KEYS TO THE CITY

Demola
Summer 2020

INTRODUCTION

Our stimulating project puts forward a ground-breaking vision for cities of tomorrow: how would life without keys be like? How would life become is doors—virtual or physical—are opened up to its citizens, businesses and tourists? Demola and Smart Tampere empower our imaginations by encouraging us to abandon current legal, technological and ethical constrains, in order to paint out a horizon of what can be realized with such a smart access system.

We consequently put forward the following scenarios in the sections to come. We invite you on a journey of imagining and creating this future together. Considering how we behave in certain scenarios, then identifying problems and how it can be improved, before finally using our system to imagine a smarter, key-less future for each of them.

Aerial view of Tamepre, 2019

CONTENT

2 OUR TEAM

4 THE PROBLEMS

6 IDEA DEVELOPMENT
- Case Studies
- Interview Findings

14 OUR SOLUTIONS
- The Medium
- Permission Level
- The Functions
- Risk Mitigation
- Value Proposition

20 THE SCENARIOS
- Tourism
- Transportation
- Workplace Sports
- Hospital
- Residential Area
- School
- Emergencys

40 INCLUSION OF CITIES
- The Elderly
- The Disabled

46 USER STORY

53 APPENDIX

Hi! My name is Tingting Huang. I am currently a graduate student studying City Planning and Transportation at University of Pennsylvania.
Before I moved to Philadelphia, I lived in Guangzhou, China. I graduated from Sun Yat-sen University, studying Urban Planning and Finance. I love using statistical and mapping tools to explore cities, also I enjoy travelling, talking to people with different backgrounds and listening to their stories to observe, feel and understand the world.
I'm a data lover, a culinary art enthusiast, an amateur photographer. I play piano and I'm fascinated in jazz music. I'm so glad to have the opportunity to join Demola sharing our brilliant ideas!
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Hello! My name is RosyMa. I major in clinic medicine in Fudan University. This year is my freshman year. I have lots of interest. In spare time, I always watching movies and reading different kinds of books, especially novels. I enjoy communicating with others to get new knowledge and spark new idea, discovering myself through trying. Keys to the city is an interesting and challenging topic, really hope to have a great cooperation with you.
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Linkedin:

Hey guys! My name is Converse. I'm studying machine science in Huazhong University of Science and Technology and I'm a freshman in college. I love music and movies. I'm also a amateurish magician. My dream is to become a designer and devote myself to make our life happier. I am a big fan of this project. Hope we can have a good cooperation!
E-mail:magicianwkw@hust.edu.cn

OUR TEAM

It's pleasure to let everyone know me here. This is Wang Rongxin, who is a junior undergraduate from Huazhong University of Science and Technology. I have both engineering technology and product thinking, and I have endless curiosity about the underlying logic of things. In the next two months, I will do what I have learned to contribute to our "smart city".

I love life, thinking, food, travel, music, sports, and especially try new and interesting things. This time Demola brought the challenge to us. Then I congratulate our team in advance for working together and successfully completing this challenge.

E-mail: rongxinwang99@gmail.com

Hi everyone! My name is Keyi, a Land Economy undergrad at Pembroke College Cambridge. Vice President of Cambridge Consulting Network, I have led numerous commercial consulting projects including HSBC and ARM and recruiting Cambridge undergrad, masters and MBA students on consulting projects. As an aspiring management consultant, I will bring a wealth of consulting frameworks from MBB to our brainstorming sessions to summarise logical proceedings. I cordially hope to befriend mutually inspiring friends across Demola projects. Do feel free to reach out to me so we can share insights on projects or stimulating ideas! All in all, it is my absolute pleasure to be working with all of you. Wish you the very best in the summer too-let's also have fun alongside!

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THE PROBLEMS

How many keys are you carrying with you today? You probably need SEVERAL different keys to your house, office, bike, car... If you are interested in fitness, you may need a ID card to the gym, and in your wallet, you will also have cards for the bus, office, electricity ... To have access to those different places in cities, you would normally have to carry get a huge of keys with you! This may cause some security risks as keys and access cards could be lost or stolen. At the same time, this can give rise to a lot of inconveniences, which reduces the efficiency of getting things done.

Let's say you are a maintenance worker or a cleaner. You have a job to complete in an office building. How many hallways, gates, doors and elevators do you need to access just to even get to where you need to go? To obtain this access, how many receptionists do you have to queue to talk you, who then makes how many phone calls to confirm your identity, who then refers you to some more people to get you through, taking hours just to get through some doors...

Witnessing rapid technological progress around you, you may be thinking:

Whether we could have a smart key system that helps people entering places more efficiently?

This vision is exactly what we want to deep dive into for you to showcase the possibilities of cities of tomorrow! We're also thinking:

what is the platform like? what it looks like if we could grant individu-als temporary access to wherever in cities?

Also, if we arleady have this smart key system, can we integrate smart key systems with other smart systems in the city, like government system, etc and do we need to classify different levels of personal information to gain access, which is helpful to protect our privacy much better. We will conduct our research in Tampere as the main city. Under the assumption that the system has already existed, we will analyze what positive impacts it will have on our daily life. We'd like to describe ourselves as a group of science fiction writers and we are writing a book about future life with a smart key system. We are trying our best to paint a picture of a more efficient, more intelligent and more humanized future of city life to our readers. We wish to extend our warm welcome to come on broad with us to imagine how our lives in cities will devolve.

IDEA DEVELOPMENT

To answer the question of what it like if we could grant individuals temporary access to wherever in cities, we need to firstly firgure out what platform we are using to realize this vision. Then, we can build the application scenarios based on the prototype. We thus conducted a wealth of ***literature review*** by carefully examining case studies of smart key system and smart cities around the world. Shenzhen and Hangzhou in particular provided numerous inspirations.

Next, we investigated technological possibilities in cities. Smart key is one kind of keyless entry technology, but it is more advanced than standard passive key entry. Keyless entry also called passive key entry, allows users to lock and unlock their doors without usingc a regular key. Depending on the application scenario, smart keys have more additional functions more than remotely unlock and lock doors. Smart key system are widely used in vehicle, intelligent housing system in modern apartment, and enterprise entrance

Case studies is an important part in the idea development process, we got inspired and generated new idea by the cases of which smart key system in smart living, smart mobility and smart business. It helps us preliminarily determining the scenario of smart key in cities. Additionally, we get the theoratical and technical support for our smart key prototype and application scenarios which will be discussed in later chapters from cases around the world.

Then, we want to,investigate where, when and who will use the smart key platform. To enrich the scenarios with more detials, we conducted ***in-depth interviews*** with both Finnish citizens living in Tampere. Since the research is based on Tampere, but not limited to this one city, interviews were conducted with current or former residents of the city and international students. From the interviews, we gained a general understanding about daily routines in Tampere. The questions in interviews focused on transportation, housing, climate, recreational and cultural activities of Tampere, their daily lives in Tampere and the context of using keys.

By analyzing their daily life track, we find that the places they visited most often are home, public transportation station, office (work place), and fitness centers. Based on these case studies and qualitative data from interviews, we decide the scenarios with smart key system will focus on tourism, workplace, transportation ,sports and residential area. We also discussed the inclusion of cities with the smart key, we include the life of the elderly and the disabled with the smart key system in later chapter.

To make the scenarios that we proposed more robust, we conducted a second round interview with people living or working in the contexts. The interviewees include students in college, travel lover, employee working in Shanghai, doctor, and people working at home. The questions for them focused on their attitudes to our smart key APP, the user experience with the product, and the scenarios that they expected with the smart key APP. Since they are more familiar with the aforementioned contexts, they gave us more professional insights and suggested new points to be considered!

THE TOOLS

The tools we used for idea development include: (1) Miro; (2) Axure; (3)Wix (4) Indesign.

The Logos of Tools We Used

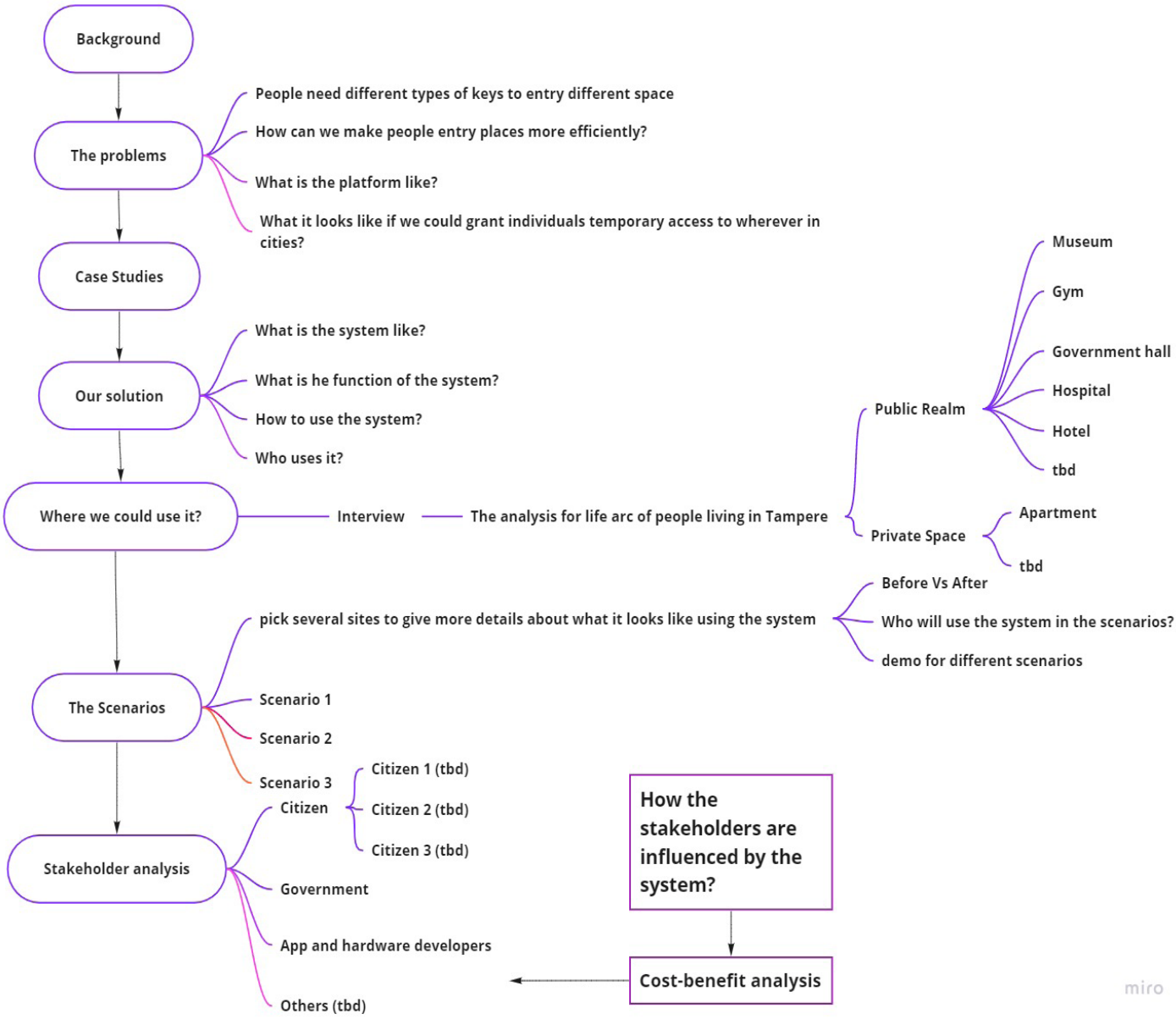
(1) We used Miro to collect and organize our ideas and build a structure by which we hope to proceed with our investigation. We have constructes issue trees, mindmaps and pyramid structures regarding specific topics' investigation.

