India

Data Collection Survey for Enhancing Non Rail Revenue and Social Impacts of the Indian Metro Projects

Final Report

February 2022

Japan International Cooperation Agency (JICA)

McKinsey & Company Inc. Japan

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22-038

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List of abbreviations

ADB	Asian Development Bank
AM	Assistant Manager
API	Application Programming Interface
AR	Augmented Reality
B2C	Business to Consumer
CSC	Common Services Centre
CSS	Customer Satisfaction Survey
DGM	Deputy General Manager
DMRC	Delhi Metro Rail Corporation
ED	Executive Director
ETA	Estimated Time of Arrival
FGD	Focus Group Discussion
GCP	Google Cloud Platform
GM	General Manager
GMV	Gross Merchandise Value
ICE	Impact, Confidence and Ease
IRCTC	Indian Railway Catering and Tourism Corporation Limited
JICA	Japan International Cooperation Agency
JR	Japan Railway
MaaS	Mobility as a Service
MVP	Minimum Viable Product
NIC	National Informatics Centre
PMO	Program Management Office
SBI	State Bank of India
UI	User Interface
USP	Unique Selling Point
YONO	You Only Need One

Chapter 1 Project objectives

We performed a study of possible new businesses for the Delhi Metro Rail Corporation (DMRC) for the purpose of increasing non-fare revenues – particularly in areas related to a digital technology platform.

At its core, a digital platform is a web or application interface that makes it possible to seamlessly and efficiently provide services to customers, without necessarily requiring the possession of products or services (a so-called "light asset" model).

The development of new businesses through digital platforms has become particularly common in recent years, making it possible to quickly develop detailed services that meet customer needs without requiring large investment decisions. And the spread of mobile devices such as smartphones has made reaching customers easy, creating demand for digital services where a certain amount of data is provided to receive an optimized (personalized) service.

In addition, for the companies providing the services, the use of partnerships or cloud services makes it possible to build a service with lower costs and lower risks than in the past when an investment in physical assets was required and allows for easier differentiation and customer targeting. Figure 1 below shows how the digital platform can cater to customer needs such as convenience, personalized experience, seamless technology integration and supplier trends such as digital customer channels, higher visibility, and targeted service delivery.

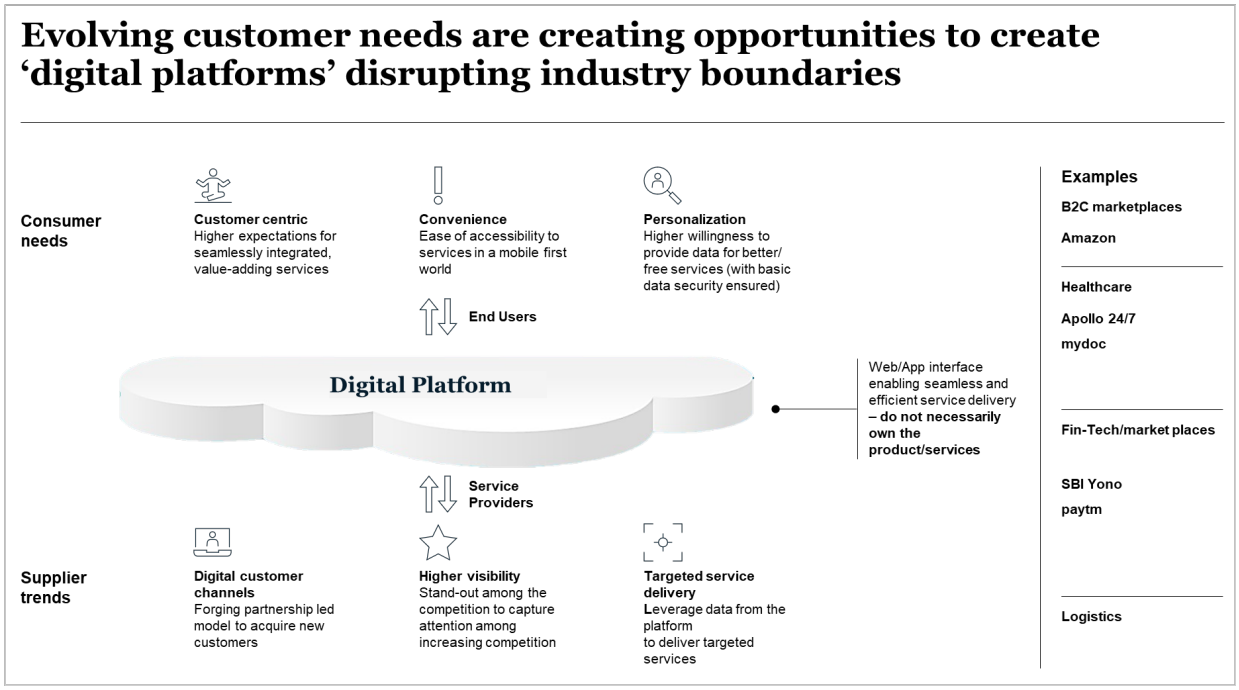


Figure 1 – Conceptual Diagram for the Digital Platform

In this project, we confirmed what kinds of businesses might make it possible to increase non-fare revenues, whether they could be realized via a digital platform, and what the feasibility of the required partnerships would be among other things.

1.1 Project implementation structure

A joint team of DMRC, JICA HQ, JICA India office and McKinsey India and Japan offices had been established to run the data collection survey. At the DMRC MD's instruction, the Delhi Metro established a team under the leadership of the ED of Operations who was assisted by GM of Telecommunication, GM of IT, GM of Property Business and GM of Finance. The McKinsey team was headed by team leaders from Japan and India and was assisted by a project manager. The McKinsey team worked closely with JICA HQ and JICA's India Office in analyzing case examples from other countries and businesses, performing customer journey analysis, and holding idea generation workshops.

In addition to the management consulting staff, the extended McKinsey team consisted of sectoral and subject matter experts across logistic sector, mobility business, development of digital platform, corporate strategy, marketing, digital design, data analytics, social impact and other experts for global use cases, facilitation support, general research, etc.

1.2 Project timeline

The project has been conducted in 3 phases:

(1) **Blueprint phase:** This phase lasted 3 months and involved global benchmarking of best-in-class apps, journey analysis of a metro customer, ideation of new digital use cases for DMRC, based on which, a business plan was created.

(2) **Build/pilot phase:** This phase of the project involved building the minimum viable product (MVP) version of the digital platform, including reaching out to potential partners and incorporating prioritized digital use cases onto the app.

(3) **CUG testing:** The last month of the project was spent to get user feedback on the MVP, while finalizing the draft final report and final report.

Figure 2 below references the overall work plan for the project, including the Blueprint phase to the MVP phase till January and details out various milestones over the period of ~ 10 months. Figure 3 details out the Build/ pilot and CUG testing part of the project, from August 2021 to February 2022.

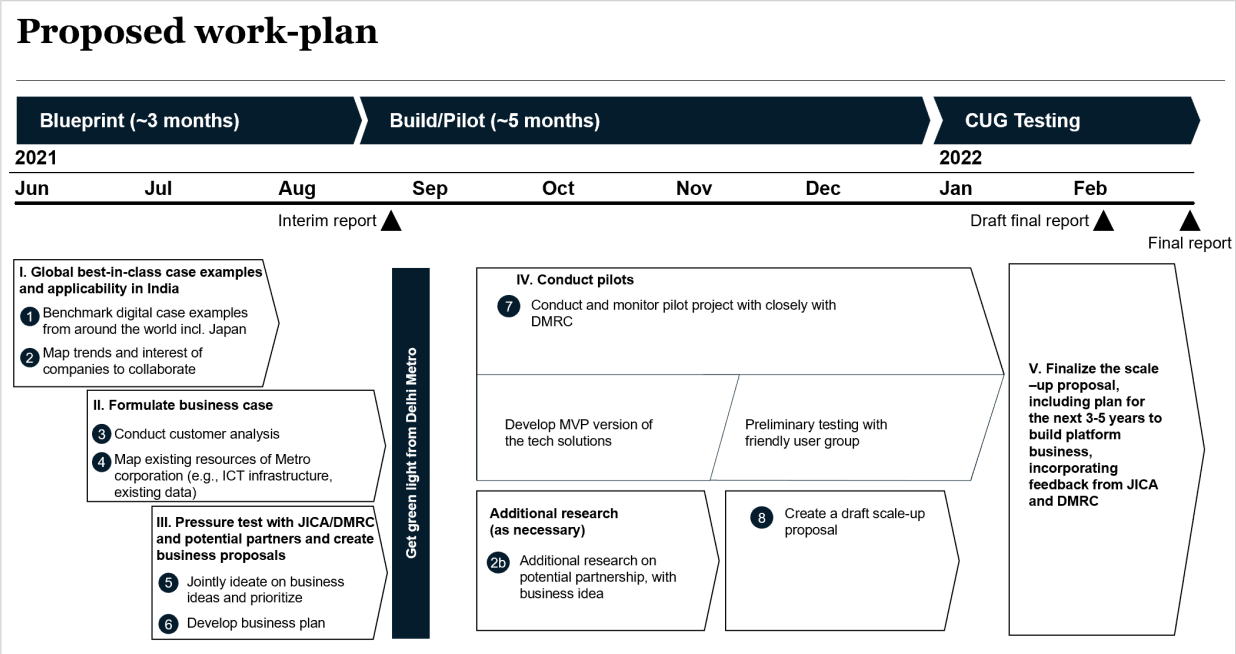


Figure 2 – Overall work plan in the study

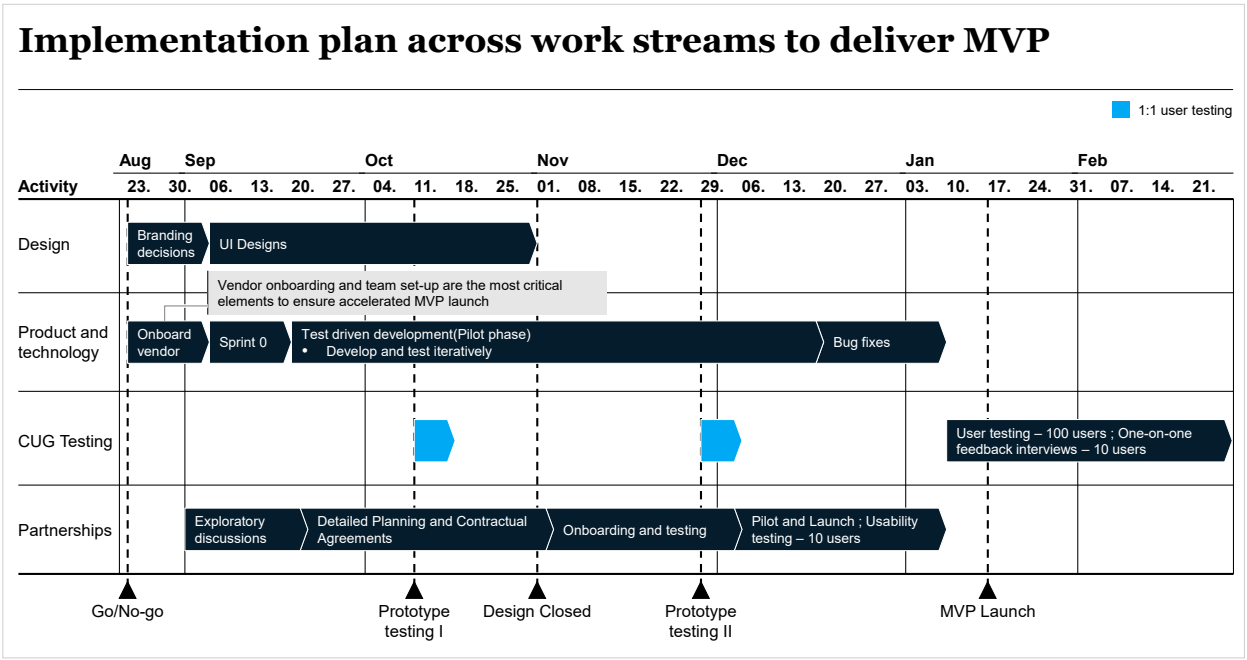


Figure 3 – Implementation plan across work streams

Chapter 2 Advance case examples from other countries

Before we begin the detailed assessment of digital platform business for DMRC, we collected case examples from other countries of the use of digital platforms in railways, as well as smart cities and other socioeconomic infrastructure businesses. In this chapter, we describe the global examples in three archetypes in section 2.1, then provide a comparison between digital platforms of various metro providers across the world in section 2.2, and how data was handled in various digital platforms in section 2.3.

