

The Investigation and Enhancements of the Strætó and Klappið Systems

Supplemental Materials

An Interactive Qualifying Project Proposal Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE In partial fulfillment of the
requirements for the Degree of Bachelor of Science

Kyle Lusignan
Luke Regan
Ryan Saklad
Iain McEwen

Table of Contents

Table of Contents	2
List of Tables and Figures	3
1 Introduction	4
2 Background	4
2.1 Transportation In Iceland	4
2.2 Public Transportation is a Critical, but Underused Resource in Iceland	5
2.3 Cars are the predominant transportation option in Iceland	5
2.4 The bus system allows for equitable access to transport for all Icelanders	6
2.5 History of Strætó	9
2.6 Accessibility of Digital Ticketing	9
3 Methodology	14
3.0 Methodology Introduction	14
3.1 Goals	15
3.2 Improve the customer satisfaction with the Strætó bus system	15
3.3 Increase the ridership of the Strætó bus system	17
3.4 Increase the accessibility of the KLAPP system	19
3.5 Potential Obstacles to Data Collection	20
3.6 Summary of Potential Deliverables	20
3.7 Ethical Considerations	21

Extra Information on Strætó

- Public company

- Financial reports

- DDOS attack

KLAPPID info

- How it works

- The wifi process

Methodology

- Every survey and All survey questions

- Reddit comments and slack comments plus extra opinions

- Posters that we put up (3 in total, bus stops(talk about different sizing)

- Consent forms/statement

- Somehow get all data from survey in here or maybe link?

- Every interview questions and notes on interview

Data

- Data analysis

- Contact page

- Bibliography

Extra Information on Strætó

Main System Faults

Description	Status
Discount entitlements not activating for users	Finished
Difficulty activating tickets in older iPhone devices	Finished
Scanners can't activate tickets on Klapp cards - Sends a "no tickets available" message to user	Finished
Error when purchasing tickets in mobile app	Finished
Apple wallet activating when user tries to scan ticket - takes over screen and makes it impossible for user to scan ticket	In progress
Difficulty scanning aztec codes - too long processing time	In progress
Not possible to move subscription from mobile app to Klapp card	In progress
Accounts with high number of unused tickets - timeout error on bus when scanning klapp card	In progress

Upcoming features

Title	Description
EMV payments	Activate contactless bank cards, apple pay and google pay on scanners
Fare capping	Daily and weekly fare capping - users never pay more than 3 single fares per day or 9 single fares per week. If they exceed that number of paid fares, they get a free ticket valid through the rest of the day/week
Pay-as-you-go	users can validate single fares on their klapp card although they haven't purchased a product to their card. They only need to connect a credit/debit card to their account, and the system will charge the card for each fare on demand.
NFC Tokens	Activate nfc tokens as fare mediums in the system. Example of NFC tokens are keyrings, event-pass bracelets/tickets etc.
Event tickets	Option to publish specialized tickets for special events, such as national sports events. Ticketholders can scan their event tickets on board of buses and have full access to the public transport system for a limited time around the event

Social Media Post

Strætó posted us to their website and their facebook, this brought engagement and more publicity on our project and surveys

Link:[Strætó í samstarfi við bandaríska nemendur – Strætó \(Strætó.is\)](#)

[Strætó in cooperation with American students – Strætó \(Strætó.is\)](#)

If link does not work post is as follows:

Strætó in cooperation with American students

A group of American students is currently working in cooperation with Strætó to research the implementation of the Klapp ticketing system. The student group comes from the school Worcester Polytechnic Institute (WPI) in the state of Massachusetts and will spend seven weeks in Iceland. For the past several years, Strætó has collaborated with student groups from this school, where the students have successfully completed various projects.

The current project is researching the implementation of the Klapp ticketing system, and a survey will be submitted to customers and bus drivers. Stickers have been placed in buses where users can scan a QR code and answer a survey about the Klapp ticketing system.



If link does not work post is as follows: (Icelandic)

Strætó í samstarfi við bandaríska nemendur

Hópur bandarískra nemenda vinnur nú í samstarfi við Strætó að rannsókn á innleiðingu Klapps greiðslukerfisins. Nemendahópurinn kemur frá skólanum Worcester Polytechnic Institute (WPI) í Massachusetts fylki og verður sjö vikur á landinu. Strætó hefur nokkur undanfarin ár verið í samstarfi við nemendahópa frá þessum skóla þar sem nemendur hafa unnið hin ýmsu verkefni með góðum árangri.