(2) Axure is a powerful prototyping tool in the product developement process, we used it to design the potential smart key APP and clearly present the workflow of our product.

(3) We used Wix to design the logo of the smart key APP.

(4) Indesign is a layout design desktop software, we use it creating our final report to logically present our ideas.

RESEARCH STRUCTURE

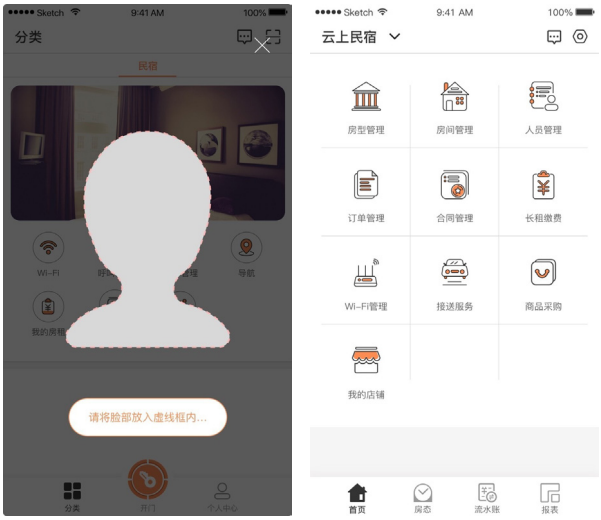


CASE STUDIES

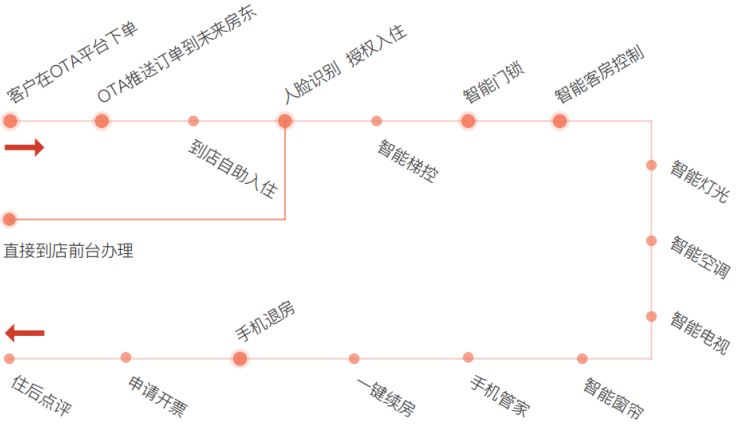
We now turn to numerous examples from other cities that have provided inspirations to Keywise. This benchmarking process is important because it empowers our system to not only work in Tampere, but also any cities in the world, because urban problems are similar across the globe or at least among countries at similar stages of development. Here we present only a few cases covering many fields such as business, living, security and mobility.

Key to hotels-Yunnan, China

In Future Key pilot program in Yunnan, it upgrades the locks and access control system for more than 1000 rooms in 12 homestay hotel in Lijiang and Dali, no traditional room card is needed to check-in, when face recognition authorization is completed on the mobile phone, the door will open and facilities in the hotel will be available.



User Interface of Future Key for Hotel



Future key homestay hotel check-in process

Future Key Logo

Key to an international airport-Shenzhen, China

Unattended equipment has covered all departure gates in Shenzhen international airport, and have achieved boarding with facial recognition. Every passenger just needs 1-2 seconds to finish verifying and passing, which greatly improve the efficiency and accuracy.

The facial recognition system USES cameras installed at the back of security checkpoints to quickly capture images of passengers' faces when they arrive and compare them with images of their identity CARDS.When the inspector reads the passenger id information manually, the system can complete the comparison between the passenger face image and the ID image, and give the discriminative prompt result, and assist the security security inspector to complete the identification of the passenger id and identity.

Smart Access System in Airport, Shenzhen

Key to energy-efficient public services-Dubuque, US

Dubuque is the first smart city around the world. Its feature is attaching great importance to intelligent management. Cooperating with IBM, the government digitizes all the resources in the city and connect them with internet of things engineering covering water, electric power, petroleum, gas, traffic and public service. The government collects the data through sensors. And then through monitoring and analyzing all the data, the government can dispatch resources more reasonably, hitting citizen's spots, lowing energy consumption and rotating smoothly.

Renewable Energy Developement

Next-gen connected homes in Portland

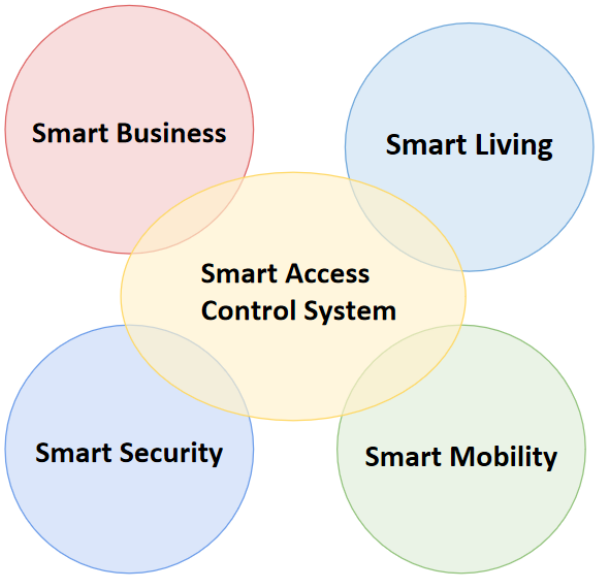
Each apartment has various sensors, smart outlets, and switches installed in every room, enabling renters to monitor different aspects of their apartments. These systems also track the habits and preferences of the dwellers and enable renters to create rules to customize their home environment from anywhere and any time through a mobile app. While still exploratory, this type of connectivity could vastly enhance the renter's convenience and comfort, while also saving energy and costs.

Smart Home System

INTERVIEW FINDINGS

Through literature review and case study, we believe that in future cities, smart key system will be an important part in smart business, smart living, smart mobility and smart security, but we still need more information to help us identify the contexts where the smart access control system can play its value.

In order to understand the sites in cities that people used most frequently, as well as to enrich the scenarios with more detials, we conducted in-depth interviews with both Finnish citizens living in Tampere. The findings of our interview are shown as below.



Smart Key in Smart Cities

How would you describe your daily routine? What city life problems have you identified?

Oskari

I enjoy living in Tampere, which has a decent size of being a city and a town. Getting around is quite easy.
Bus schedules are not very regular. Occasionally there would be long waits, which can become extremely stressful during extreme weather like snow storms in winter. What's worse is that sometimes buses could get cancelled! One could not even bike during such weather. Additionally, the public transport systems between Tampere and Helsinki are not connected. Often it is troublesome to buy tickets using cash on spot.

For food, students usually eat in the canteen or cook at home. Very few people call deliveries, probably because it is too expensive!
Access to residential buildings such as deliveroo staff will be a good point to improve. If it becomes easier to call food delivery if the delivery guy can come into those buildings more easily. This can significantly boost life utility because more choices of food would definitely brighten up a gloomy day. Referencing on life experiences in China, where he recalls the huge variety and how quickly deliveries arrive (often within 20 or 30 minutes), this is how higher efficiency due to open access systems can increase happiness levels!

Xiao Zai

By analyzing their daily life track, we find that the places they visited most often are home, public transportation station, office, school and fitness center.

OUR SOLUTIONS

So how would this pioneering, futuristic open access system work?We have envisioned a prototype as the following.

The system, which we named ***'Keywise'***, consists of key media, identification equipment, and an app.

Keywise Logo

THE MEDIUMS

The key medium is the "key" for storing information, and the identification device is the device for identifying and verifying these "keys". The key medium can be divided into two forms: biological and electronic.

Fingerprint Technology

THE BIOLOGICAL FORM

The biological form entails the collection of certain biological characteristics of a person to represent the identity of the person, thereby representing the access authority. For instance, with one's fingerprints, facial characteristics, voiceprints, it will be possible for key functions in the society such as the police to track a person's entry into a high-security area, for instance, when access is required for entry by a handyman into one's apartment. This information will be classified as highly confidential, and only released when consent is given.

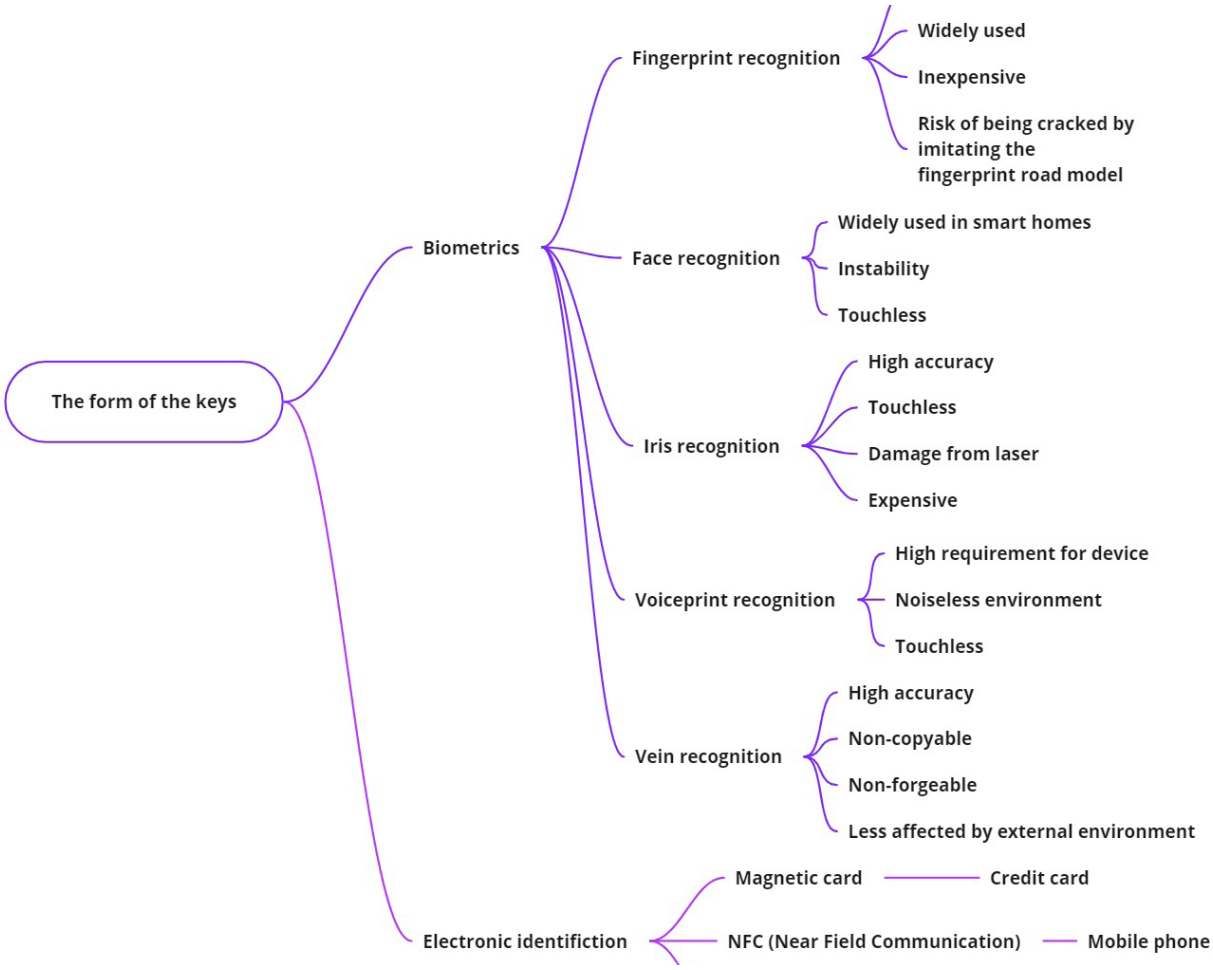
Face Identification

THE ELECTRONIC FORM

The electronic form is to use a certain medium to store the access authority, and the device can be used to write the authority to the electronic medium so that the person who owns the electronic medium can obtain the access authority.

