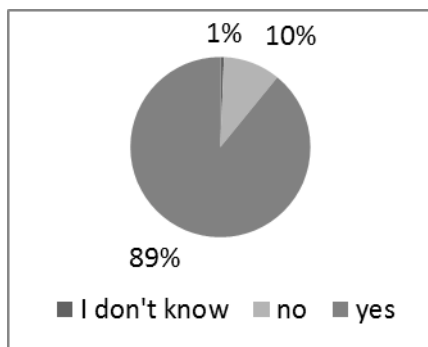


Fig. 5. Survey, Question 4
 Diag. 5. Umfrage, Frage 4

Question 4: Do you think the central station of Newcastle is easy accessible?

Out of the 156 respondents 139 consider the central station of Newcastle upon Tyne as easy to access and well integrated into the transport network. On the contrary 16 people answered *no* and one person abstained from voting for one side.

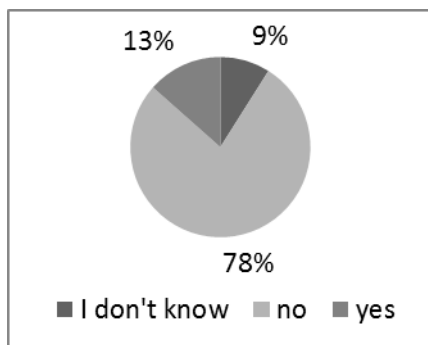


Fig. 6. Survey, Question 5
 Diag. 6. Umfrage, Frage 5

Question 5: Do you experience inconveniences during peak times at the central station of Newcastle upon Tyne?

For a majority of 121 people rush hours and peak times are no cause for inconvenience. Inconveniences occurred to 21 respondents while 14 people *did not know*. Within the daily travel frequency customer segment even 80% experience no problems during peak times.

The overall satisfaction was determined by the average of ‘positive answers’² in the five questions presented above and all questions are valued equally. The average satisfaction is 75%, below the base value of 80% purposed by Green & Halls.

The open questions of the survey supplement the closed questions with concrete examples of customer ideas for improvement. Within our respondents, 102 people (65%) wanted to contribute with concrete examples. In this paragraph we present the top five frequently mentioned wishes of the customers and link all mentioned ideas for improvement to the main areas of our analysis.

Figure 7 shows the top 5 needs identified for improvement that customers mentioned during the survey. The percentage shows the times that a need was mentioned among the 102 people that contributed with concrete examples about needs for improvement. In the case of public toilets 28 persons (27,5%) mentioned a need for a better access to public toilets.

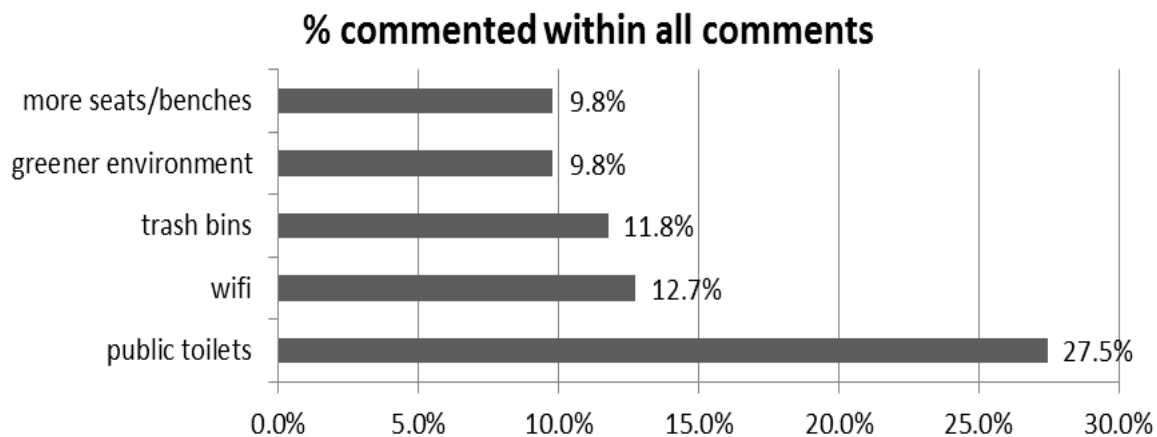


Fig. 7. Most frequently suggested improvements in (% of comments including)
 Diag. 7. Häufigste vorgeschlagene Verbesserungen (% an beinhaltenden Kommentare)

If one links the needs for improvement to the main areas of our analysis, it is possible to rank the areas according to the times that a need was mentioned within all suggestions. Results are presented in Table 1. No person said that there is a need for improvement with regard to peak hours, however the respondents who answered the open questions named 18 different needs related to infrastructure with a total frequency of 94 times (63,5% out of 148 times mentioned).

Table 1

Number of needs and mentions per main area (% of mentions)

	Information	Infrastructure	Design	Accessibility	Peak Time	Sum
needs	7	18	8	2	0	35
mentioned	20	94	23	11	0	148
	$\Sigma = 13,5 \%$	$\Sigma = 63,5 \%$	$\Sigma = 15,5 \%$	$\Sigma = 7,5 \%$	$\Sigma = 0,0 \%$	

² ‘Positive answers’ doesn’t mean ‘yes’ answers, but the ones that show positive overall satisfaction related to the question (Q1: yes; Q2: yes; Q3: yes; Q4: yes; Q5: no).

5. CONCLUSIONS AND RECOMMENDATIONS

The overall picture shows a very positive and satisfied customer. There are some tremendous results that show the well performing dimensions of Newcastle Central Station. Out of the sample, 78% experience no inconvenience during peak times. A share of 85% of the sample regards the information that is provided as sufficient. And the best result for the station is the intermodality, out of all people who answered the survey, 89% believe that the Central Station is easy accessible and well integrated into the transport network.

The other two areas- Infrastructure and Design- show lower results, 65% and 58%, respectively. The future intervention should focus first in these two areas. In fact, the open questions show the same, the most suggested improvements meet these needs- public toilets (27.5% of people who suggested improvements), Wi-Fi (12.7% of people who suggested improvements), trash bin (11.8% of people who suggested improvements), greener environment and more seats (both with less than 9,8% of people who suggested improvements). All the proposals are related to the Infrastructure, except the proposal of 'Greener Environment' that aims at the 'Design'.

In order to enable the comparison between the sample analysed and the studies of Green & Hall, it was necessary to assume a method to calculate the 'Overall Satisfaction' within the sample. To get that, it is assumed a simple average within the five areas. The overall satisfaction within the sample was 75%, lower than the 80% suggested by Green & Hall. This result confirms that the station still needs some improvements, particularly in infrastructure and design. Specifically free internet access, digital information boards for buses and central positioning of the ticket centre can be introduced. With regard to infrastructure, more toilets, better signings as well as more litter bins could be installed. Accessibility to the station can be improved by introducing a bigger parking lot. To secure a greener environment, green hubs can be installed within the station.

It should be noted that the ongoing reconstruction of Newcastle Station is already addressing partially some of the areas mentioned.

6. FURTHER RESEARCH

A detailed survey is suggested to give people the opportunity to state specifically in which areas they would like to see some improvements; this will also contribute to the development of new proposals and the evaluation of their impacts on future customer services.

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Received 10.07.2014; accepted in revised form 01.10.2014