Verkefnið núna er að rannsaka innleiðingu Klapps kerfisins og verður könnun lögð fyrir viðskiptavini annars vegar og vagnstjóra hins vegar. Límmiðar hafa verið settir í vagna þar sem notendur geta skannað inn QR kóða og svarað könnun um Klapp kerfið.



General Information

2021 Financial Report:

ps://wp.Strætó.is/wp-content/uploads/2022/03/Strætóbs_arsreikningur_31122021_undirritad.pdf
[htt](#)

2021 Report: [Bus Sustainability Report 2021 – Bus \(Strætó.is\)](#)

KLAPPID info

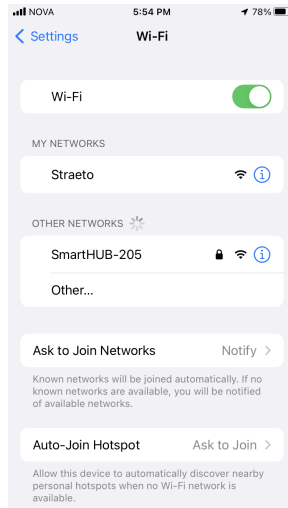
Odd account steps

- 1. cannot combine accounts, you need to delete one account and add the information from that account to the other account.
- 2. people often create one account with her phone number in the app, and another account on my pages at [Klappid.is](https://klappid.is) with their email, and some people also create a third account anonymously in the app.
- 3. need to login to the app anonymously and there you can add your email to the app.
- 1B. If you try to register your phone number on my pages after you have login to the app with your phone number, you will get an error message, that says "Phone number already in use"

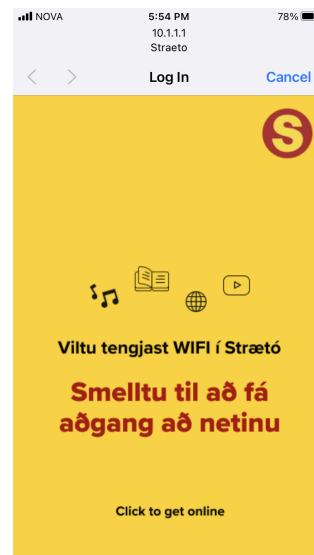
Wifi process

The process to get on the wifi on the bus is convoluted. In our experience you cannot just click to join. There is a multi-step process.

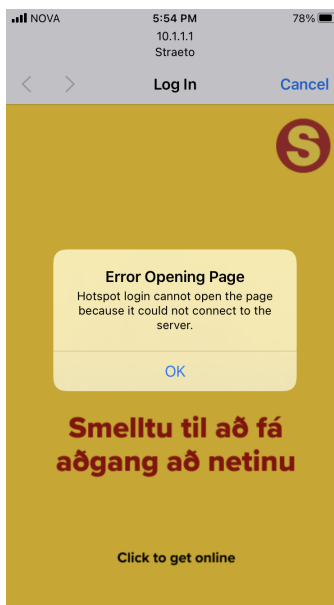
1) Find the wifi named Strætó.



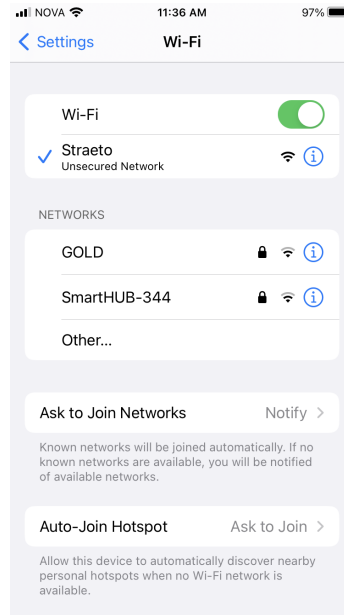
2) Click on it and will take you to a popup in Icelandic where you have to click anywhere on the screen.