2.1 Global examples under 3 broad archetypes

The global examples we collected were grouped into 3 general categories: 1) smart payments using prepaid cards or app-based payments, as well as the peripheral ecosystem, 2) the MaaS (Mobility as a Service) area, covering end-to-end mobility, and 3) things that are broadly related to the lifestyle area, including ecommerce, lifestyle, media, etc. Figure 4 below presents 10 global use cases along with a few examples across each of the three archetypes including smart payments, mobility as a service and E-commerce, lifestyles and media.

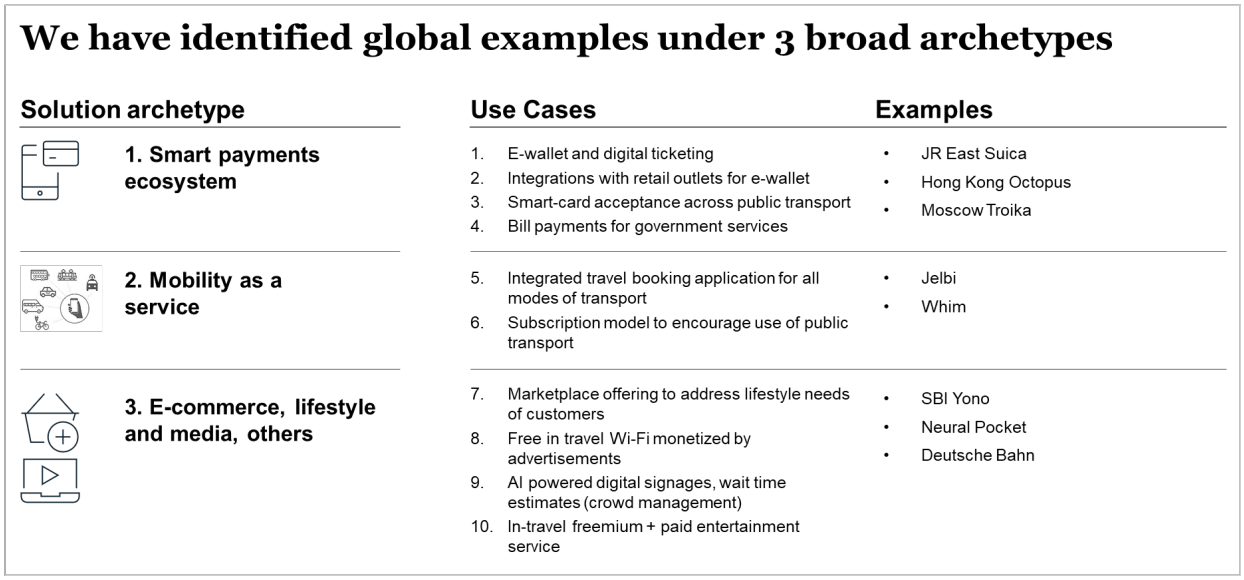


Figure 4 – Three archetypes in advanced global examples

2.1.1 Smart payments ecosystem

(A) Japan Railway (JR) East's Suica

JR East's Suica is the smart ticket/payments service that has the longest and most successful history in Japan. During its introduction, the element that attracted the most attention was the simplification brought about by the use of contactless cards that did not need to be inserted into ticket gates. However, since then there have been many improvements to convenience. In addition to the ability to pay for small purchases at vending machines or kiosks, other features have been broadly adopted, such as interoperability with other

railroad companies, auto-charging through tie-ups with credit card companies, and a move away from IC cards by linking with smartphone payment functions.

JR East's Suica also performs customer capture by having customers build up points and makes it possible to collect information about customer movements and payments. (However, because only information about deductions can be tracked, even if it is used at one of the company's own directly managed stores, it is not possible to check the details of how the funds are used unless it is connected in detail with the POS data.) Figure 5 shows that JR East's Suica can be used by multiple devices across various service providers resulting into benefits namely demographic history, improved customer engagement and rewards for all the involved stakeholders.

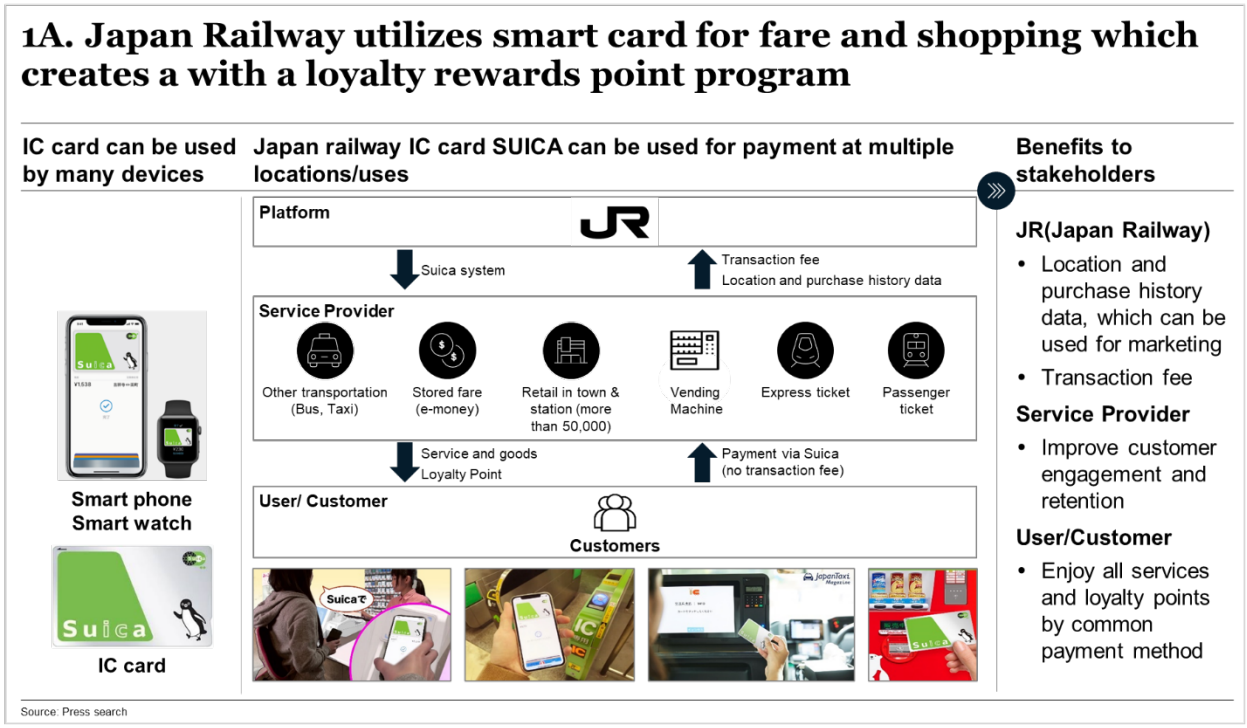


Figure 5 – Japan railway IC card SUICA

Non-fare revenues make up approx. 30% of JR East's revenue structure, and are broadly categorized into retail/services, real estate, and hotels. Commission income for the use of Suica and B2B consulting make up less than 1%. As shown in Figure 6, the non-fare revenue for JR East was ~32% (8.79 Bn USD) out of which ~8% (0.72 Bn USD) came from the usage of Suica card.

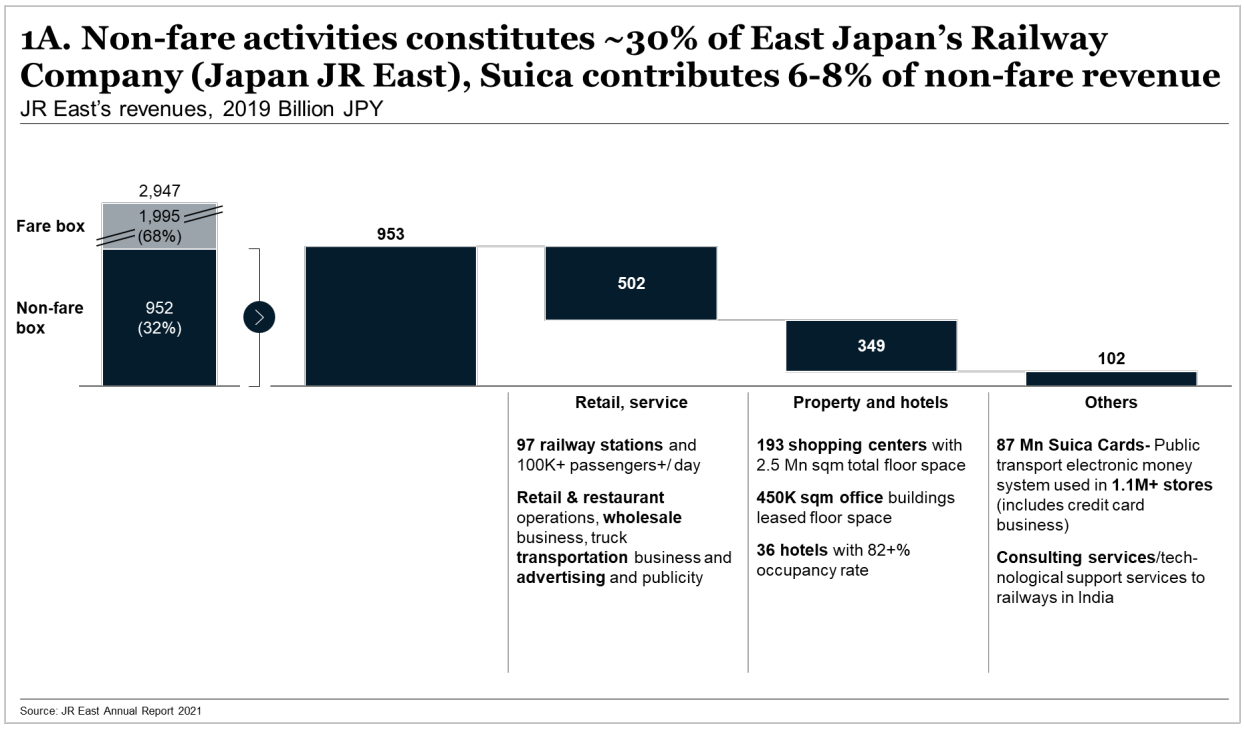


Figure 6 – Non-fare revenue for Japan JR East

(B) Hong Kong's Octopus Card

Another example of an expanded ecosystem where prepaid cards are used for other kinds of payments is Hong Kong's Octopus Card. This is a card used for transportation services that has evolved to be used for broader retail payments.