NFC identification

THE FORM OF KEYS



THE LEVEL OF PERMISSION

The biological media key case is used to represent the user's personal information, which usually needs to be used in real-name access situations, while the electronic media key only represents the access authority. The authority is written into the electronic media key through the app, and the electronic key can be used to access it.

The app is the center for managing permissions. One can find, obtain, grant, and reserve permissions through the app, and realize functions such as payment, social networking, and information query. This system is open, anyone can use this system by entering personal biometric information.

The permissions in the app are divided into ***Confidential*** permissions, ***Comprehensive*** permissions and ***Basic*** permissions.

There are three levels of permissions

THE BASIC PERMISSION

Basic permissions refer to permissions that can only be accessed but not granted to others.

THE COMPREHENSIVE PERMISSION

The comprehensive permissions are the permissions you have, such as the house entry permission owned by the house owner, and the company room access permission owned by the company boss, ect.The owner of this permission can give permission to others so that others can access.

THE CONFIDENTIAL PERMISSION

'**Confidential**' is the highest level of access required when accessing very important places, such as science labs with dangerous chemicals, police record systems and where the army/police stores weapons. This requires one to give all information about him or her including home address, birthday, birthday place, work place and even security vetting. This system will not be used very often in daily life.

The benefits of having this system are firstly for the whole society's safety that those access needs to be closely monitored. Citizens will feel safe if they know 'an additional pair of locks ' are now put onto critical places!

Secondly, businesses will significantly benefit from a confidential level of access to protect their assets and intellectual property better. Jewelry shops, for instance, can have multiple facial recognition systems and Keywise authentication before letting anyone into the room where valuables are stored. By connecting to street surveillance cameras and the transport database, it will then be possible to quickly trace and arrest the thieves to recover losses, making doing businesses safer in smart cities.

In a similar vein, for innovative firms that have intellectual property rights, the Keywise system can also protect their innovations. Tampere for instance is striving to create an innovative hub. To attract tech firms, this improved security promising that firstly where they store their commercial secrets will be very safe; secondly, in case of theft, immediate and highly effective responses from the city will be guaranteed. These will truly attract firms to this smart city!

THE FUNCTIONS OF THE SYSTEM

(1) **Access function**: You can access certain locations or use certain devices by using keys.

(2) **Permission grant function**: You can grant access permissions to certain media or someone through the app.

(3) **Permission search function**: You can visit open public places around and obtain access permissions through the app, such as basketball courts, gyms, etc.

(4) **Authorization appointment function**: You can make appointments for hospitals and offices through the app.

Payment function: It can realize payment for entering certain places, certain public transportation, called place tickets, etc.

Information query function: You can query the real-time flow of people in certain places and the flow of people in the time period after the previous data prediction, query your own permissions, grant permissions, reserved permissions, query your own access records and other functions.

RISK MITIGATION

There would inevitably be concerns regarding cybersecurity of our system. What if a hacker can break in and steal the identity information of every citizen? We address this concern in the following ways:

Classify access (private information) into three categories. The more important a set of information is, the more steps there are and so more security authentication there will be. For information of the highest security levels, such as address and fingerprints, those systems are safeguarded by the police. Hence, to access them, there must be an official record about how obtained this access, for how long and when this access will be terminated

Our ‘online keyring’ can be safer than a physical set of keys because of the cybersecurity team and citizen support teams that are on duty 24/7. In doubt of access given, one can contact a support individual, hopefully with a very short waiting time of within 1 minute, and highly effective investigation will be carried out.

At certain entry points, CCTV cameras will be set up and linkages to the police will also be established. Upon suspicion that access is given yet the owner is not aware, immediate responses will be carried out with high-level scrutiny.

VALUE PROPOSITION

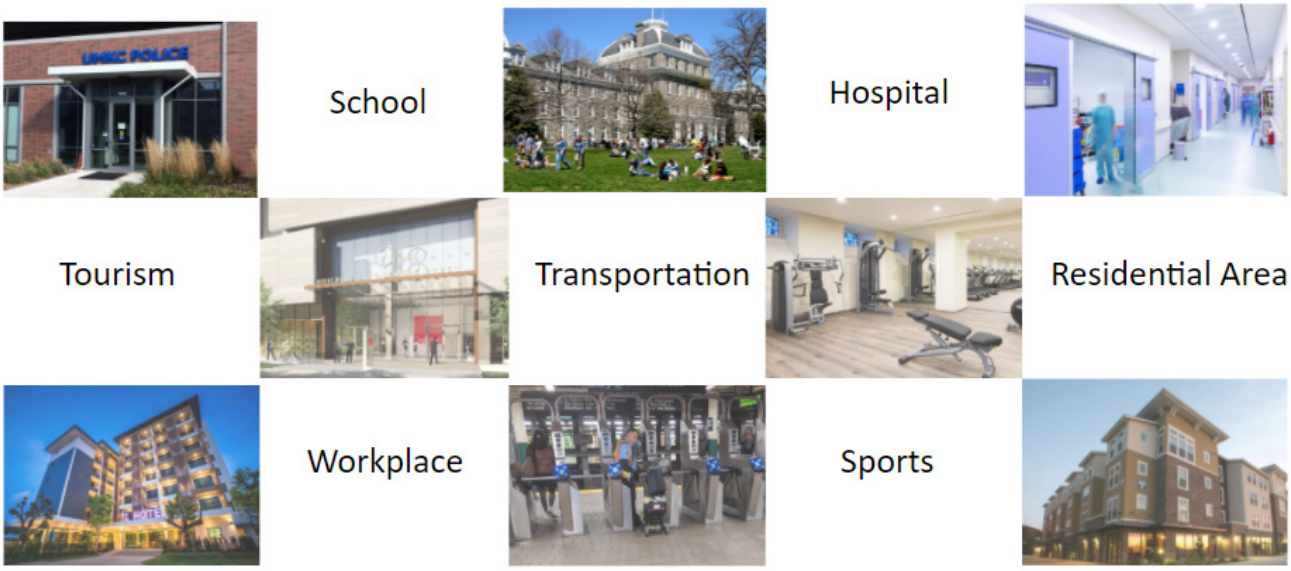
For the authority owner, the unified management of authority can be completed efficiently by using this system.

For permission holders, you can clearly see what permissions they have and can obtain certain permissions.

This app has a large number of functions, hence acts like a ‘magic key’ that others do not need any other apps, which we will continue to unpack in the paragraphs to come.

THE SCENARIOS

Our stimulating project puts forward a ground-breaking vision for cities of tomorrow: how would life without keys be like? How would life become is doors—virtual or physical—are opened up to its citizens, businesses and tourists? Demola and Smart Tampere empower our imaginations by encouraging us to abandon current legal, technological and ethical constrains, in order to paint out a horizon of what can be realized with such a smart access system.



SMART KEY IN TOURISM

THE BACKGROUND

Tampere is a developed city and many tourists come here every year to experience Finnish culture. During their travels, tourists may face many troublesome problems, such as booking tickets problems, making reservations problems, queuing problems, and so on. Based on this background, we try to use our system to make Tampere a more comfortable place for visitors.

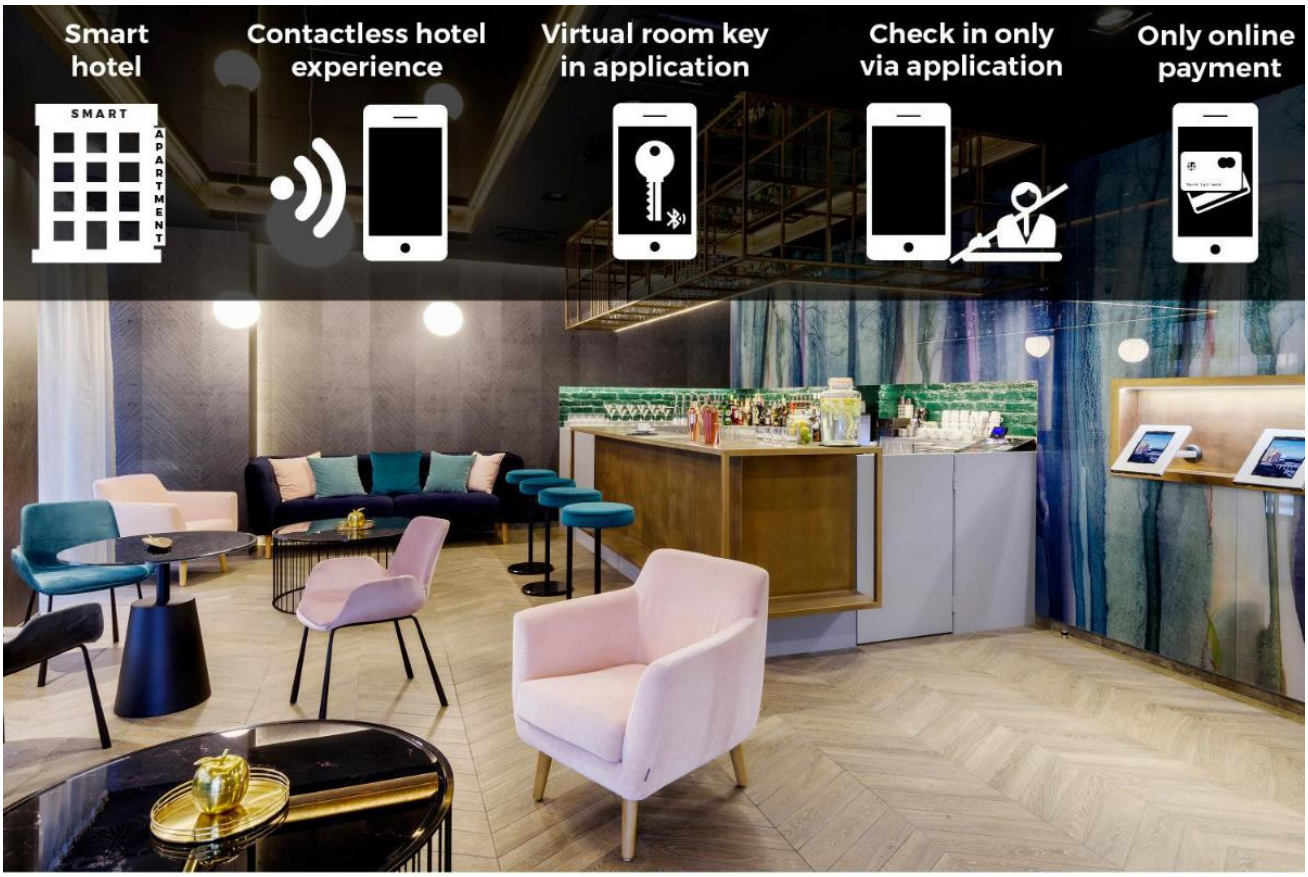
Tourist Attractions in Tampere

THE SCENARIO

With the permission of a smart city, tourists can make an appointment to plan a day's journey as soon as they get off the plane, know where there are many people or heavy traffic, so they can avoid these places and know where there are large activities. After arriving at the destination, you don't need to buy a ticket or queue up to enter the scenic spot directly. When you return to your booked hotel at night, you can enter the room directly through the system without any extra steps. Visitors can complete the contactless check-in process through smart phones. When visitors arrive near the rooms, the APP will automatically search for the key to open the door.