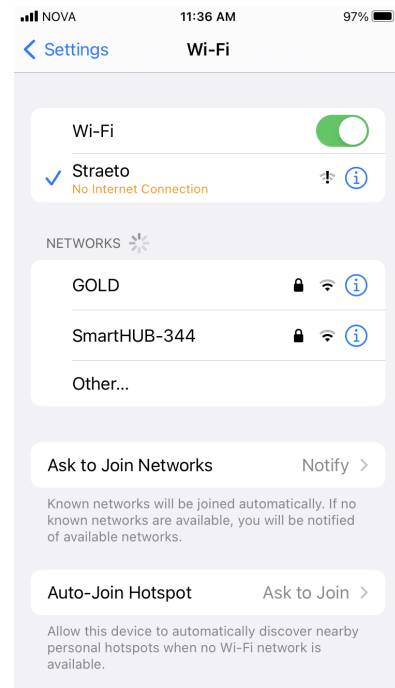
3) You will get an error message



4) Reclick on the wifi and it should work.



5) However, the wifi is unreliable and is prone to not working at all.



Methodology

Interviews

Daði Áslaugarson Interview Questions and answers

- How long have you been in IT? How long have you worked for Strætó?
 - Started 2013, quit for 2.5 years to work at a bank and private.
 - Worked so much for Strætó privately that they outright hired him again
 - Worked as a CIO, hard to find jobs after that. IT for routes was in ruins, decided to fix it.
 - Strætó app was developed by a third party, at dadi's initiative
 - Strætó app was a quick fix, didn't work well
 - Paper tickets were faked by tens of thousands
 - Strætó was out of date, so fix was redo from scratch or have a new app
 - QR has issues, but huge improvement over paper tickets
 - 2 upcoming updates, capping mechanism and contactless card
- What exactly do you do at Strætó?
 - 100 buses, 4 computers per bus
 - A lot of the day is answering emails,
 - Priorities are payment application, nordic conference, EU drone-city infrastructure
- How many developers are there?
 - 0 devs, everything outsourced
 - Stockholm has started insourcing IT. Stockholm is very big though, Strætó has little use
- How has the transition from the old Strætó system to the klapp system been?
 - Horrible
 - Payment system hasn't changed in 80 years
 - Changing tech is easy. People's behavior is difficult
 - Public transport is delicate. Everyone has an opinion; those who don't use it, the most extreme
 - Having errors didn't help
 - What about the fringe cases?
 - Like schools, disabled, elderly, ukrainians, accidental duplicate accounts
 - Have to prioritize them, and balance it
 - Hard thing to fix was disabled discount. People were cheating the system by buying disabled tickets. How do you authenticate that? There is an official authentication system from the government, and allowed proof by ssn-esque thing. Using that, they search various systems to find if a student, disabled, etc. Difficulty came from making it user friendly
- What features have been the most challenging?

Its all harder. Aztec code was difficult to sync front and back end. Apple wallet likes to pop up whenever nfc is close, so they had to suppress it.

- How long have they taken to implement?
- Would a way to receive user feedback be helpful?
 - Current process is with marketing. Marketing will go to IT with a problem
- Can you talk about the DDOS attack and how much of a problem you expect that to be in the future?
 - Alan is the coworker to talk about with that.
- (After explaining what we are doing as our project) Is there anything we can do that would be helpful for you?
- How long do major changes to the app take, for example: adding a route system?
- How is the bus wifi
- How is the bus gps tracking involved with the app
- Is your routing data open source and available to the public/companies (ie google maps)
 - Do you mind mapping/routing data is being taken over
- How much of the old Strætó app was incorporated to the Klappid
- How is the transition to the old Strætó app to rural app going to go

Strætó is subcontractor for the road system. This idea has been in the air for 2 years with no movement. Using the old app is silly, it is unsecure, outdated.

Rural area has point of sale system, so can pay with credit card/cash, but very slow.

Why exactly was the switch from the old streato app to klappid necessary

Anna Birna Ívarsdóttir's Interview Question and Answers

What does your job entail?

Answering emails, helping customers, training people (recessionists/phone people)

No access to the code

How big is your team?

Most of you answering email/live chats/facebook messages, phone people different

How long have you worked in this position?

One year, right when KLAPP started

Ask questions about Strætó if applicable

How many customers do you help a day?

30-100-exchange students: School creates number:

What do they say? Confusions?

Most of the time, having too many accounts

What problems do they have?