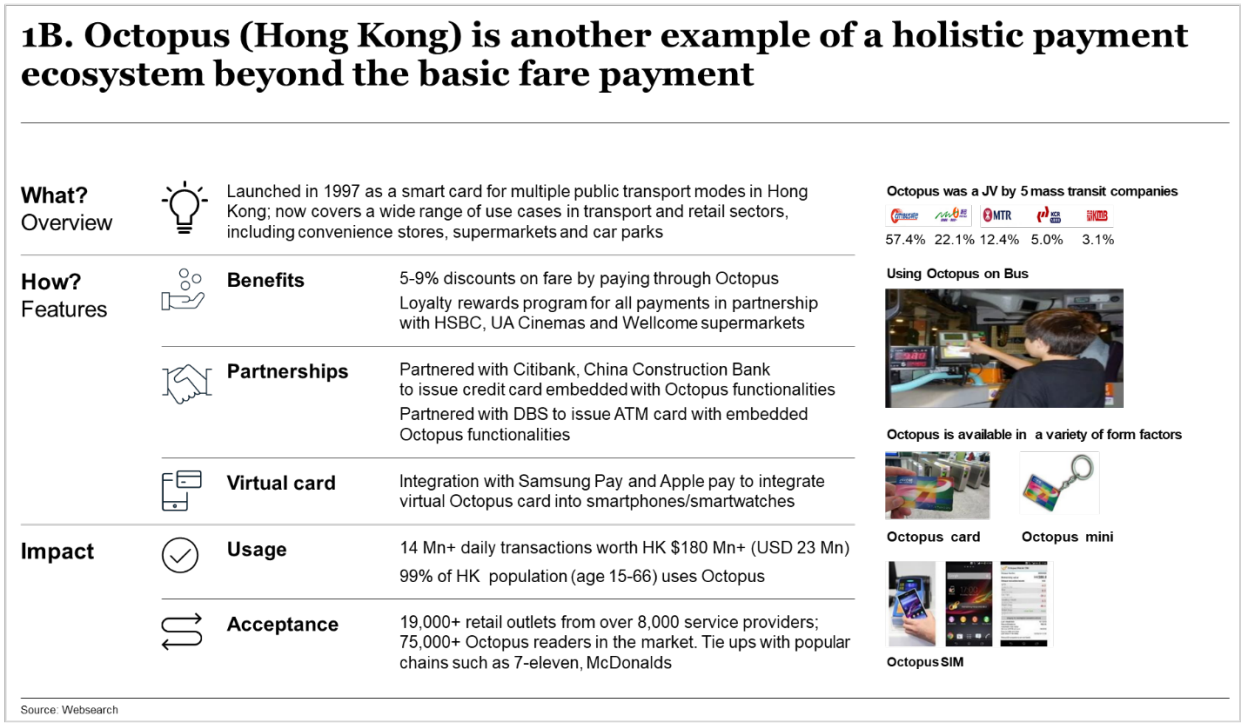


Figure 7 – Octopus card – Hong Kong

As shown in Figure 7, the smart card Octopus is used across multiple transport modes in Hong Kong. The card has features like rewards to users, partnerships with financial institutions for monetary transactions and integration with Samsung Pay and Apple Pay allowing usage as a virtual card. The card used by ~99% of working population in Hong Kong generates ~ 23 Mn USD through daily transactions and has acceptance across retail outlets, service providers and popular chains such 7-eleven, McDonalds, etc.

(C) Moscow Metro's Troika Card

The Moscow Metro's Troika Card is used for more than 90% of public transportation payments, and is compatible with many payment methods, including Pay Pass, Pay Wave, Samsung Pay, and Apple Pay.

The percentage of contactless payments increased by 30% annually from 2018 to 2019, and they are also planning to expand the feature by increasing the compatible modes of transportation, introducing retail payments, etc. As shown in Figure 8, the Troika card in Moscow is being used across all the transport types such as metro, buses, airport shuttles and commercial operators. The card has benefits like non-banking card system and discounted fares and has a potential to become universal instrument of payment after addition of planned functions and services.

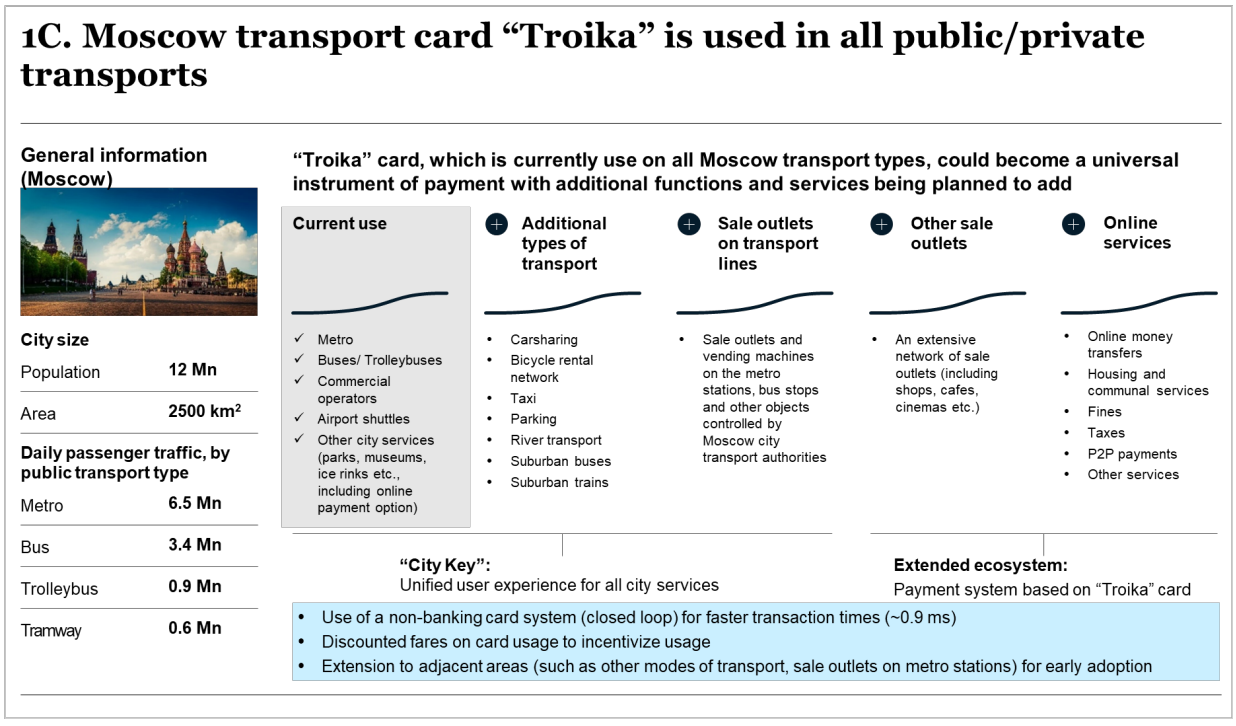


Figure 8 – Troika card – Moscow

2.1.2 Mobility as a Service (MaaS)

(A) Berlin Transport Authority's Jelbi

In Europe, MaaS compatibility is also being seen. The Berlin Transport Authority has partnered with mobility platform Trafi for sharing taxis, cars, and bicycles, and integrating modes of public transport such as buses, and is in the process of introducing an app called Jelbi for travel planning and ticket purchasing (Figure 9).

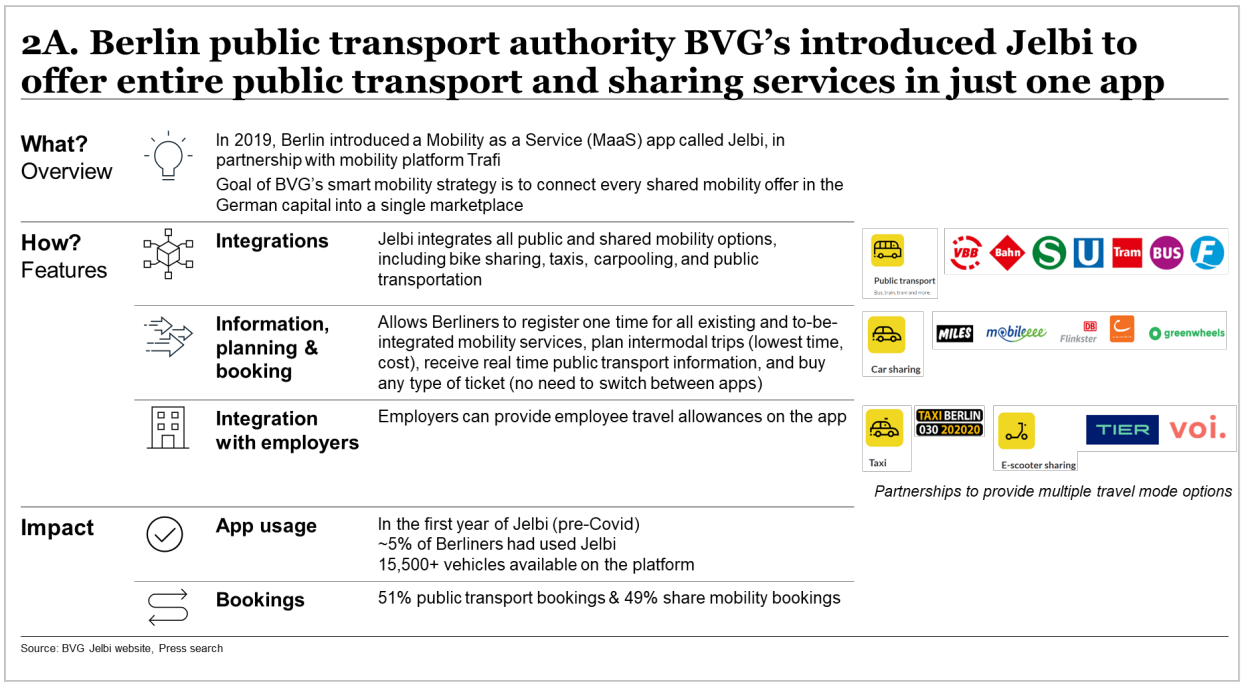


Figure 9 – Jelbi app – Berlin

(B) MaaS Global's multimodal app Whim

Similar experiments are taking place elsewhere in Europe, with MaaS Global's multimodal app "Whim" seeing particularly high penetration in Helsinki Finland, and increasing usage in Austria, Belgium, and Switzerland. One of the characteristics of Whim's business model is that it provides multiple subscription models to match the user's style.