Such a system greatly optimizes tourists' itineraries and makes their trips more pleasant.

The Future Hotel's Front Desk



Smart Check-in System in KViHotel Budapest, Hungary

THE KEY USER GROUPS

The key user groups are tourists and people who work in the tourist industry. For tourists, they can use our system in three specific ways. First, Visitors can use the system to book in advance the scenic spots they want to visit. When they arrive, they can directly enter through this access, without any waiting. In such places, we only need visitors' basic information, such as your phone number, no need for more personal information such as your name and your id number. Second, Based on the function of crowd monitoring and information collection, the system can design the best travel route for tourists, avoiding traffic jams and crowded places, which make the journey efficient and comfortable. (The information will be updated all the time on the platform.) Last but not least, When visitors return to the hotel, they can enter the room directly through our system by reservation, without checking in and any access card, which is efficient and convenient. In some places like hotels, in order to guarantee safety, we'd like to ask for comprehensive information.

For those people who work in the tourist industry, their working habits would change with visiters' habits. For example, in some scenic areas, Paper tickets will be phased out and our system will become their first choice. Additionally, In hotels and other places, the hotel staff can easily manage the whole hotel and reduce operating costs through our system because our system can replace the traditional ID card, and people do not need to check-in.

STAKEHOLDERS ANALYSIS

Tourists are not the only group that benefits from it, governments and other industries will also benefit from this revolution. For the government: the system has helped Tampere's tourism industry grow rapidly. It helps the city attract more tourists. And it will also create more jobs. For small and medium businesses: it creates more opportunities to develop their business. Our system can also be used in the daily entertainment. For example, citizens can use our app to see about nearby restaurants, cinemas, and some places like that to get relevant information such as geographical location and user reviews. Meanwhile, people can book them in advance. When there is any activity in the city, relevant information will be displayed on the platform as soon as possible, so as to let everyone know.

SMART KEY IN TRANSPORTATION

THE BACKGROUND

Whether traveling by public transit or private cars, keys are needed to unlock vehicles or get access into the public carriage. At present, the keys of private cars are mostly physical smart keys with remote control systems. The key user groups of smart key in transportation field are passenger using public transit and drivers. When passenger enter the subway, bus or other public transportation carriage, they are supposed to buy a ticket and present the ticket as a credential to get access into the carriage.

The Future Airport

The Present Subway Entry with Tickets

THE SCENARIO

For most means of public transportation, entering and buying tickets can be done by an app on smart phones. This app can help you know the real-time location of buses, update road conditions and link with your account but not identify. Smart phones with near-field communication provide payment solution for transportation users. Account-based payment combines all forms of transit payments such as bus, metro, parking, car and bikes rentals, which reduces transaction costs.

For transportation like trains and planes, the ticket information will be linked with your ID cards, when you buy the ticket, the information will update in time, so you can enter train stations or airports just with id cards.

In Beijing, first-time passengers have to stop before the gates for several minutes to download and register themselves on a seperate APP ‘YITONGXING’. This is highly inconvenient due to often very poor signals in the subway, resulting in many people unable to download it and so unable to use the service completely because people rarely carry cash with them! Also, for tourists, this is a highly inefficient process because once they leave the city, there is no point of holding on to this app. Often people delete it. Wasted resources.

Passenger Buy Ticket by Scanning QR Code

The App "YITONGXING"

By constrast, Wuxi, a city near the East Coast of China has a much more integrated and highly efficient smart transport system. For a first time underground user, the only thing that is needed, is simply to search up ‘Wuxi undergroud code’ via Alipay. As Alipay is a commonly used app that nearly every citizen has installed, this becomes very easy to use. It takes onyl 10 seconds to search and another 5 seconds to authenticate. Then one only needs to scan the QR code to take the public transport medium! On Alipay, it is also possible to open up a bus code in the exactly same way. Tourists need not to download a seperate app at all and it facilitates their trips tremendously.

THE KEY USER GROUPS

The key user group are both dwellers and tourists to Tampere. For dwellers, this app can greatly simplify the payment. For tourists, this app will help them use public transportation and have better experience travelling in Tampere without buying extra cards. Passengers don't need to get paper ticket. Meanwhile it can prevent crime to enter the public transportation and catch criminals.

THE STAKEHOLDERS ANALYSIS

A 'keyring' that combines the keys to access public transport, across mediums (trains, underground, buses...) and even potentially across cities will be PIONEERING. Imagine the convenience and efficiency experienced by every city's citizen when they visit each other. Take a Tampere business man arriving in Helsinki for instance. Instead of buing an expensive one off metro card, he can use the app he uses for Tampere's buses to get anywhere he wants! Since Keywise is only a medium, this does not involve the problem of profitability and impossibility of setting the same fares across different cities and differrent companies running different services. This is only one way of accessing their transport services.

Thus, our system has great potential in achieving high effcieincy in public transport, hopefully encouraging more outings this way instead of private car journeys, hence also contribute to environmental good deeds too.

SMART KEY IN WORKPLACE

THE BACKGROUND

Controlling employee and visitor access is a top concern for office spaces. As job responsibilities vary, different employees will require different levels of access to certain parts of the office building, and at different times in the day too. For instance, IT staff might stay up late to maintain computer systems, but investment bankers may come in to trading floors at 4 am. It would be very difficult to have receptionists and securities staffed at all times. In this part, we will explore how smart keys can help employee get access to certain parts of the workplace and company can monitor employee access more efficiently.

THE SCENARIOS & THE KEY USERS

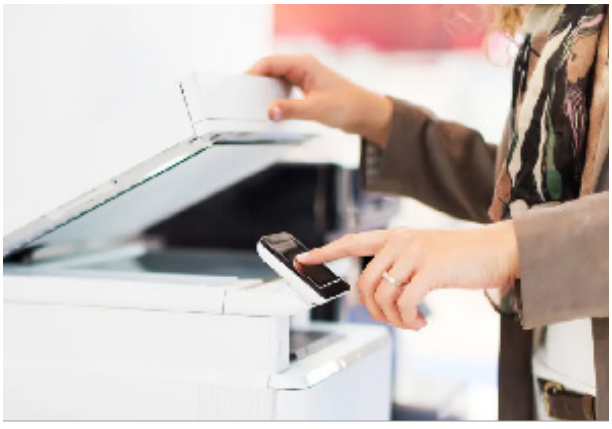
The key user groups in workplace are the ***company***, the ***public agency*** and the ***employees***.

Entering The Company with Fingerprint

For employees

Employees arrive at the company in the morning and enter the company with the smart key(fingerprint). They can pass through quickly since they don't need to take out traditional keys from bags avoiding crowds.

In most office buildings, people with verified credentials will be able to call for the elevator. Employees can use the smart keys (fingerprint or ID card) to get access to any floor to which they are authorized to enter. Also they can use facilities, including printer, computer by fingerprint.



Acquiring Access to The Facilities by Fingerprint

Additionally, employees can book a conference room advance with the smart key system. The system will reserve rooms according to employees' preferences and the location of their offices. And the system will real-time reports availability of the rooms. This system can collect the data of the types and periods of time employees enter the certain parts of the building, and individualized access to different rooms for employees.

Scheduling meeting room by the APP

For companies

The company can easily add or revoke access to employees to different kinds of rooms based on their job responsibilities by the system, which will greatly improve HR productivity. For example, rank-and-file staff can't enter sensitive areas, such as rooms where company's confidential documents and large amounts of cash are kept. In some biotechnology companies, non-technical staffs don't have access to the laboratory and cannot be directly accessed through fingerprints. Instead of having different keys for different employees, companies can simply lock or unlock the access on the system. Otherwise, since employees enter the company every morning by presenting ID card or fingerprint, the company can make use of the platform for convenient and efficient attendance management.

In addition, the smart key system helps reducing operating cost. There is no need for a dedicated person to manage and allocate the use of the conference room. The system can handle the room reservation directly.

Support HR Productivity and Reduce Cost

For security of the business, the company can consistently monitor and control the flow of employee traffic in and out of sensitive areas easily with the smart key system. With traditional lock and key systems, doors are often left unlocked, making it far easier for an employee with malicious motives to gain a point of entry into a sensitive area. With the smart key system, the doors in sensitive area stay locked at all times, and only employees with assigned access will be able to enter a given location.

For guests

Guests can schedule a meeting with an employee via open open access system which can be connected to Google/Outlook Calendar and the smart front desk system. The appointment information including time, location will be presented in the system. There will also be a reminder in the form of a message notification before the meeting starts

The smart key system can automatically grant guest passes for unlocking the right doors at the right times. There is no need for the employees to guide the guest to the right room in person, there will be floor plan on the system, and the guest can access the elevator to the selected floor by presenting credential on their phone.

Temperature screening and security check will be done through the hardware installed on the front doors considering the COVID-19. The temperature is recorded and can be checked by the APP.

The stakeholders analysis

In a work place scenario, employers, employees and visitors could all enjoy the efficiencies brought about by the smarter Keyless system. The company can benefit from higher productivity by its workers as time is saved from waiting outside locked up meeting rooms, easier booked team meetings and a better perception by clients and visitors when witnessing how smart their office spaces are! Additionally, employees could also enjoy their time more at work. Instead of dull and inefficient work routine, they can truly enjoy time here and be proud when showcasing to clients, families and friends how futuristic and convenient their office spaces are. Higher utilities result!

SMART KEY IN SPORT

THE BACKGROUND

Our system also strives to encourage more citizens, in particular those in Finland, to do more sports. We have identified a growing problem of less physical activities among city-dwellers from our interviews, partly because of frequent extreme weather, partly because of the lack of information about where indoor sports can be practiced and what is going on around them. A 2013 WHO report has alarmingly suggested only 34% of adults and 20% of older adults are exercising to the reocmmended levels. This is only one out of many pieces of evidence showing an increasingly sedantry lifestyle that will pose serious health risks to citizens.

%	ADULTS (18-65 YEARS)	OLDER ADULTS (65+ YEARS)
MALES	32	25
FEMALES	36	17
BOTH SEXES	34	20

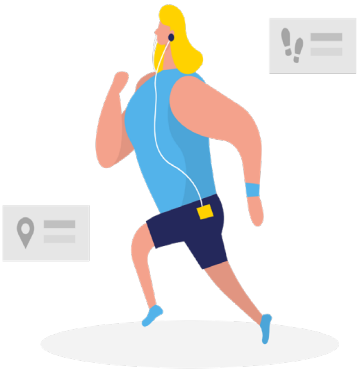
Table. Prevalence(%) of adults reaching the WHO recommended physical activity levels, 2013

THE SCENARIOS

We hope to connect all the indoor facilities of sport in the city via the same medium. For instance, if a citizen is able to check out the nearest facility wherever he or she is and without the hussle of registering again, they are much more likely to use these facilities. Our interviewees have endorsed this view. A Tampere dweller has expressed positive wishes, saying if University facilities are opened up to dwellers nearby outside term time, then there will be no need for them to travel into the city every week just for gym. They will thus use those facilities much more often.

citizen is able to check out the nearest facility wherever he or she is

Additionally, a lot of cities have extreme climate months. In Finland, constantly snow and bad weather makes outdoor sports rarely an option. Therefore, by sending notifications of what indoor activities are taking place nearby, not only can it give more indoor activities' options, but also increases community interaction and cultural communications. For instance, if some Pingpong desks are being set up in the basement of a library.