Confusion on going online / to the KLAPP system: electronics ID, school, disabled account, login, multiple accounts

How often are you able to help them?

Phone problem

Iphone XR, no QR

Have you seen more problems with the KLAPP system than the previous system?

New system new bugs

CRN system

What additions would improve the KLAPP system?

More information online, be able to link accounts together.

Hyperlink to click to phone number, message to phone, put in code.

Changes?

Merge accounts

Receipt number to database

No more anonymous

What limitations are there?

Buy ticket, can't look it up, has to talk to norway

Send tickets to klapp card, not using app

Most people don't know to push forgot password

Another link button, without making a new account, sends to phone number

If you log in anon at top will be log in to my pages,

Have you got a lot of no tech savvy users

Most people are how to use phone

Most people have cards on account,

Bus Driver Interview Questions (English and Icelandic)

Inngangur

Við erum bandarískir háskólanemar frá Worcester Polytechnic Institute og erum að skoða nýja greiðslukerfið, Klappið. Við erum háskólanemar og störfum því ekki hjá Strætó. Öll svör eru algjörlega nafnlaus. Allar niðurstöður verða nýttar til að bæta starfseminu.

Preamble

We are American college students from Worcester Polytechnic Institute studying the new Strætó KLAPP system and all that it entails. We do not work for Strætó and all answers will be 100% anonymous. All data collected will be used for the betterment of the company.

Questions

Spurningar

1. How long have you been a bus driver for Strætó? **Hversu lengi hefur þú unnið hjá Strætó?**
2. How do you feel about the KLAPP system? **Hvað finnst þér um nýja Klappið?**
3. What kind of problems do you see with the KLAPP system? **Hvers konar vandræði horfir þú upp á í Klappinu?**
4. How has the transition been from the old Strætó system to the new KLAPP system? **Hvernig finnst þér breytingin hafa verið frá gamla Strætó appinu yfir í nýja Klappið?**
5. How often do passengers have trouble scanning tickets or problems with the app? **Hversu oft eiga farþegar í vandræðum með Klappið eða að skanna miða?**
 - a. What do you do when that happens? **Hvað gerirðu þegar það gerist?**
6. Are you hearing other needs / complaints from riders? **Hefurðu heyrt af kvörtunum/ábendingum frá öðrum farþegum?**
7. Anything else you would like to say? **Eitthvað fleira sem þú vilt koma á framfæri?**

Reddit Survey (English and Icelandic)

Q1: How Old are you? **Hver er aldur þinn?**

- <12
- 12-17
- 18-24
- 25-39
- 40-66
- 67+

Q2: What is your gender **Hvert er kyn þitt?**

- Male **Karl**
- Female **Kona**
- Other **Annað**

Q3: Do you have a disability **Ertu með einhverja fötlun?**

- Yes **Já**
- No **Nei**

Q4: Do you live in Iceland? **Býrðu á Íslandi?**

- Yes **Já**
- No **Nei**

Q2: What transportation do you use primarily? **Hver er þinn helsti samgöngumáti?**

Q3: How often do you ride the Strætó bus? **Hversu oft notar þú Strætó?**

Q4: Why do/don't you ride the bus? **Hvers vegna/hvers vegna ekki notar þú Strætó?**

Q5: Why do you use (their preferred transportation) over the bus? **Hvers vegna notar þú (þinn helsta samgöngumáta) fram yfir Strætó?**

Q5.1: Why do you use the buses over other transportation? **Hvers vegna notar þú Strætó fram yfir aðra samgöngumáta?**

Q6: Do you have any recommendations for improvements of the bus transportation? **Ertu með hugmyndir eða tillögur um hvernig bæta megi Strætókerfið?**

Q7: Do you have anything else you would like to say about Strætó? **Er eitthvað annað sem þú vilt koma á framfæri varðandi Strætó?**

QR Code Survey

The Survey begins with the following preamble and questions:

We are American college students from Worcester Polytechnic Institute, researching transportation and technology here in Iceland. Our project will help improve the Strætó Bus system and Klappið bus app's quality and usability. Your feedback is vital and we appreciate your time. The survey should take no more than three minutes.

What country do you permanently reside in?

How old are you?

What is your gender?

Do you have a disability?

How many times a week do you ride the buses?