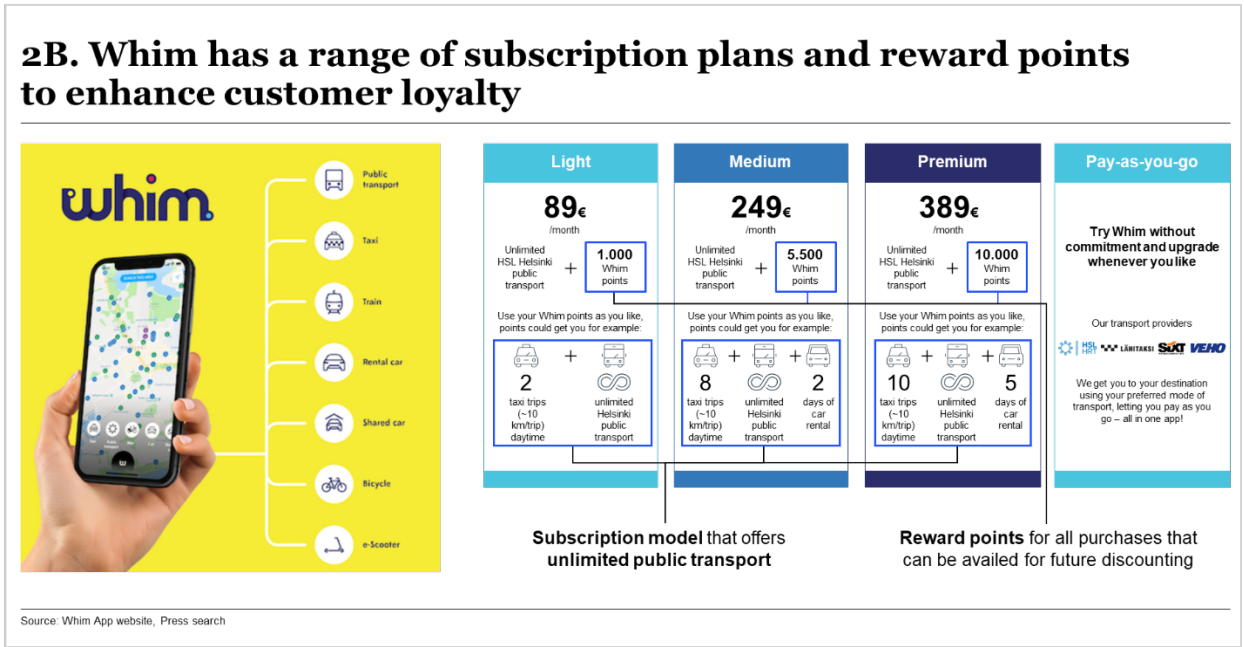


Figure 10 – Whim

Figure 10 shows the subscription plans such as Light, Medium and Premium available on Whim and benefits to the customer in terms of reward points which can be availed for future transactions.

2.1.3 E-commerce, lifestyle, media and others

(A) ICE portal by Deutsche Bahn (Germany)

There is an ICE portal provided by DB (Germany) for the needs of passengers while onboard the train. Connecting to the onboard Wi-Fi in the train, the portal offers in-train infotainment and entertainment features like streaming of TV news, travel guides and journey information, as well as select films and TV services. They have started upselling to some customers by separating free programs from paid, on-demand programs (Figure 11).

To provide these, DB is using partnerships with a private-sector company that provides streaming services (previously Maxdome, now Joyn).

3A. DB's in-train infotainment through "ICE Portal" and partnership with streaming service provider Joyn

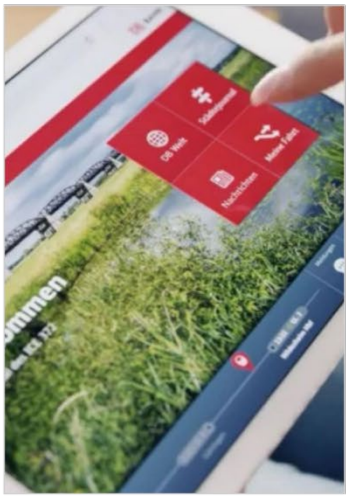
Deutsche Bahn's "ICE portal" is a free infotainment web portal on DB's high-speed trains (ICE) which opens by default after logging into the train's WiFi

ICE portal offers multiple information and entertainment features

- News pages as well as streaming of TV news programs
- Travel guides for 50 cities in Germany with sightseeing and mobility information
- Information about the journey (e.g., train route and current position on map) and current offerings, e.g., in the in-train restaurant

Partnership German streaming service Joyn to stream films and TV series in trains

- Using the in-train WiFi and DB's infotainment web portal, travelers will have access to a selection of films and TV series
- While part of the offering (50 films and TV series) are free of charge, the full selection (~ 600+ films and TV series) requires a payed Joyn+ subscription, which can be bought as a add-on to the ticket.
  - Earlier DB partnered with Maxdome, another content streaming platform



Source: McKinsey; Company Website "Zukunft Bahn"

Figure 11 – Deutsche Bahn's ICE portal

(B) State Bank of India (SBI)'s YONO

Although this is not the rail industry, SBI (State Bank of India), which is the largest commercial bank in India, has deployed a digital banking platform called YONO (You Only Need One), which is being used to deploy an ecommerce business. Multiple business partners provide products and services via the platform – there are currently more than 80 companies providing products and services in more than 20 categories.

As seen in Figure 12, SBI Yono app is an online marketplace with features like online shopping, ticket booking, e-wallets, offers, rewards, etc. The platform has exclusive personalized offers and satisfies all non-financial needs of the customer integrated with banking experience.

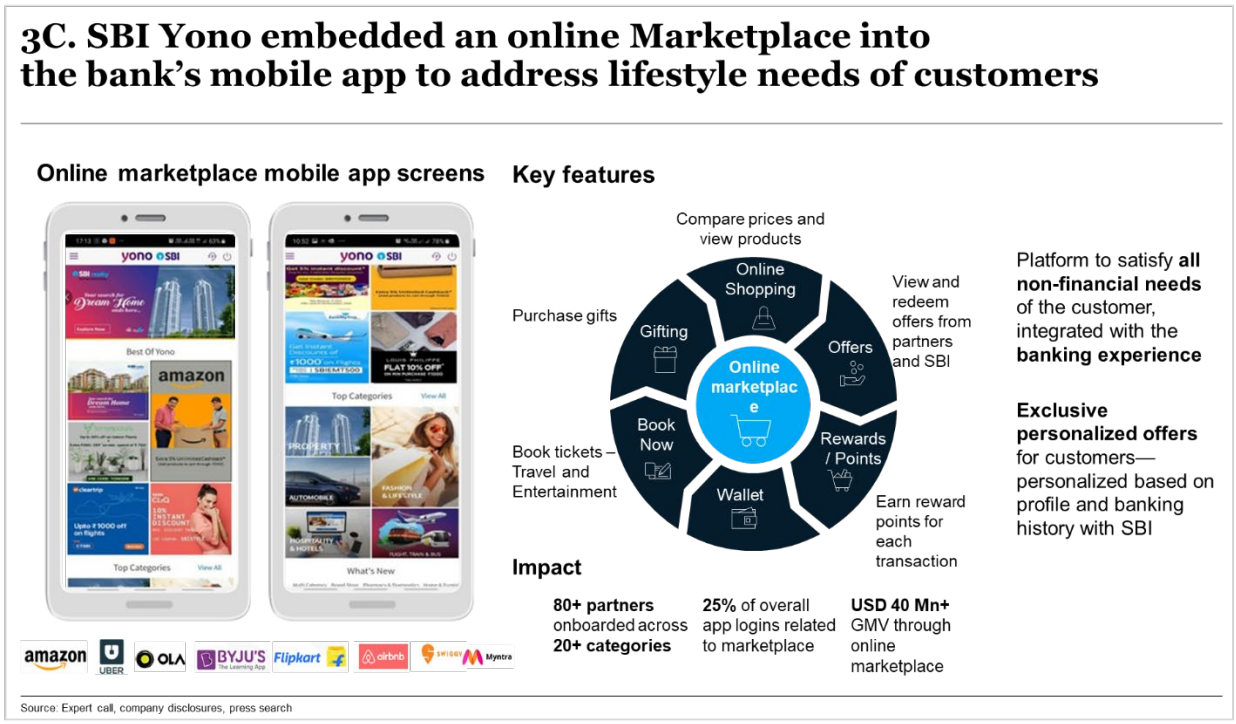


Figure 12 – SBI Yono – Online Marketplace

Figure 13 reflects SBI YONO's B2C marketplace hosting integrated financial services across 12 use cases (sectors) such as Education, Health, B2B and B2C marketplace, Travel, Mobility, etc. Yono has had high level impact with greater than 26 million registered users and more than 2.5 billion USD disbursed in loans.

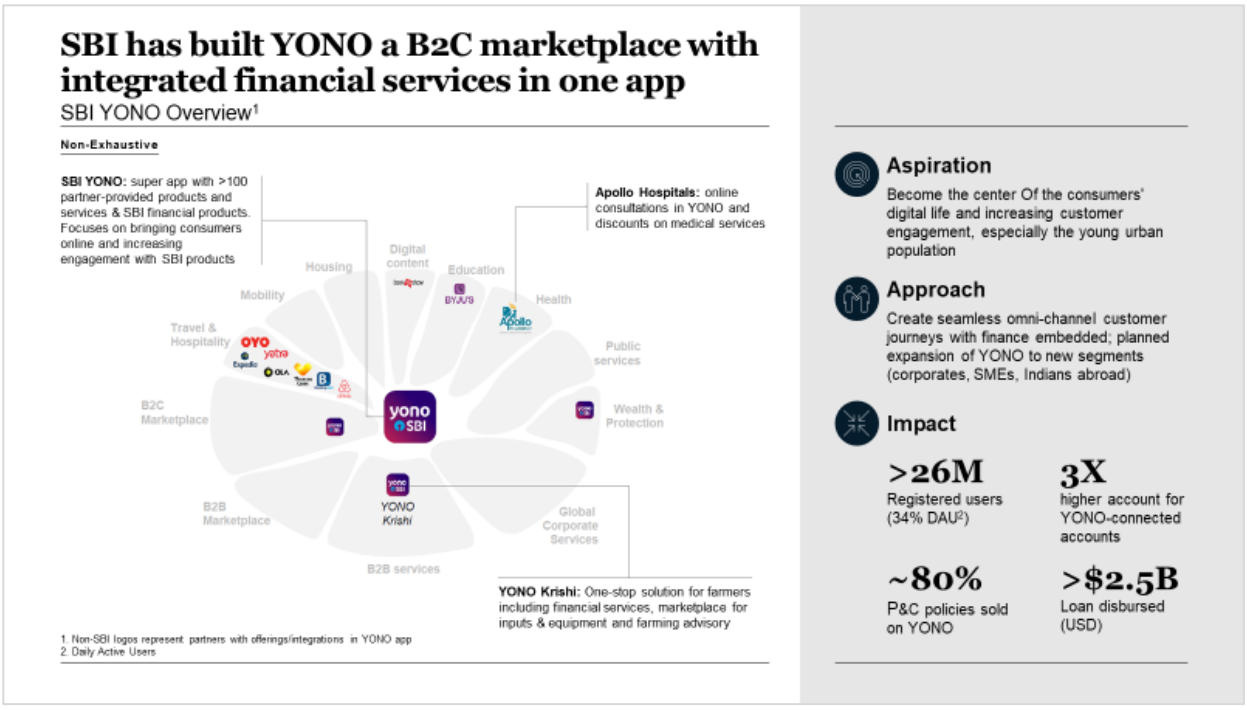


Figure 13 – SBI YONO Overview

In addition to the digital banking products offering a fully digitized customer journey, SBI YONO also serves as a Financial superstore and Lifestyle marketplace as seen in Figure 14. The detailed offerings across Lifestyle marketplace are reflected in Figure 15 and Figure 16.