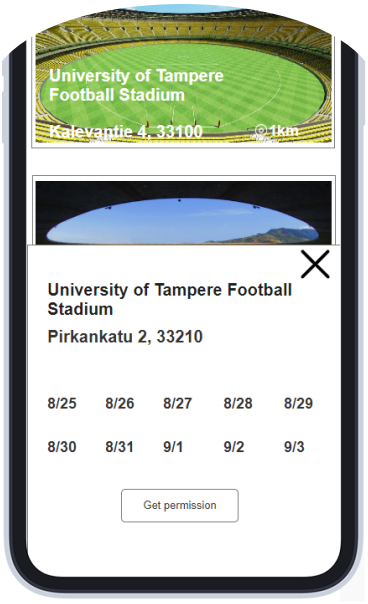
sending notifications of what indoor activities are taking place nearby

The key user groups & The stakeholders analysis

The key user group of such sport facilities are any citizen that will be propelled to do more physical activities if they know where and when they could! We are hoping for adults, after a day of work, they might be interested in finding some indoor activities where they can socialise; for children, their parents might wish to take them to cultural events such as a family run; for the elderly, they might benefit from knowing new people when going to a park walk, hence reduce the sense of loneliness commonly observed among Japanese elderlies for instance. Consequently, every age group could benefit from more sports information. It will not only bring health benefits, but also encourage socialising, hence building a happier community where people know each other and perhaps socialise more frequently at those events.

The system allows citizens to get information about nearby sports venues.

Moreover, citizens can book their time in the system.



SMART KEY IN HOSPITAL

THE BACKGROUND

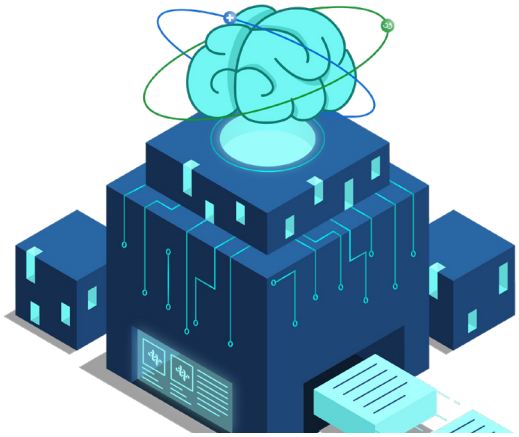
Health care has grown into more and more important in people's daily life, from health care in the home to treatment in the hospital, they have become part of your life. While present medical treatment system still have some problems that bothering patients a lot, so we design the medical system in the future from different perspectives with different types of smart keys that can catch the problem.

THE SCENARIO

Firstly, the key is your social security number that matches the medical information of you. In the past time, some patients do medical examinations in the community hospitals, when they needs to referral in a higher level hospital, they have to take physical X-ray or CT scan imaging pictures and inspection reports with them, or even worse, because different hospitals have different checking levels, they have to do the similar treat for another time.

These kind of repeated examinations waste both time and medical resources. Apart from these, some patients are send to hospital because of emergency accident and need to be treated in time. Some people are allergic to certain medicals, if doctors don't know the allergy medicines, the urgent treatment may cause some unknown influence. Assume your social security number becomes the key to your medical information. If you want to make an appointment with doctors, just use the number to reserve, the system can make the appropriate time for you according to your information. All the results of examination and your allergy medicines will be recorded in the database, and your number is the key. When seeing the doctors, the hospital and doctor will have the access to the database. To protect the privacy, the database will be protected strictly by the government.

Your social security number becomes key to medicine information



Smart guide in hospital

Secondly, when you go to the hospital, there will be an intelligent guide for you according to your appointment and state of illness in your mobile phone. Before you go there, you can make your appointment with doctors in a suitable time. Then you arrive at the hospital, the app will lead you to the consulting room. When it's your turn for consult, you will get the access to the consulting room. If you need to do other examinations, the guide will be uploaded in the app and make an intelligent guide for you. The keys to different consulting rooms will be the app on your mobile phone. And the result will be recorded with your social security number. And you can check them in your app. If you need outpatient surgery, all the key you need is the app, you can use it to

SMART KEY IN RESIDENTIAL AREA

THE SCENARIIO

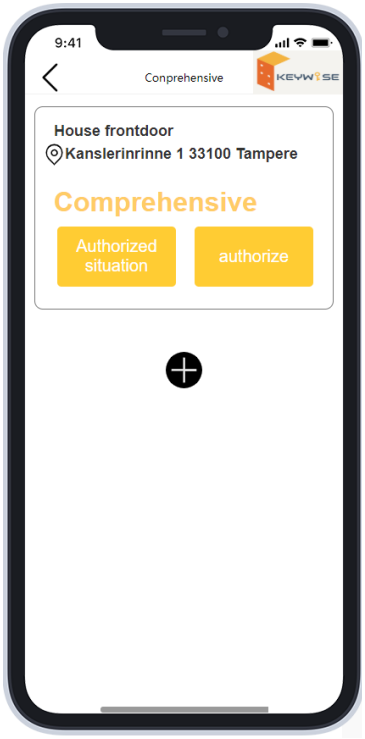
The use of the system in the home scenario is mainly to grant permission. By granting permission, the owner of the home can allow others to access his home and the equipment in the home. Grant objects can be friends, relatives, cleaners, takeaway brothers, couriers, property personnel, etc. (The identity of these people needs to be verified) This can greatly improve the efficiency of the staff, and it is also convenient for friends and relatives to visit each other.

present delivery for home with trouble

THE KEY USER GROUPS & THE STAKEHOLDERS ANALYSIS

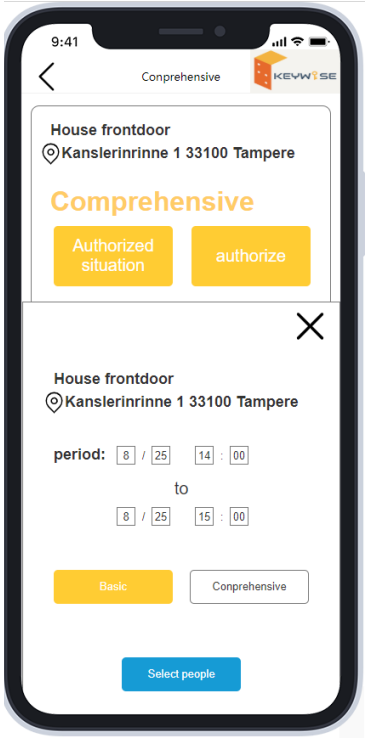
In a residential context, every citizen will benefit from easier access because Keywise provides much easier access for themselves and their visitors. Take an apartment dweller for instance. If she is not at home when a delivery guy is delivering her parcel, she could simply give him the access to enter the front of her apartment and leave the package at her door. This access could require 'Comprehensive' person data from the delivery guy, because people's homes are an intimate place. In case of vandalism or theft, this access system can help the victim and the police to locate them soon. Additionally, this is also easier on the visitors side. For a delivery man that previously visits the apartment very often, by having this access, this saves a lot of time as he no longer needs to wait in the cold, make many calls... He could simply scan a code each time and get in within seconds!

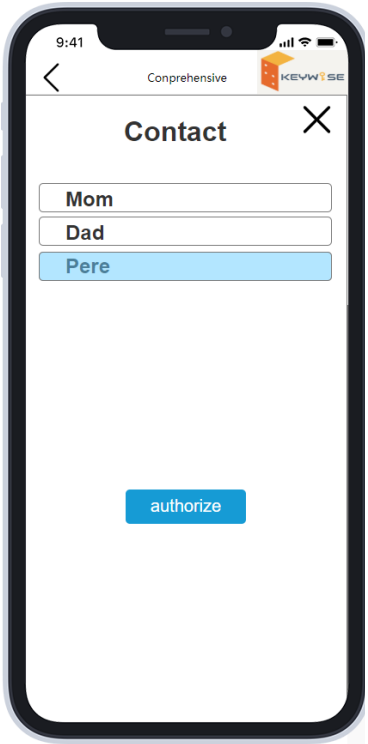
THE UI FLOW



First, the owner clicks on the “authorize” option in “Compreh--ensive” section.

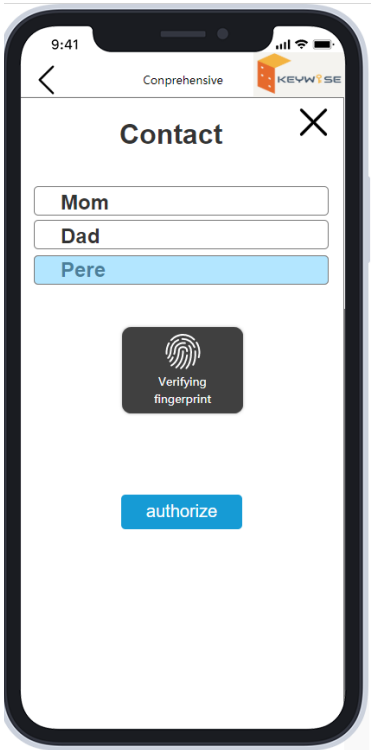
Second, confirm that how long they would like to get the permis-sion for and then click the “select people” button to choose.





After choosing the right person, click the “authoriza” button to give permission.

Lastly, use your fin-gerprint to verify your identity. After that, your friend can have the permission to your home!



SMART KEY IN SCHOOLS

THE BACKGROUND

Schools are places where teachers focus on educating young minds and students focus on learning, without being bothered by external threats or concerns. However, we don't live in a 100% safe world. It's very improtant for a school to have an access system to keep certain threats outside campus. Additionally, the teachers and students frequently 'traffic' between classrooms and labs for different classes, they need be granted to access into these rooms.

THE SCENARIOS

This system can firstly be a medium for easier access to facilities on campus. If the university system can be accessed via the same app, they can check whether the library, gym and classroom have free space, how crowded each study space is and so on.

Student traffic into different rooms for classes

This kind of information may help them plan their outings more effectively. For instance, seeing the library is more crowded but the cafe is empty, they save time by going to the cafe directly. Furthermore, based on our system, they can also make reservation in advance for multifunctional classroom, fitness time, library books they need and unoccupied seat. We can also use this to manage students flows, which will improve the security and reduce the risk of infection considering the COVID-19. In the present (2020's coronavirus health crisis) context, a warning could be sent to the school's health team if a high concentration of students is witnessed.

Library in universities

Second, for people who are not in the university, they can use the system to make appointments, gain temporary access to some places in campus, in order to use the campus multifunctional classroom, gym, library and other places. If the university is happy to rent out/ open up those facilities, this will be a more efficient use of previously unused space. But this will be done is a very safe way. Upon entry, the smart access system could request 'Basic' or 'Confidential' level of personal information.

In case of vandalism for instance, immediately this person's address, phone number, place of work...will be obtained by the police. Knowing they will be caught immediately, planned crime is likely to be very few.