Do you have experience with both the KLAPP system and the previous Strætó system?

Please describe Strætó in three words

It will then show one of the 3 following surveys:

Survey 1:

You are satisfied with the KLAPP system. (KLAPP app, KLAPP card, KLAPP ten)

Why do you agree / disagree? (Regarding the above question)

Do you feel more satisfied with the new KLAPP system or the previous Strætó system?

Why do you feel more satisfied with the KLAPP/Strætó system?

Survey 2:

As of now, I mostly use Klapp single/ten/monthly to get on the bus

Alternate payment methods accepted when boarding the bus would make the bus riding experience easier. (Apple Pay, Google Pay, Credit Card, tap to pay, etc...)

What alternate payment methods accepted would make the bus riding experience easier?
(Select all that apply)

You would best describe the current Strætó bus system is ___ to use

Survey 3:

Have you experienced any problems with the process of riding the bus so far?

What have those problems been?

Have those problems been fixed?

Do you have any suggestions to make the KLAPP system better?

What suggestions do you have?

Survey 4:

1. Please label the importance of the following: (unimportant - very unimportant)

Vinsamlegast merktu við eftir mikilvægi: (Alls ekki mikilvægt, ekki mikilvægt, hvorki mikilvægt né ómikilvægt, mikilvægt, mjög mikilvægt)

Additional payment methods on the bus (Apple pay, Google pay, credit card, etc...)

Aðrar greiðsluleiðis s.s. Apple pay, Google pay, greiðslukort o.s.frv.

Email based sign up (Gmail, yahoo mail, etc...)

Innskráning með tölvupósti (Gmail, Yahoo, o.s.frv.)

NFC - (non-wifi scanning / payments)

NFC - (skönnun/geiðslur án þess að tengjast wifi)

Pay as you go (Adding credit card directly on KLAPP card)

“Pay as you go” (Tengja greiðslukort beint við Klappið)

Increased bus frequency (More buses)

Aukin tíðni (fleiri vagnar)

More frequent bus stops

Fleiri biðstöðvar

Larger expanded route system

Stærra og útbreiddara leiðakerfi

Better KLAPP application (QR codes, etc...)

Betra Klapp app (OR kóðar o.s.frv.)

Cheaper ticket pricing

Ódýrari fargjöld

More reliable wifi

Betra og öflugra wifi

Better trained bus drivers

Betur þjálfaðir vagnstjórar

2. How was your experience with setting up the KLAPP app?

Hvernig reyndist þér að setja upp Klapp appið?

Easy, somewhat easy, neither easy nor difficult, somewhat difficult, difficult

Auðvelt, frekar auðvelt, hvorki auðvelt né erfitt, frekar erfitt, erfitt

3. Have you ever reached out to customer support?

Hefur þú haft samband við þjónustuver/þjónustufulltrúa?

Yes/Já

No/Nei

4. How was your interaction with customer support?

Hvernig voru samskipti þín við þjónustuver/þjónustufulltrúa?

Short answer

Skrifaðu stutt svar

The survey will complete by asking this question:

Do you have anything else you would like to add about Strætó?

DATA

Excel

Alongside this document, there are three accompanying Excel sheets containing the raw and processed data that our team collected.

Data Analysis

Types of Data we are gathering

Survey Data

Surveys are a useful tool for collecting large amounts of data with a meaningful sample size. When these conditions are met, analysis can be easily performed, as the data should represent the general population. Surveys in this case were call to action QR codes scattered around the bus stops and even on the buses. We aimed for at least thirty survey responses in order to have a large enough sample size to draw accurate conclusions. Qualtrics was able to collect this data. The surveys allow us to get a larger number of responses. The data will be short and concise. Questions on the survey range from yes and no to short answers. This makes for easier data analysis on specific questions we aim to ask

Visuals

For ourselves we are going to visualize the data we receive in google sheets. It will have each question and response in a column making it easy to see all of the responses / patterns. It will also allow for easier data analysis due to the fact that we can go in depth on each question one on one. This will allow us to see common themes and motifs and come to conclusions

In the booklet, having a collection of positive and negative aspects of the old and new system will help the reader to understand more. The objections for our project will also be used. Having them organized under each object will keep the problems and supposed solutions to be digested and understood easily. It will also do a better job as to explaining why those objectives are important and why both Strætó and the public should care.