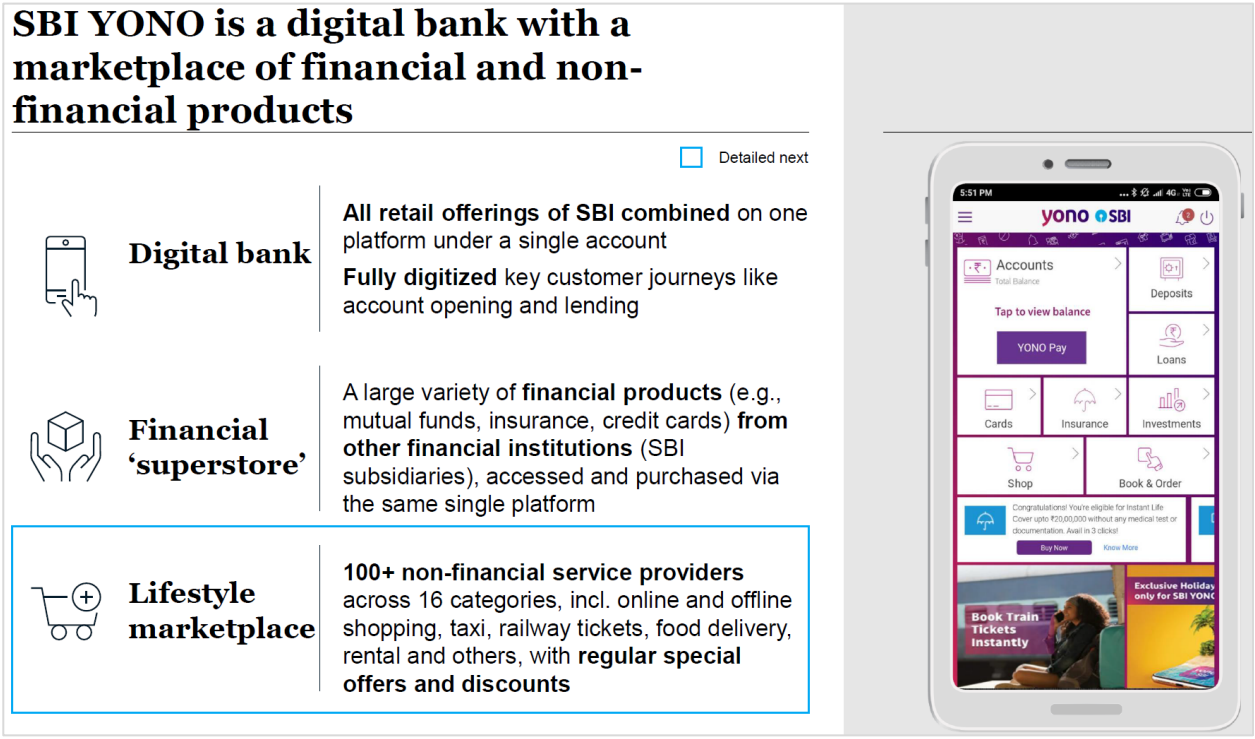


Figure 14 – Marketplace for Financial and Non-financial Products

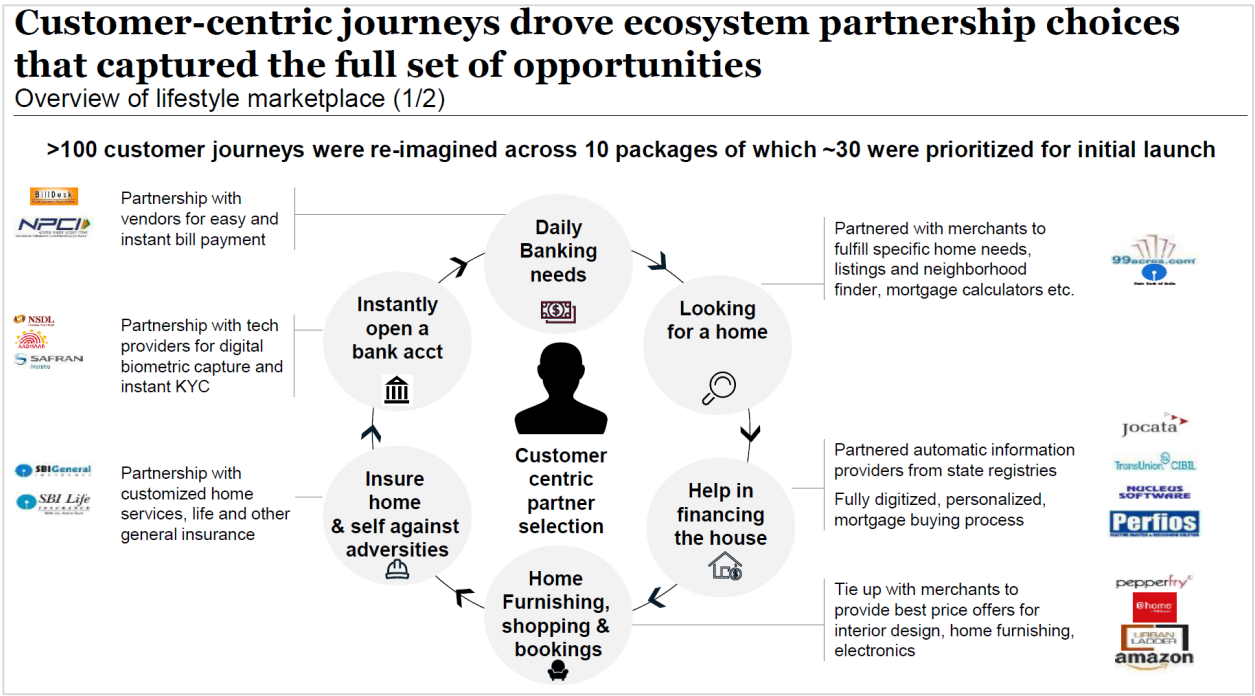


Figure 15 – Lifestyle marketplace overview-1

As seen above in Figure 15, customer centric approach leading to ease in daily banking needs, real estate funding, virtual shopping, and selection of insurance products for the customers, drove the ecosystem partnership choices for SBI YONO. Partnerships with market leaders offering best in category offers to the customers has resulted into YONO becoming a super app from a loyalty program. YONO's leading partners across E-commerce, Entertainment, Travel, Lifestyle, Food delivery and mobility services offering discounts and their respective market share is shown below (Figure 16).

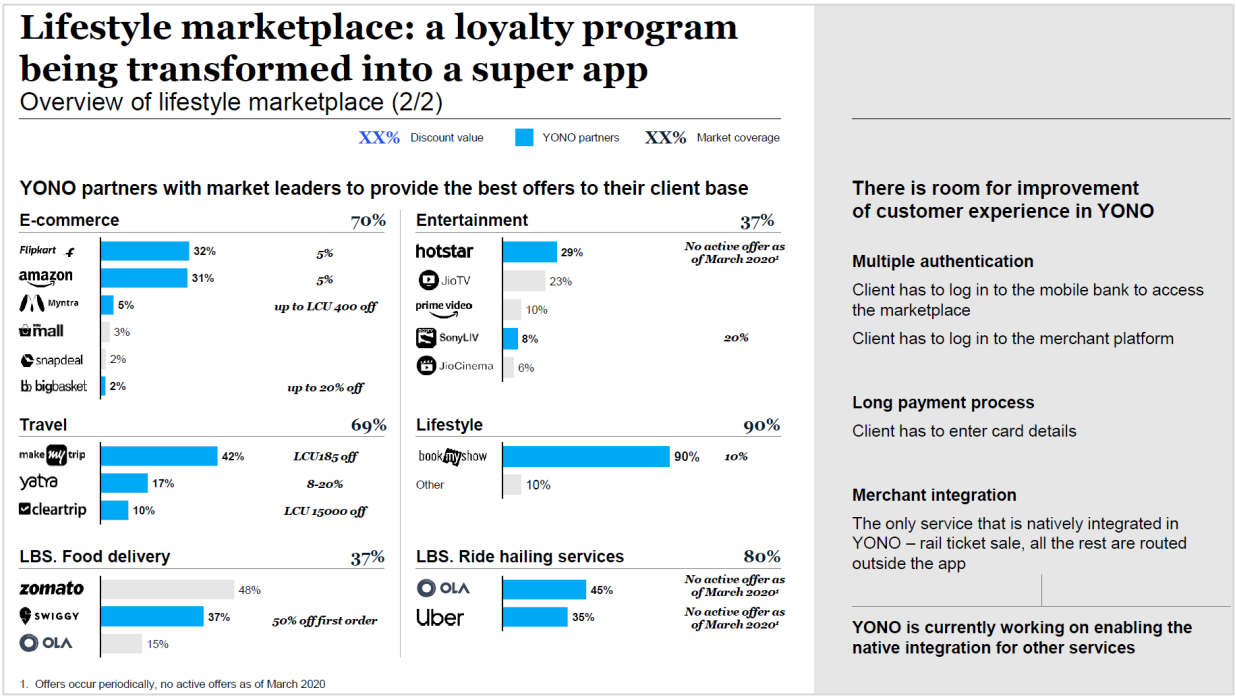


Figure 16 – Lifestyle marketplace overview-2

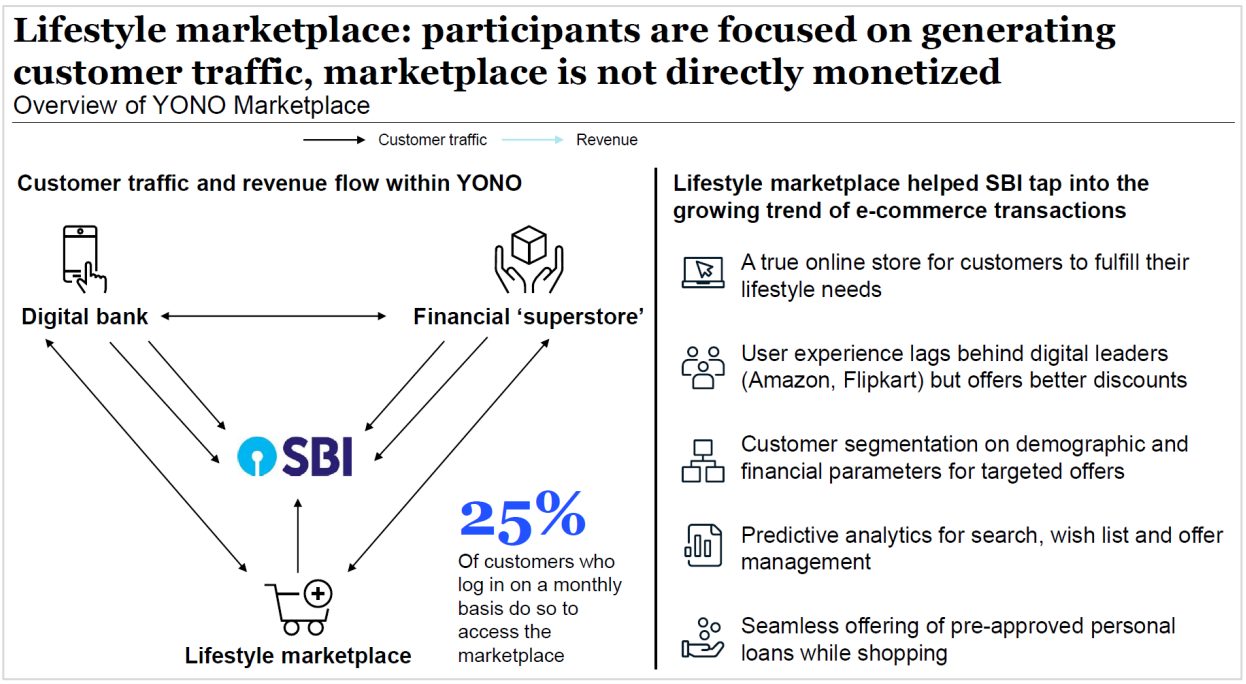


Figure 17 – Overview of YONO marketplace

Figure 17 reflects customer traffic generated from Digital banking and financial products (superstore) has led to enhanced revenue generation for SBI. The lifestyle marketplace has enabled SBI to tap into growing trend of e-commerce transactions with 25% of monthly customers using the app to access the marketplace. This has resulted in SBI conducting one of its kind 'bank-led' online shopping festival which generated tremendous customer traffic and engagement. The shopping festival led to increase in daily registrations by ~60%, while daily logins and page visits on marketplace saw an exponential increase of ~150% and 600% respectively as shown below in Figure 18.