Furthermore, when there are a large number of students, the number of permissions granted to the wider community to access on campus facilities may be limited. But during students' holidays, the number of permissions could increase, which not only helps the nearby residents, but also makes full use of the resources of college.

At the same time, the system can also guarantee the safety of teachers and students in the school. We can use this on many primary and secondary schools. By prohibiting unidentified person from gaining access to schools, we are able to significantly decrease the occurrence of children-related criminal offenses such as kidnaps; hence, make cities a safer places for children too.

Our system can make school a safer place for children

According to Tampere University and Tampere University of Applied Sciences, there are more than 30,000 students in this town with a population of 220,0000. This means around 1/7 citizens will benefit from easier access to the rest of the city via a smarter, keyless system.

The key user groups & The stakeholders analysis

Keys to schools can benefit multiple stakeholder groups. Firstly, children can benefit from safer campuses as all teachers, staff and visitors must give 'Comprehensive' level of personal info before coming in. Parents could feel safer as the identity of whoever that will come into contact with their children will be recorded.

Secondly, schools and universities can benefit from having a smarter system monitoring who is coming in because this empowers them to safely rent out spare resources. Outside school terms, gyms, sport grounds, classrooms, theatres... Are all left idle. Previously this is not used partly due to security concerns. However, if the identity of peoplr coming in can be traced, renting out or evening openning up for free to the community becomes financially feasible! The school can charge people from the local (easily too because our system is linked up with payment options). The society benefits too because people living near by can therefore use more facilities, become healthier and have more.entertainment options.

SMART KEY IN EMERGENCY

THE BACKGROUND

City life can be full of risks. We cannot forget the tragedies of terrorist attacks, health emergencies and hazards that pose challenges to the normal functioning of cities. In our system, we support rapid responses of public services by being connected to a huge number of mediums depending on the type of emergencies.

Our cities need quick response

THE SCENARIO

Firstly, in case of a terrorist attack, such as the London Bridge attack in the UK which killed 8 and injured 47, our Open Access system's cameras can be used to analyze the situation. Normally, those cameras would have been used for facilitating traffic flows or ensuring access is given only to the right person, but once it captures imagery involving knives/ guns/ robbery... it could be programmed as such that emergency signals are sent to the police immediately to (1) alert (2) analyze the situation for them.

Additionally, if the cameras are able to analyse wounds of victims and send those footages to the hospitals immediately, then the hospital staff can be prepared in advance hence save lives.

Furthermore, a smart access system can potentially not only give access but shut down access too.When an attack takes place, the city's transport can be directed in such way to make escape route clear and protects civilians.

A smart access system can potentially not only give access but shut down access too.

We can also use the system to separate the crowd, so as to prevent COVID-19.

In response to an emergency, such as a terrorist attack, our system's connection to the city's public services can also save lives. The use of drones is also part of the equation. Immediately after a CCTV catches signals of a terrorist attack, a drone could be launched autonomously from a dispatch center or fire station and fly to the immediate location of the incident providing real-time situational awareness via secure video streaming to dispatch, responders and/or the IC. This provides invaluable information as to the magnitude of a fire, hazmat situation, explosion, flood, tornado, and much more. Drones may also deliver critical medication to underserved areas or automatic external defibrillators to a cardiac arrest. This situational awareness information would help identify if additional resources are needed or to reduce speed and even release unnecessary responding units. Drones may be flying constantly as part of overall smart city monitoring for multiple purposes including public safety, with a warning system connected to the police.

Drones also have the potential of identifying wounds of victims immediately. If the CCTV can capture clear photos of where the victims are hurt, a smart analysis can be conducted immediately, so as to instantly determine what medical resources are needed. For instance, if such system can be in place, the 2018 London Bridge attack in London victim's bullet and stabbing wounds could be acknowledged by hospitals nearby immediately. With connections to hospitals' databases, spare beds, doctors' availabilities, and expertise could be very quickly matched up; with connection to the transport system, traffic lights can be coordinated so as to let the ambulance and police cars arrive as quickly as possible.ambulance and police cars arrive as quickly as possible.

The key user groups & The stakeholders analysis

All stakeholders in cities will benefit from an emergency scenario smart key system. In case of natural hazards like an earthquake, or a humanitarian crisis like a terrorist attack, the smart system can open up access to all for access to safety, and potentially close down access for any criminals to accelerate their arrest. Hospitals, the police force, social workers... Will all significantly benefit from the improved efficiencies of an integrated information system, immediate closure of information gaps, so to allocate scarce resources most effectively to accomodate for needs of citizens in cities.

INCLUSION OF CITIES

Cities are not built for someone but should be equally accessible to all. Ghandi once said we should judge a nation's greatness by looking at how the underrepresented are treated, here, we wish to address two particular precarious groups that cities could be designed more user-friendly than now so they are well cared after. The success of urban inclusion, nonetheless, relies not only on the systematic designs but also on its people around them. Our system provides the hardware, but education, compassion, and human trust is instrumental to realise this too.

The elderly and the disabled also will benefit from the smart key

THE ELDERLY

THE BACKGROUND

According to some reports, the aging problem has become reality a in many countries, especially in Nordic countries. By 2030, a staggering 26% of society will be 65 years old or older, making up a major component of the city demographics. Thus, it is crucial that we also consider elderly people's living habits as a part of the smart keys system. When people age, their hearing and eyesight may become worse and memory gradually fails, so taking out different physical keys or remembering several passwords could become difficult.

The elderly is opening the door

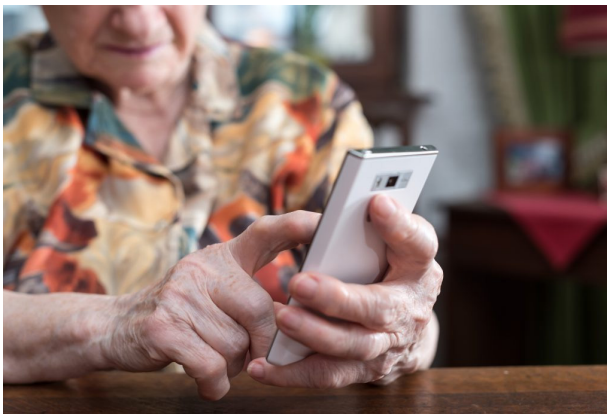
We envision that in the future we can combine multiple physical keys into one and simplify their usage by putting all of those access authentications onto a facial recognition system. This can be extremely user-friendly to elderly people. This will mean they do not have to worry about bringing their keys with them, forgetting a metro card or even a payment card, if their faces can render information about their identity and automatically they can get to wherever they want to. This is important as once again, we should judge a society by how it treats the less privileged. To consider the difficulties faced by the elderly, who are more susceptible to dementia, we really strive to create a more inclusive society and so reduce fears of people as they age too.

THE SCENARIO

To propose some scenarios about how this system will work in practice, we link societal problems we observe and analyze how this can be solved with a smart access system like Keywise.

When visiting the shopping mall or strolling in the park, they only need to take the smart bracelet for entering and paying. More than this, there is some news about elderly people going missing when they go out along. This smart bracelet can, therefore, become a ‘key’ to finding where they are! If consent is given in advance, a GPS could always be switched on, so a key to the people’s location can be available for viewing by his or her family members, and when necessary, the police, in case of disappearance.

To minimize the risk of financial fraud, elderly people could also give consent to facial recognition when making lump-sum payments. The notification could be sent to family members too so to prevent payments that are not made out of the family’s will.



The elderly is opening the door

In case of emergency, such as an elderly person falls down or suddenly falls ill at home, his/her house’s access could be set to automatically inform first-aid personnel and allow access into one’s apartment, so they could be treated as quickly as possible. In Japan, an issue of top concern is ‘longly death’, where a single elderly person’s illness is noticed by no one and so they die in their homes in a lonesome way. This could be prevented if this system can also update their health conditions at regular intervals to their community health center and social care workers.

THE DISABLED

THE SCENARIO

When we consider a city's design of public facilities, we customarily accommodate a normal person's needs. We assume everyone can drive a car on their own, go upstairs and downstairs easily, ask a receptionist for a key card, and so on. Yet there is a large group of disabled citizens that risk being forgotten by the very city they are living in! As Ghandi once said, we shall judge a society not by how it treats the rich and privileged, but how it treats the poor and disadvantaged. are always forgotten by us, and they are the people most needs special attention and care. They may have hearing or seeing disorder or have difficulty in walking, some simple acts like use keys to open the door become very difficult.

Easier access system is needed by the disabled

Finland and the vast majority of countries in the world are also committed to the UN treaty on the rights of persons with disabilities. So we hope the smart cities with smart keys systems are friendly to disabled people and can help them live better in cities.

Starting from the living place, people with difficulty walking and people with seeing disorder may need to use wheelchairs or walking sticks to help, so we can turn all locks such as different rooms or computers in the house into a voice lock. The voice lock can recognize your voice and orders, so you can just sit there and operate.

For people with hearing disorder, we can use other types of keys like fingerprint identification in house locks. Apart from this, the disabled people's house authority management will be able to be open for nursing personnel and social workers in certain times for help them do housework and treatment. Their house's authority will be checked by both government and the owner, and also the social workers' identification will be checked and registered through the internet. After this, certain caring people can get the visitor authority in certain time to the disabled people's house by password or facial recognition.

In some emergency situations, such as the disabled people live alone at home while suddenly fall down, when the smart bracelet they take monitors the abnormal body index, the system will call for the hospital for help, and the first-aid personnel temporarily get the authority to the people’s house, so they can help he/she in the shortest way.

When disabled people pass the road or enter some building, they always meet some problems, they may need more time than the normal time to pass the traffic lights, they may have difficulty in taking subways or even elevators. So we think maybe they can take a special smart bracelet with them, and this bracelet stores some information about them such as disorder and what kinds of help they need like a key to database. When they need to pass the road or enter a bus, there will be matched public installations settled in these crossing or bus doors interact their information and take related measures like lengthen the green light time or settle the wheelchair accessible passage.

More than real keys in life, we can also develop interactively and suggested keys through people and people, people, and gover·nment. An online community can achieve these ideas. For instance, when disabled people encounter difficulty in obtaining access to a particular place, they can send a request via the app to call, for help. For those that are nearby, they could perhaps give a hand out when seeing this message popping out as a notification! This 'call for help' could also be designed by levels: emergency (potentially connected to the police system, while notifications sent to people around are marked with "!!!" so high emergency) or ordinary that signal is only sent to staff of the shopping cent, er etc. and people around receives an SOS alarm.

In connection, feedback can also be given to improve this place. Users, including but not limited to disabled users, can also upload feedbacks if facilities are not friendly to disabled people and so the government can make some effort to upgrade it in order to fulfill municipal duties. When they plan to go outside, they can search in the community for a friendly road with a barrier-free facility.

USER STORY

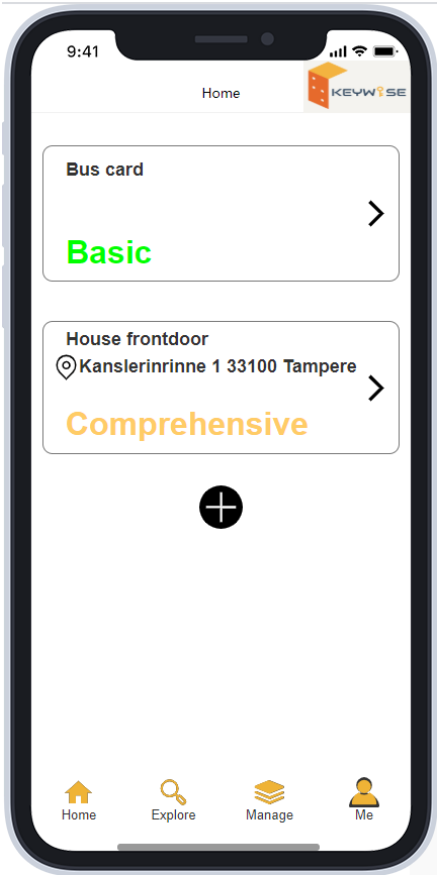
"Keywise" is an integrated app that combines the functions of big data permission management, permission application from individuals and permission utilisation and permission.