Key Takeaways

We will have room for the key takeaway either as an abstract or at the end with a conclusion. This should summarize the main problems and potential solutions to have for Streato. We want the reader to understand the importance of public transportation, especially in Reykjavik.

Conclusion

Besides the above mentioned Key Takeaways, the conclusion will primarily focus on the future. Namely, this will be on further work that could be done in domains similar to our project, which is

most likely for future IQPs with Strætó as a sponsor. This allows our booklet to be a starting point for the next time an IQP is done with Strætó.

Code Book

Data cleaning:

Qualtrics data omitted:

Columns deleted:	Reason:
Status	They are all IP Addresses
IPAddress	We have no use for IP Addresses and we want to remove unused identifying information
Progress	As we are dealing with only finished responses, this column is all "100"
Finished	As we are dealing with only finished responses, this column is all "True"
LocationLatitude	We have no use for this information and we want to remove unused identifying information
LocationLongitude	We have no use for this information and we want to remove unused identifying information
DistributionChannel	Column is all "anonymous"
RecipientLastName	Empty
RecipientFirstName	Empty
RecipientEmail	Empty
ExternalReference	Empty

Bus rider survey specifically:

UserLanguage	Column is all "EN", also we have a question asking for preferred language
--------------	---

Responses omitted:

Any response that filled in no fields beyond the demographic questions was omitted from our data.

Reddit Code Book:

Reasons for riding:

Car - anything car related that doesn't compare to the bus, either don't ride bc they have a car or they ride bc they don't have a car

Price - relating to the cost of the tickets

Convenience - the effect of how out of the way riding the bus is

Speed - the speed of the buses

Rider experience - how it is on a personal level to be a rider on the bus, having to transfer, waiting at stops, other people

Routes - anything to do with the paths the buses take, be it wanting more or a larger range

Scheduling - frequency of buses at a stop

Tech - relating to the apps, Aztec codes, or scanners

Ease - Ease of use of the entire system

Reliability - reliability

Other - anything that does not fit

Any responses that don't have a reason are ignored.

Suggestions for improvement:

Price - ticket prices

Frequency - more buses per route

Tech - improve the app/codes

Routes - improving the routes, changing/adding

Stops - adding more stops

Driver Behavior - behavior, performance

Buses - improve the buses

Scheduling - wait time at stops, operating hours, departure times

Infrastructure - roads

Marketing

Other

Any responses that did not include areas of improvement or were too broad (i.e. "Completely overhaul it") were ignored.

Drivers Code Book:

How they felt about KLAPP system:

Rated each response as positive, negative, or neutral with a “P”, “N”, or “0” respectively

We then took keywords from their responses like “slow”, “unreliable”, “happy”.

Problems with KLAPP system:

Riders Code Book:

Why are they satisfied/unsatisfied with the KLAPP system:

Tech

Wifi - anything to do with network

App - anything to do with the app

Feature - a specific feature of the app

Scanner - anything to do with the scanners

Ticket

Security - The security of the system

Payment - the process of buying

Cost

Routes

Time

Older better - they simply state the older was better with no given reason

Other - Response that do not fit in other categories or give enough information, or that we don't understand

Efficient

Unreliable

Accessibility

Translate: what the fuck did they mean?

Responses that do not add any information (i.e. "disagree", "excess") were not coded.

Why they prefer KLAPP system:

Payment

Ease of use

Rider experience

Boarding

Planner

Responses that do not add any information (i.e. "it's better", "10/10") were not coded

Why they prefer Strætó system:

Payment

Ease of use

Planner

Speed

Functionality

Cost

Appearance

Responses that do not add any information (i.e. "it's better", "10/10") were not coded

Problems with the riding the bus:

- Application
- Accessibility
- Delays
- Early
- Bus stops
- Bus drivers
- Scanners
- Cleanliness
- Safety
- Overcrowding
- Cost
- Other

Any responses that were not under Strætó's control were ignored (i.e. "I got kicked off")

How was their interaction with customer service:

- Response time
- Good
- Neutral
- Bad
- Crazy
- Helpful
- Unhelpful

Any responses whose meaning could not be understood were ignored (i.e. "Gór"/"Mountains")