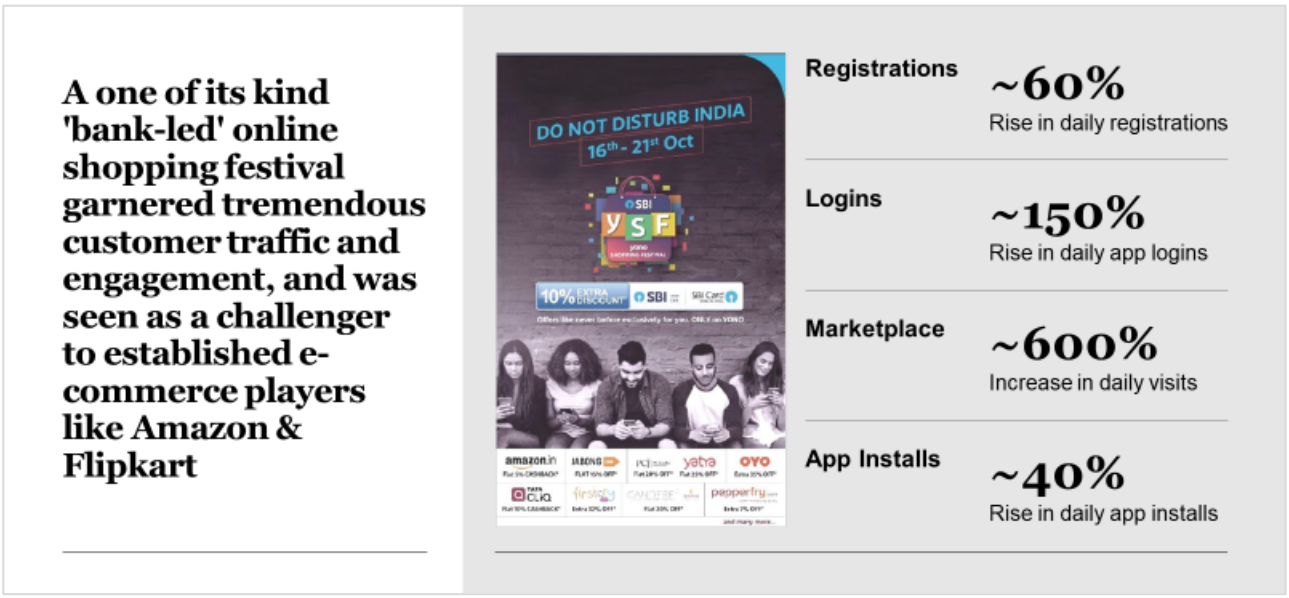


Figure 18 – SBI YONO's Customer traffic and engagement

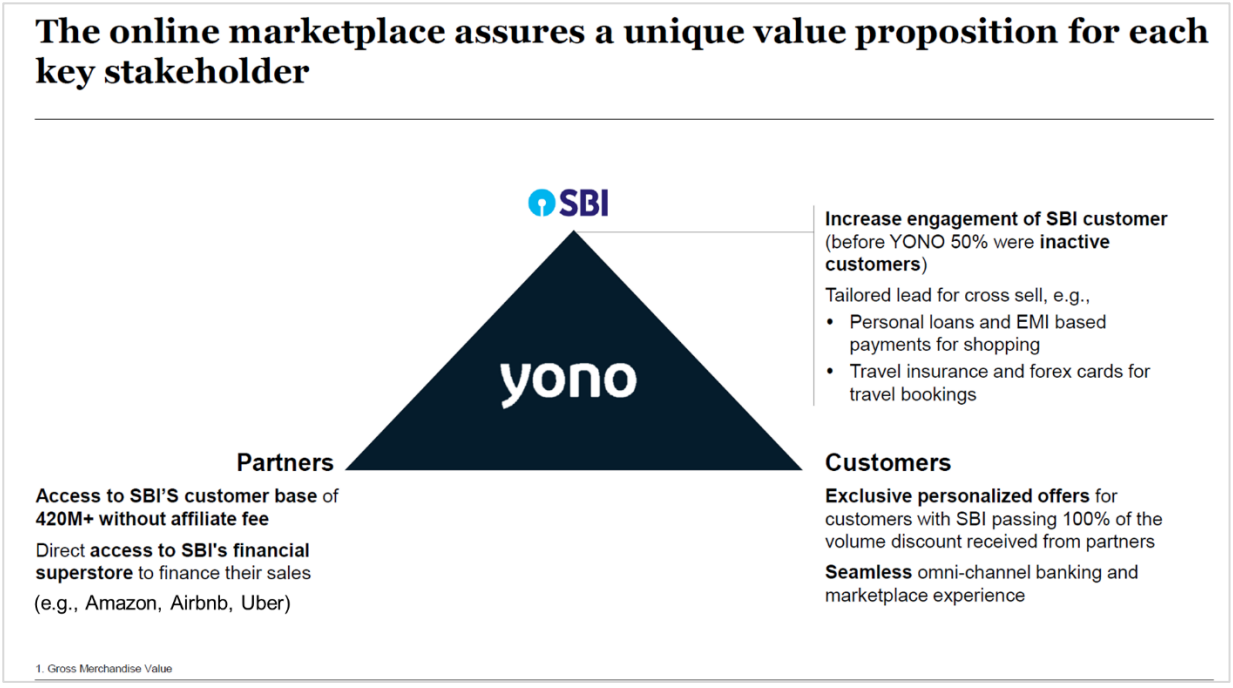


Figure 19 – SBI yono's suceess model

The success of YONO can be attributed 'online marketplace' which offers a unique value proposition for each stakeholder. As shown in Figure 19, YONO has increases SBI's customer engagement by offering tailor made products in the form or loans. Insurances, forex cards, EMI based shopping and travel bookings. The customers have benefited from personalized offers on marketplace and seamless digital banking. Direct access to SBI's financial superstore and access to a large database of over 420 million SBI customers have been the gains for partners resulting into a win-win situation for all the involved stakeholders.

2.2 Comparison between digital platforms of various metro providers across the world

Figure 20 shows services provided by various metro operators across the select use cases. From this analysis, we see that the most common application of the digital platform business is partnership – every metro / rail operator has partnership with other companies to make this happen. Second, E-wallet, retail (virtual shopping), and loyalty and reward points are common use cases that we see in most if not all operators. Other use cases such as integrated mobility, virtual card, e-ticketing, in-train infotainment, and route planning are available in only select operators, and tend to be observed with more sophisticated platforms. We have used these global cases as references when we considered key features of the digital platform for DMRC.

Comparison between digital platforms of various metro providers across the world

Digital Platform	Integrated mobility	E-wallet	Retail (Virtual Shopping)	Virtual Card	E-ticketing	Loyalty and Reward points	Partnerships	In–train infotainment	Route Planning
SUICA (Japan)	✓	✓	✓	✓	✓	✓	✓		✓
Octopus (Hong Kong)	✓	✓	✓	✓		✓	✓		✓
Troika (Moscow)	✓	✓	✓			✓	✓		
Jelbi (Berlin)	✓		✓		✓		✓	✓	✓
Deutsche Bahn's ICE portal (Germany)		✓				✓	✓	✓	
SBI Yono (India)		✓	✓			✓	✓		

Figure 20 – Services provided by digital platforms for various metro operators

2.3 Handling of data collected on the digital platforms

Operators in developed countries handle personnel information, mobility data, transaction data according to the governing laws of the land. This information is utilized in aggregated sets to design new and better services and products for the users. Given the complexity and sensitivity of the data handling on digital

platforms, we have summarized below how IRCTC (Indian Railways Catering and Tourism Corporation) in India and JR East are handling them as reference cases.

2.3.1 IRCTC (India)

Based on our research through the website of IRCTC (IRCTC, 2022) which provides multiple services of Indian Railways including online ticketing, catering, and tourism, IRCTC respects and protects the privacy of the individuals who use IRCTC's services. Namely, individually identifiable information is not willfully disclosed to any third party without first receiving permission from the user, and except when the user specifically and knowingly provides such information, IRCTC does not collect any unique information such as name, email address, etc.

However, IRCTC notes and saves information such as time of day, browser type, browser language, and IP address with each query. These information are used to verify records and to provide more relevant services to users.

Besides, IRCTC does not share personal data with advertisers, business partners, sponsors, and other third parties without the express consent of the users. However, IRCTC may divulge aggregate information about its users. For example, it may disclose how frequently the average user visits www.irctc.co.in, or the age distribution of aggregate customer set or the frequency of use of PNR enquiry page etc. etc.

2.3.2 Japan Railway East

According to the JR East website (EAST, 2022), personal data that JR East collects on using the product/service website is cookie, device number, operating system, action history (accessed URL, contents, order, advertising history, browsing time, browsing method, etc.), location information, and IP address.

The collected information is used for market research on business, or other research or surveys, analysis related to its business, ensuring security of its customers and employees, selection and development of software, systems, equipment, devices etc. to ensure security, operation and maintenance of facilities, equipment and devices and the management of usage status of them, analyzing the website usage status.

JR-East shares the data collected for following purposes:

- Information to service vendors for development, operation, maintenance, and management of its systems and digital platforms (located in Japan)
- Internet service vendors that respond to inquiries and requests (located in Japan)
- Transport related service vendors that process fare settlement of its products for overseas customers visiting Japan (located in Japan)
- Travel agencies and worker dispatching companies for exchanging/selling its products for overseas customers visiting Japan (located in Japan)

Chapter 3 Passenger journey analysis and idea generation workshops

Based upon these advanced case studies, we used customer journey analysis on Delhi Metro users to identify pain points (customer issues and areas of dissatisfaction) and create rough ideas for new business to address them.

Specifically, at a workshop (hackathon) with DMRC members, we performed everything from preliminary journey analysis to idea generation, then held focus group discussions (FGDs) divided into 6 categories by gender and reason for travel and conducted an online survey targeting Delhi Metro users to check sensitivity toward those ideas both qualitatively and quantitatively. Because adopting an approach that emphasizes an understanding of the customer was an important element for this study, the details of the activities are given below.

3.1 Workshop with DMRC members (hackathon)

First, on July 6th 2021, we shared the global case examples from Chapter 2 with 35 Delhi Metro employees, and then divided them into 6 small groups for discussion. The groups included DMRC employees, JICA representatives as observers and McKinsey team members as facilitators. Each group was allotted 40 minutes for discussion and ideation.

During the discussion, we divided the Delhi Metro user journey into various processes, including overall travel planning, travel to the station, entering the station and boarding the train, riding the train, exiting the train, and leaving the station, and traveling to the destination. We then asked what kinds of pain points existed in the customer experience, and what kinds of services could potentially improve them.

We also considered how the proposed services could be monetized. Even if a particular idea for improving the passenger experience cannot be monetized, it could serve to attract people to the platform, so we did not narrow down ideas at this point.