Through collection of biometric identity data, a citizen enters the system interface. The system is divided into four sections: 'Home', 'Explore', 'Manage' and 'My Information'.

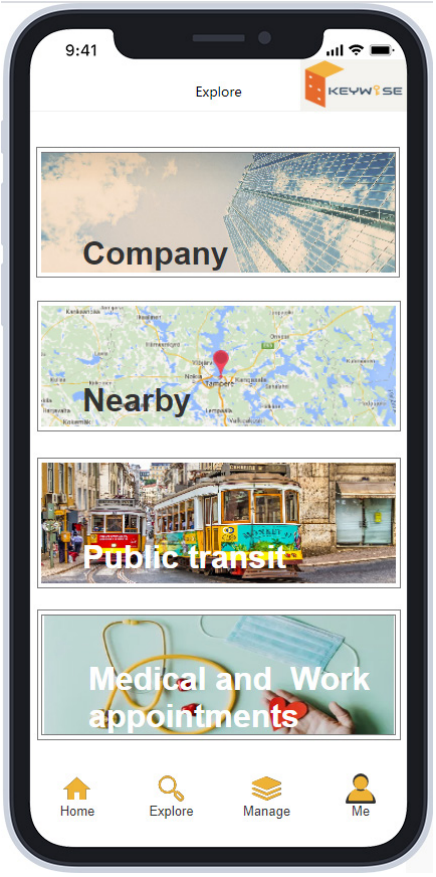
First, we look at the 'Home'. The main function of 'Home' is to handle the notifications of permission grants and permission requests and to place some permission shortcuts to facilitate daily use.

Second, we come to the 'Explore' interface. This interface is the main way to obtain permission to access different places in the city on a daily basis. The sources of authority include these visits: schools/companies, surrounding facilities, public transportation, hospitals, and government appointments. In schools and companies, you can obtain access rights in tasks, and book rooms and equipment usage rights in schools and companies. In the surrounding facilities, you can find and obtain the permission and flow information of surrounding libraries, sports venues and tourist places. To take public transportation, you can obtain public transportation permissions and people flow information. Use real-name appointments in hospital and government appointments to handle affairs and conduct face-to-face consultations.

'Home' UI



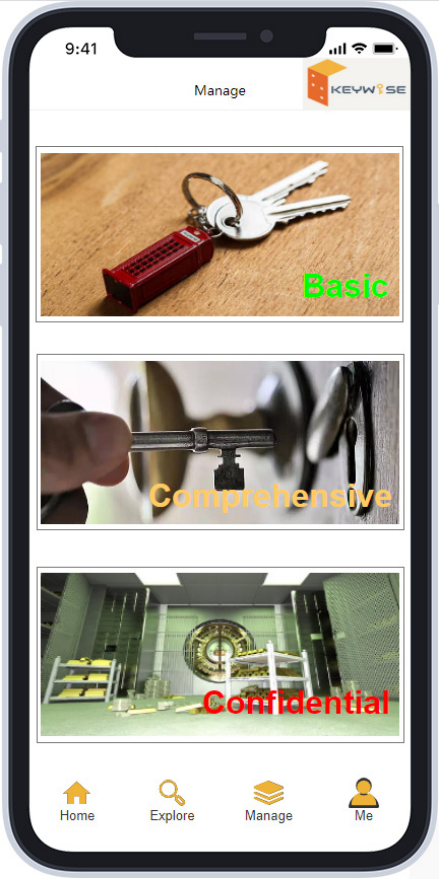
'Explore' UI



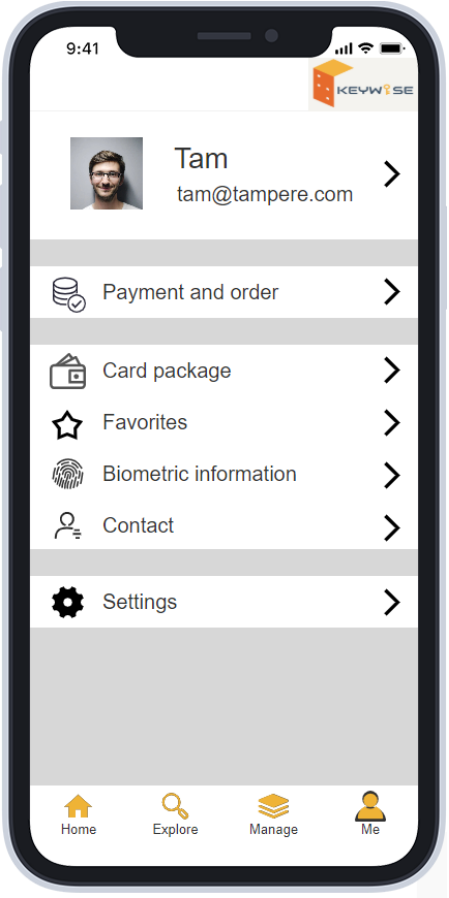
Third, it is the ‘Manage’ interface, where users can manage their own permissions. The authority is divided into three levels, namely basic, Comprehensive and Confidential.

Basic permissions are permissions that can only be used. Comprehensive permissions are permissions that can be granted to others by user. Confidential permissions refer to the permission.

Lastly, the ‘My Information’ interface provides historic data about what access have been applied for in the past, helping an individual or whoever is concerned to check one’s whereabouts.



‘Manage’ UI



‘My Information’ UI

TIME: *8 AM*

SITES: Home

RELATED SCENARIO: Residential area

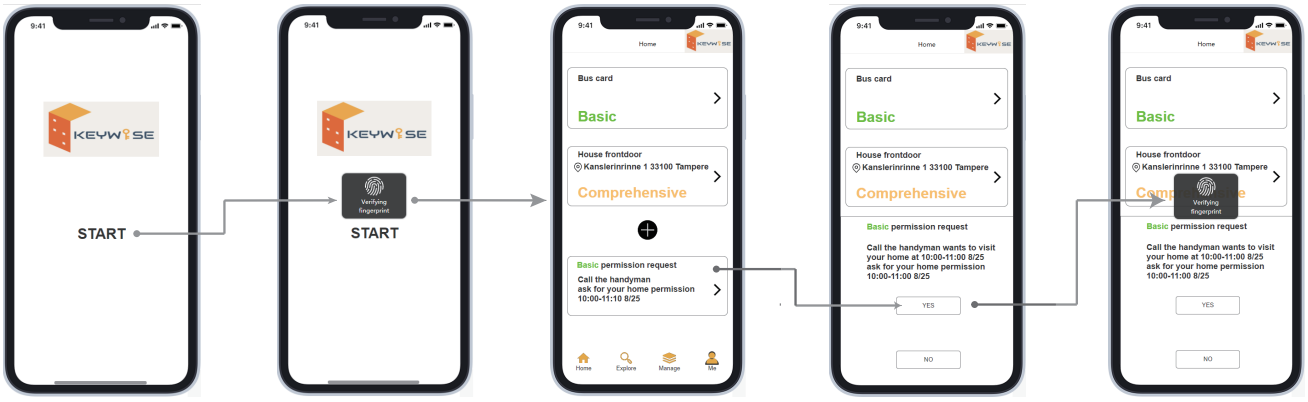
ACTIVITY

Waking up. Schedule an appointment to repair appliances on the APP

SECURITY LEVEL: **Comprehensive**

USER TASK

Tam books an electrical repairs on the app Call the Handyman at ten o ‘clock to eleven o ‘clock in the morning. Mechanic accepts the appointment and click on the app ‘Call the Handyman’ for permission to enter Tam’s house in the appointmented time and then jump to app Keywise.Tam receives Keywise’s remind and gives the repairman the permission.
The system generates a string of random password and sent it to the mechanic. The mechanic enter Tam’s house with this random password.Once the password is used, it will lose efficacy. After it lose efficacy, if you need to reuse it,you need to reapply.The authorizer can select the time in Keywise when the password is valid.



TIME: *11 AM*

SITES: Apartments

RELATED SCENARIO: Residential area

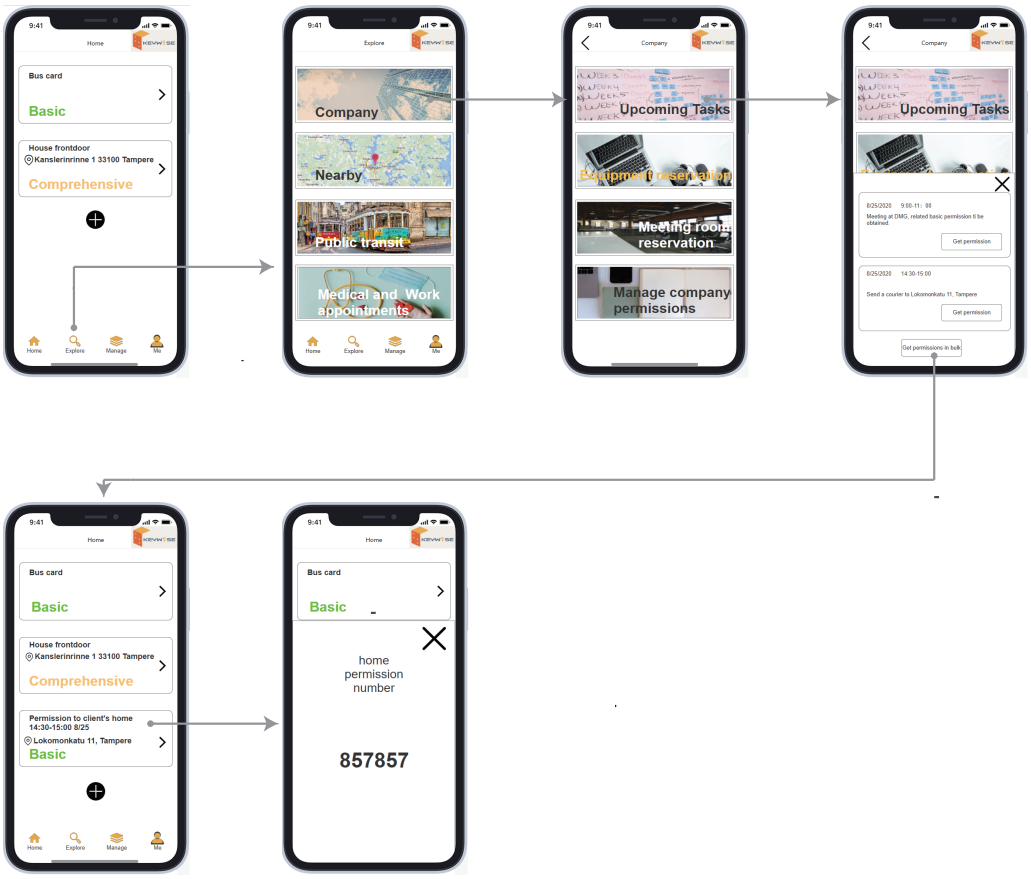
ACTIVITY

Tam is a delivery guy so he visits many homes and office places to give out parcels. He would have needed to call each individual to ask for access to their particular buildings or even neighbourhoods.