Few of the ideas generated during the hackathon are listed below:

- Crowd control at metro stations, information on crowds in train through crowd meter and real time seat availability
- In-app digital ticketing with loyalty reward points
- App based payment acceptance at retail and food outlets on stations
- Route planning, customized navigation suggesting the entry gate to be taken, which train to board and from which platform, exit gates to be approached at destination station
- Periodic alerts from DMRC regarding information on train timings, updates, downtime, news, etc.
- Effective utilization of transit time – Entertainment, infotainment, facility for online shopping, ordering food and groceries, bill payments, etc.
- Interactive digital displays for station information and entertainment with AI enabled ads

- Last-mile connectivity enabling passengers to reach their destination in a seamless way – integration with mobility service providers, feeder bus services, local modes like rickshaws, etc.
- Information on additional services near stations like e-commerce delivery / collection points, major retailers who offer services nearby, station facilities, etc.
- Implementing smart parking with real time parking availability and booking facility at metro stations
- Car-pooling with passengers from metro stations to destinations, or from metro stations to destinations

3.2 Insights from FGDs

We then conducted focus group discussions (FGDs) of sampled 42 Delhi Metro users. All participants of the FGDs were Delhi Metro users and they were split into groups according to the gender and reason for commute, so that we can appropriately understand the nuances of safety and perception by gender, and behavior according to the reasons for commute. The groups were:

- **FGD Group 1**: Female commuters who used the metro to get to school/university
- **FGD Group 2**: Male commuters who used the metro to get to school/university
- **FGD Group 3 and 4**: Female frequent commuters who used the metro to get to work/other reasons
- **FGD Group 5 and 6**: Male daily commuters who used the metro to get to work

During the FGDs, we talked about three main areas of customer's travel experience – (1) first and last mile journey, (2) on-station experience, and (3) in-metro travel. The workshop was used to derive insights from these FGDs (Figure 21).

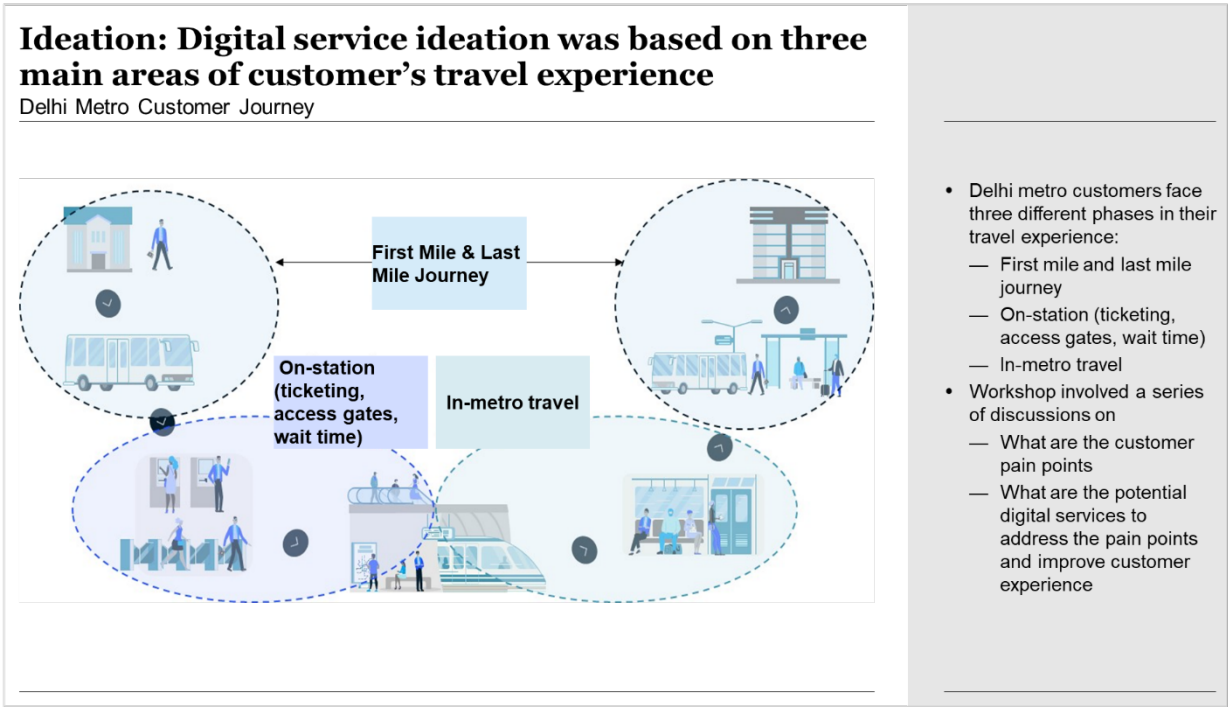


Figure 21 – Three areas of cutomer's travel experience covered in the FGDs

Instead of thinking of customer travel from end to end, in the FGDs it was organized into journeys made up of several steps, and interviews, discussions and quantitative surveys were used to identify pain points and needs related to these.

Across the board, we heard many comments about the difficulty of making plans and a lack of trust in transportation, including the inability to check congestion ahead of time, the inability to check wait times, the difficulty of understanding where the exit is after getting off the train, and the inability to grasp the presence of other modes of transport to use when traveling from the station.

Grasping each travel step in detail (for example, dividing wait time up into not only the time spent waiting for the train, but also time spent waiting when purchasing tickets or going through security to enter the station) made it possible to come up with specific use-cases (service proposals).

Figure 22 captures key pain points in each step of end-to-end customer journey. It emphasizes on travel to metro station, ticketing and card recharges, in-metro information, station facilities and last mile connectivity.

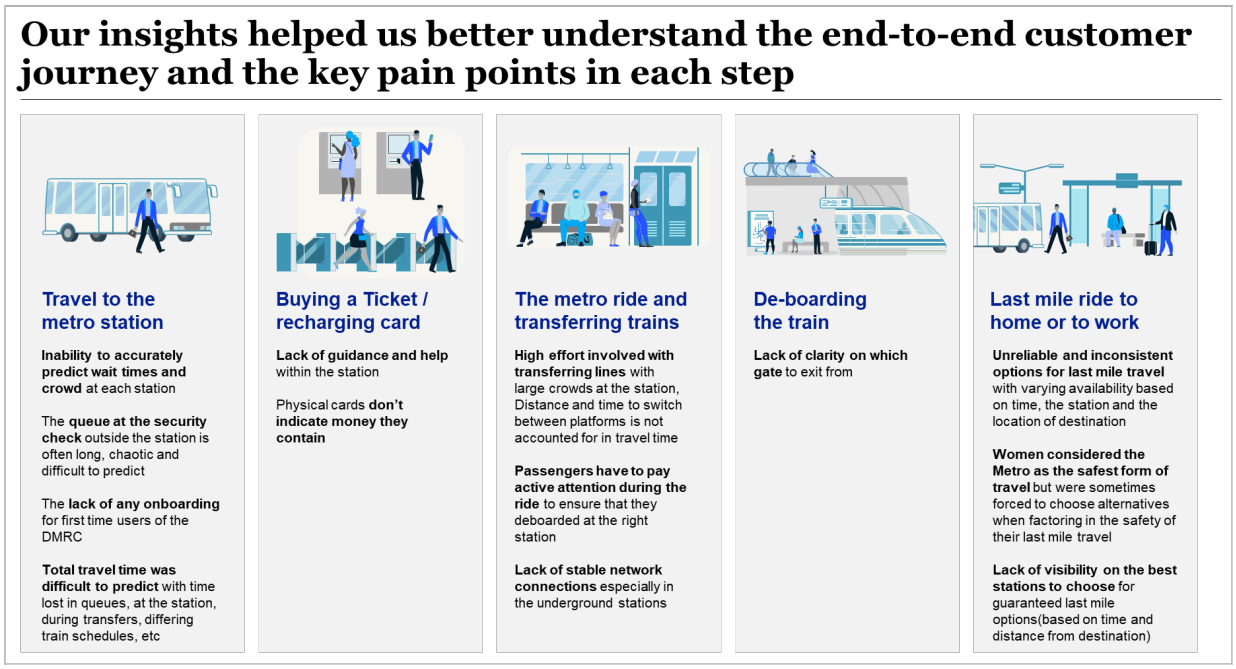


Figure 22 – Pain points in end-to-end customer journey

As seen in Figure 23, key insights from FGDs included need for fully digital experience, personalized and relevant information and curated experiences. Travel safety, logistics of last mile connectivity, impact on core offering of mobility and virtual shopping were key nuances between the groups.

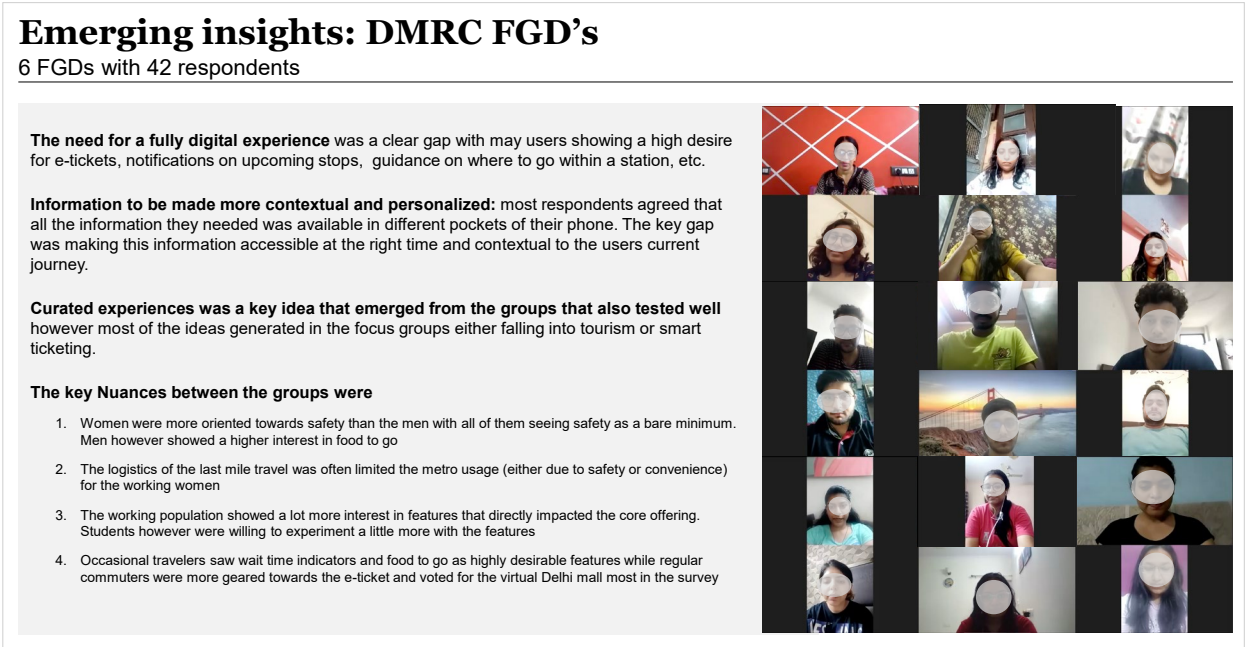


Figure 23 – Insights from DMRC's FGDs

The FGDs targeted Delhi Metro service users and were conducted by a facilitator who asked for people's opinions using a video-conferencing format. The groups were formed based on differences in gender, purpose of usage (commuting for work or school, etc.), and social attributes, resulting in a total of 6 groups of 7 people, for a total of 42 people whose opinions were heard.

Most of the pain points we heard were shared between groups, with many people complaining about the inconvenience of having to wait in long lines to purchase tickets or go through security. In addition, many mentioned experiencing stress about wait times, and about being able to quickly get information about when they would be arriving at their destination station, or which direction to go in the station when changing trains or getting off the train, etc. There were increasing expectations for the introduction of digital technology to increase convenience (e-tickets, wait time indicators, an app for notifying when you are approaching the desired station, station guides, etc.). We also discussed ideas that were more related to e-commerce or entertainment as ways to more conveniently use the time spent on the train or after arriving at the station.

Although we did determine that most needs were broadly shared, there were some items for which the amount of emphasis differed between groups. For example, with regard to security, multiple female groups said that it was a key item that needed improving, not only on the train, but including access from the arrival station to the destination.

Opinions about certain ideas were also split between segments; while infrequent users indicated a desire to improve signage functions and to pick up meals at the arrival station, users who used Delhi Metro frequently for commuting to work or school put more emphasis on e-tickets and a virtual mall that could be used onboard trains.