SECURITY LEVEL: **Basic**

USER TASK

Tam asks for permissions to get into the customers' apartment and take the lift to the right floor in 14:30 to 15:00.After this, Keywise jump to the delivery system, through fingerprint identification, system confirms Tam' s identification, then send request permissions to the customer. The customer receives the keywise message, he then grant permission to Tam. Keywise generates a string of random passwords to feed back to Tam, through which Tam enters the apartment building, and use the elevator.



TIME: *3:30 PM*

SITES: Campus

RELATED SCENARIO: School

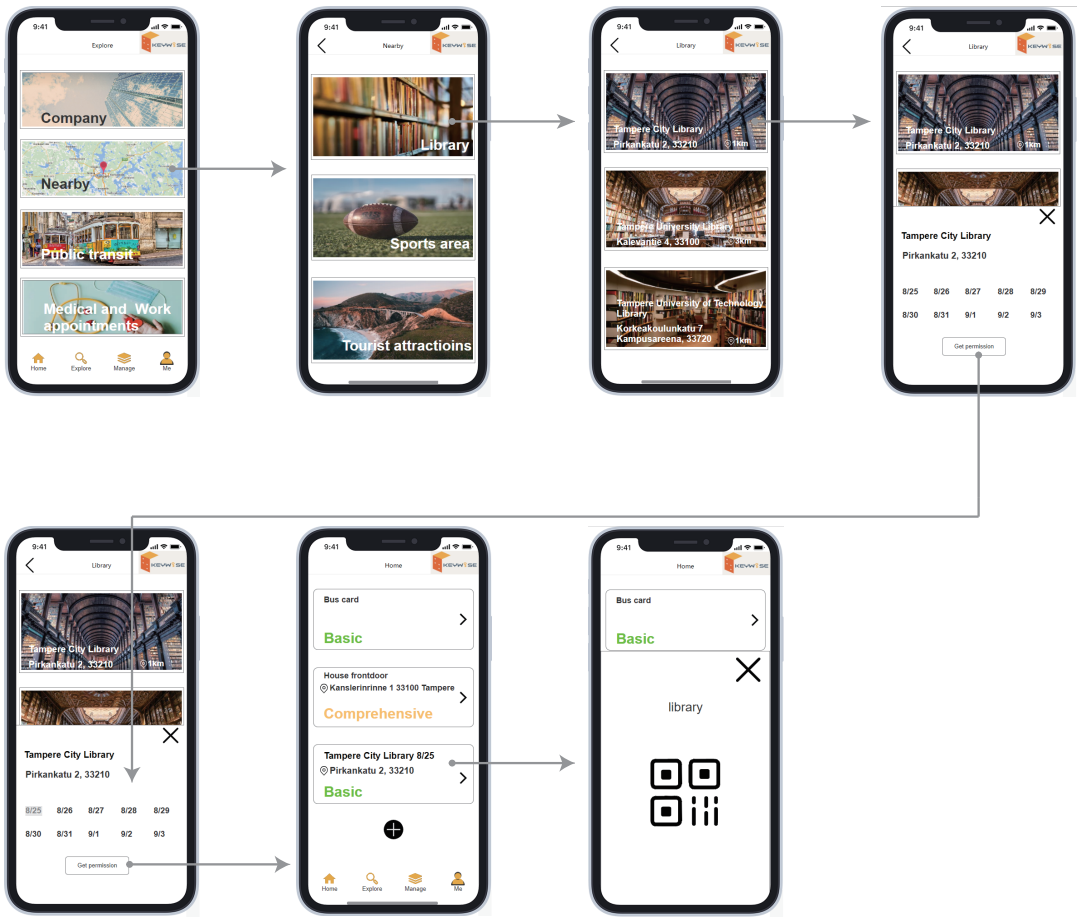
ACTIVITY

Tam is going to borrow a book from the nearby library in the university.

SECURITY LEVEL: **Basic**

USER TASK

Tam finds nearby libraries and their access requirements in Keywise. And then he applys for entry. The librarian handles permission requests at the other side. The system give Tam a QR code, which can let Tam get into the library.



TIME: *5 - 6 PM*

SITES: Hospital

RELATED SCENARIO: Health services

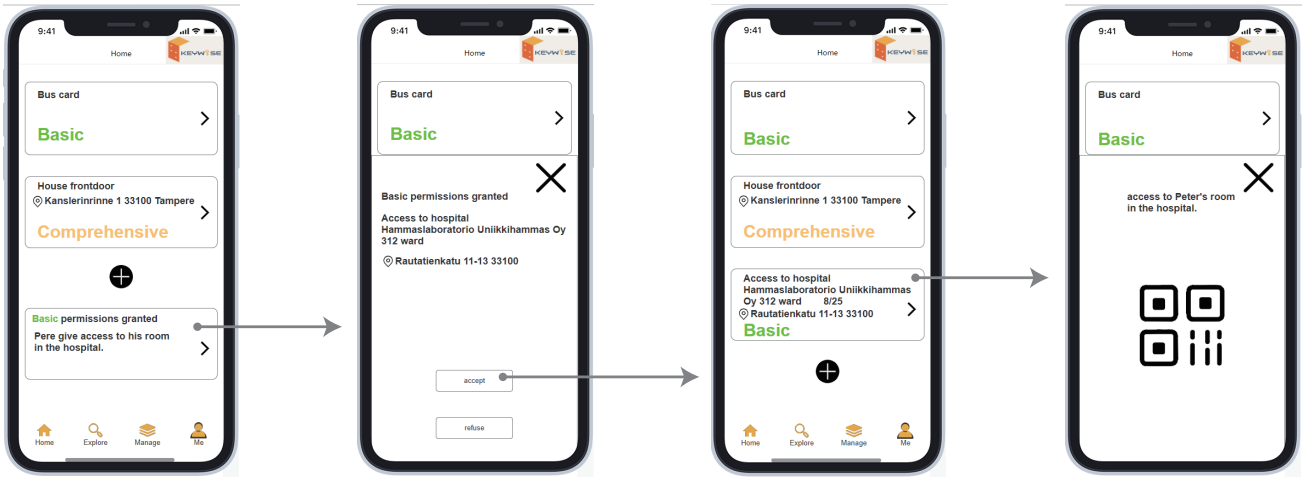
ACTIVITY

Tam visits a friend, Pere, who has just completed a minor operation.

SECURITY LEVEL: **Basic**

USER TASK

Tam applys for permission in Keywise, Pere fell ill and Tam wants to visit him. Instead of registering at the hospital reception desk, Pere has used his Keywise app to give Tam access to his room in the hospital. Normally, apart from doctors and nurses, no one could enter to ensure safety. However, Tam only needs to scan his app or put his finger print on the sensor on the door.



TIME: *7 - 9 PM*

SITES: Gym

RELATED SCENARIO: Sport

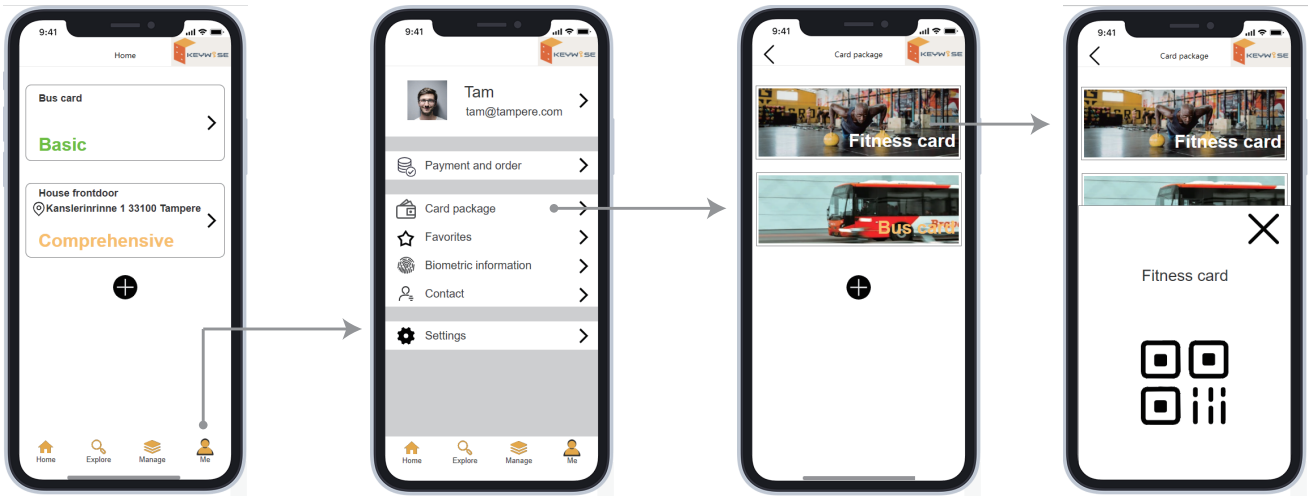
ACTIVITY

It is snowing heavily outside, and normally Tam would go back to his house, sink on his sofa with a beer to watch netflix. However, the Keywise app sent him numerous interesting indoor sport activities that are all nearby! He browsed them to pleasantly discover a indoor table football game in the bar 2 min away. So he joins the game, had a good laugh with people there and made new friends!

SECURITY LEVEL: **Basic**

USER TASK

Tam registers a VIP in a gym. Tam opens the keywise, which stored the gym's membership card. Tam opens the membership card, and scanns the membership card to enter the gym directly.



APPENDIX

Image Reference

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1.2 https://www.youtube.com/watch?v=Jc-go3aBv3g

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3.4 https://huaban.com/pins/940355642/

3.5 https://huaban.com/pins/633668343/

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3.7 https://www.behance.net/gallery/87838295/2D-Video-for-International-Bank-of-Azerbaijan?tracking_source=search_projects_recommended%7Cnfc

4.1.1 https://cn.dreamstime.com/%E5%BA%93%E5%AD%98%E7%85%A7%E7%89%87-%E6%8B%BF%E7%9D%80%E6%9C%89%E8%A3%85%E9%85%8D%E6%A0%87%E8%AE%B0%E7%9A%84%E5%A6%87%E5%A5%B3%E7%9A%84%E6%89%8B%E6%89%8B%E6%9C%BA%E5%9C%A8%E5%9C%B0%E5%9B%BE-image74151309

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4.1.8 https://www.manypixels.co/gallery/?color=09a5c6&page=3&style=isometric

4.1.9 https://www.manypixels.co/gallery/?color=09a5c6&page=3&style=isometric

4.1.10 https://www.manypixels.co/gallery/?color=09a5c6&page=3&style=isometric

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4.2.8 https://image.baidu.com/search/

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4.2.11 https://www.manypixels.co/gallery/?color=09a5c6&page=1&s=transportation&style=image
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4.5.10 https://dribbble.com/signup/new
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recommended%7Cnfc
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4.6.7 https://image.baidu.com/search/
4.7.1 https://dribbble.com/signup/new
4.7.2 https://dribbble.com/signup/new
4.7.3 https://huaban.com/pins/3326321664/
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4.7.6 https://image.baidu.com/search/
4.7.7 https://image.baidu.com/search/
4.8.1https://dribbble.com/signup/new
4.8.2 https://dribbble.com/signup/new
4.8.3 https://image.baidu.com/search/