We used this information to perform a persona analysis of Delhi Metro users. A persona is a "representative user" that aggregates survey results and is created to represent a particular user segment. In other words, it is a "user profile" that is composed of lifestyle, behavior patterns, and needs that were identified from the data collected in user interviews. The behavior patterns, objectives, skills, attitudes, and environment of a persona are generally explained in 1–2 pages, with a few individual details added as fiction to make the persona seem more real.

The 4 personas created for this project follow below (Figure 24, Figure 25, Figure 26, and Figure 27). We referred to these when holding discussions to investigate service ideas and the likely responses to them. These personas capture the current behavior and challenges, reasons for taking metro and expectations from a new platform of working professional, student, homemaker and tourist. The figures elaborate current behavior like travel timings, routes and trips taken, use of current DMRC app and frequency of usage. The challenges like uncertainty of train schedule, not knowing the balance left in the smart cards, inability to predict station crowds, safety, in-ability to find last mile connectivity, no awareness of station facilities, etc. are also highlighted in the figures. There were overwhelming expectations with regards to e-ticketing, route planning, integrated mobility, virtual mall shopping, etc.

DMRC Consumer personas: The Working professional

Suman Ahuja

Age: 42

Occupation: IT engineer

Suman is an IT specialist based out of Delhi. She along with her 15 year old son use the metro to get to work and school respectively (although along different lines).

CURRENT BEHAVIOR

- She **owns two metro cards that she keeps loaded with money**
- When on the train **she prefers to listen to music or watch a downloaded show**
- She leaves **home at the same time everyday** during the peak rush hour. she sometimes **tries to go early to avoid the rush.**
- She **tries to avoid travelling after sundown** though sometimes her work may over-run

FRUSTRATIONS

- **Not aware of the remaining balance** on her card
- **The woman's compartment is more crowded** than the rest of the train
- **Is unaware of food options at the destination station**, especially when travelling late and having to pick up food for the family
- While the metro in itself is the safest mode of travel, **last mile options are neither safe nor guaranteed** making the metro not a viable option after sundown
- **Unaware of the right exit gate to take**, at night the wrong exit can lead to an unsafe part of the station

REASONS I TAKE THE METRO

- To circumvent traffic
- Is safer than other modes

Digital Savviness

NONE LOW HIGH

Metro frequency

Occasional Daily

WHAT WILL WIN ME

- A method to track her son as he travels in the metro
- Guaranteed last mile travel
- Methods to discover stores and restaurants in close proximity to her destination station

TOP FEATURES

- **E-ticket**
- **Safety features**
- **Food on the go**
- **Delhi mall**

"...Metro is the safest way to travel but when I have to work late there is no guarantee I will find a rickshaw or taxi from the station to get home..."

Figure 24 – Working professional persona

DMRC Consumer personas: The Student

Gautam Gupta

Age: 19

Occupation: Student

Gautam is a third year Delhi university student who has been a daily commuter of the Delhi metro for the last 5 years. He has lived in Delhi all his life and considers himself an expert of the city.

CURRENT BEHAVIOR

- **His usual mode of ticket payment is the metro card** though he has experienced a few cases where his card hasn't worked or been accepted
- **When on the train he prefers to listen to music** while he waits for his station to arrive
- **He leaves home at the same time everyday** due to the timing of his classes but this is **during peak rush hour.**
- **He currently uses Google maps or the DMRC app** to plan a new route and adds 10-20 minutes as a buffer to the stated travel time
- He is **willing to experiment** with any new initiative that is offered by DMRC, but is also quick to form an opinion

FRUSTRATIONS

- **Not aware of the remaining balance** on his card
- **Losing the metro card** means all the money on it is also lost
- **Unpredictable wait times** may make him late for class
- **The travel time shown across apps** don't account for line switching, purchase time, time spent waiting in line, etc
- Has missed his station because of **missed announcements**

REASONS I TAKE THE METRO

- To circumvent traffic
- Economical when travelling alone

Digital Savviness

NONE LOW HIGH

Metro frequency

Occasional Daily

WHAT WILL WIN ME

- Cutting down the need to wait in queues and lines
- A completely card-less journey from start to end
- Ways to interact and explore the city while in transit

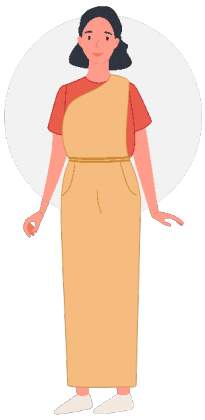
TOP FEATURES

- **E-ticket**
- **Delhi Mall**
- **Experience Delhi**

"...I take the metro everyday and I have to. I really wish the metro card was on my phone or there was some other way to do everything on my phone. It may save only 5 to 10 minutes a day but at the end that adds up to a lot..."

Figure 25 – Student persona

DMRC Consumer personas: The Home-maker



Geeta Agarwal

Age: 35

Occupation: Home-maker

Geeta is a home maker with two young children. She usually is busy during the week but finds time in the weekends to take her children out into the city. She also has a group of friends she often meets to go shopping with or to eat out in the city.

CURRENT BEHAVIOR

- **She currently uses the metro sporadically** – usually when she takes her children to her parents home or for outings
- She **plans her trips around peak hours**
- She often **plans her route at the metro station** using the maps or by asking an attendant
- She is **highly flexible** with her travel time and route
- If Geeta is joined by her husband they prefer to take the car

FRUSTRATIONS

- **Inability to predict station crowds**
- **Long queues** at the security line and when buying tokens
- **Hates transferring lines**
- **Last mile travel is often not as safe** as in-metro travel making the metro not an option after sundown
- **Last mile travel is not always guaranteed**

REASONS I TAKE THE METRO

- Is the safest and most reliable option
- Is within easy access

Digital Savviness

NONE LOW HIGH

Metro frequency

Occasional Daily

WHAT WILL WIN ME

- End-to-end mobility
- Information on wait times and crowd indicators
- Safety features

TOP FEATURES

- **Wait time and crowd indicators/ navigation support**
- **Food to go**
- **Extended payment ecosystem**
- **Integrated Mobility**

"...For me the crowd is important, I will completely change my plan if it means I will see a lesser crowd..."

Figure 26 – Home-maker persona

DMRC Consumer personas: The Tourist

Sandeep Kumar

Age: 37

Occupation: Supply chain manager

Sandeep is an out of town supply chain manager who is visiting Delhi for work. He was recently told by a friend to use the metro to circumvent traffic and to get around the city quicker.

CURRENT BEHAVIOR

- He is **unaware of how to take the metro**
- He **recently downloaded the DMRC app along with a few other applications** to get all his information.
- Usually **likes to look out from the metro** since his route passes a few key landmarks
- He is **nervous about losing his way** and hence most of his attention goes towards tracking his stations

FRUSTRATIONS

- Is **overwhelmed by all the information**. Is unsure on where to start or what to do
- When switching lines he gets confused and is **unsure of where to go**
- The **stations and train schedules have been unpredictable during COVID** with certain stations skipped or closed
- He **has to actively pay attention** to the announcements and messages from the train
- He is afraid of losing his way when exiting the station and in several instances has been **unable to find a mode of last-mile travel**

REASONS I TAKE THE METRO

- For a more predictable travel time
- To get easy access to all of the city

Digital Savviness

NONE LOW HIGH

Metro frequency

Occasional Daily

WHAT WILL WIN ME

- A clear and easy onboarding on how to use the metro
- Tourist services to orient me to the sights of the city
- Easy guidance on where to go and what to do next

TOP FEATURES

- **Plan route**
- **Delhi mall**
- **Tourist services**
- **Food to go**

"...It's so easy to walk past my station and take it for granted. Maybe there is a very famous place near it that I never even realized. The people staying in this area would know it but not me ..."

Figure 27 – Tourist persona

3.3 Insights from the online survey

As mentioned above, we formed small groups[1] of Delhi Metro users (male and female groups of high-frequency users who commute for work or school), and used the journey framework to grasp pain points to improve the experience, and tested sensitivity to the ideas that had been proposed up until then.

In addition, to get a better prediction of the response of the general public, we performed a one-week online survey of Delhi residents with high digital affinity to judge interest in the primary ideas and prioritize them. Figure 28 shows summary of the 1,000 survey respondents. Approximately 90% of the respondents were using the Delhi Metro, and the gender balance was approximately 50/50.

Figure 29 summarizes the key insights from the DMRC survey. Smart ticketing and extended payment ecosystem were top voted features as a part of core offerings while security as a service, virtual Delhi mall and food to go were the other top-rated offerings.

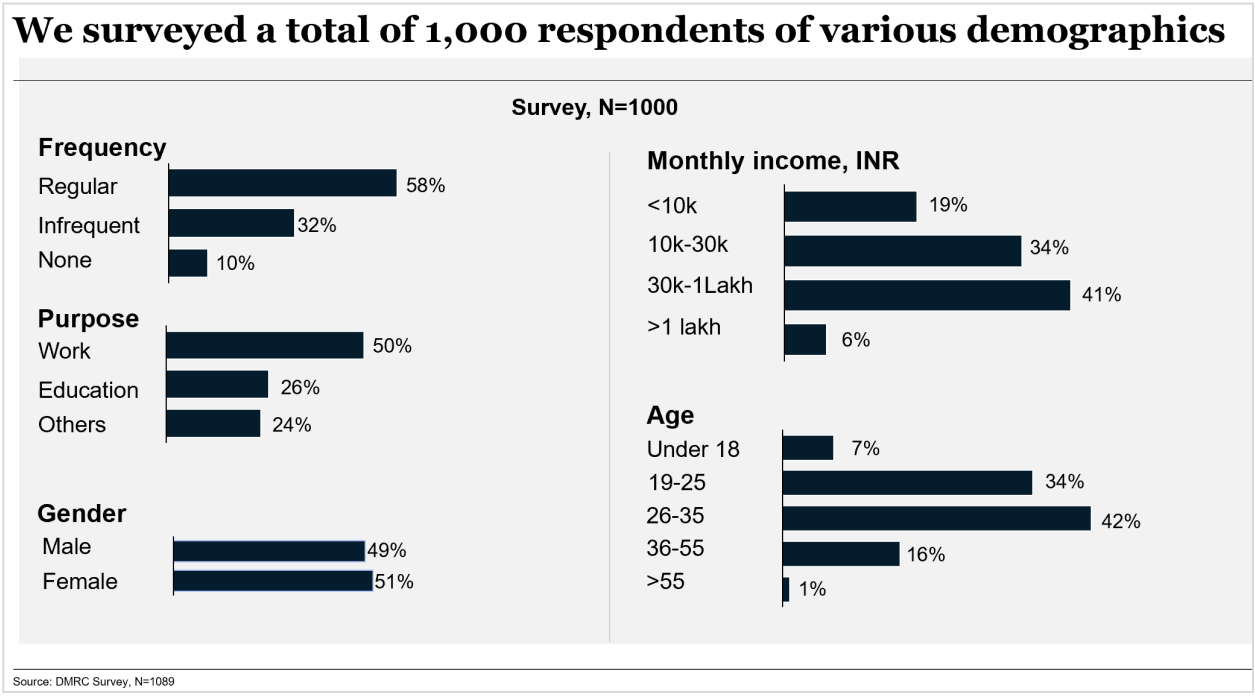


Figure 28 – Delhi metro users survey

[1] As this was not an effort to increase ridership, and because it was judged that efforts with no connection to railway or station use (e.g., simple ecommerce) would not be compatible with the public nature of the DMRC's business, segments that are not currently using the Delhi Metro were not targeted for analysis

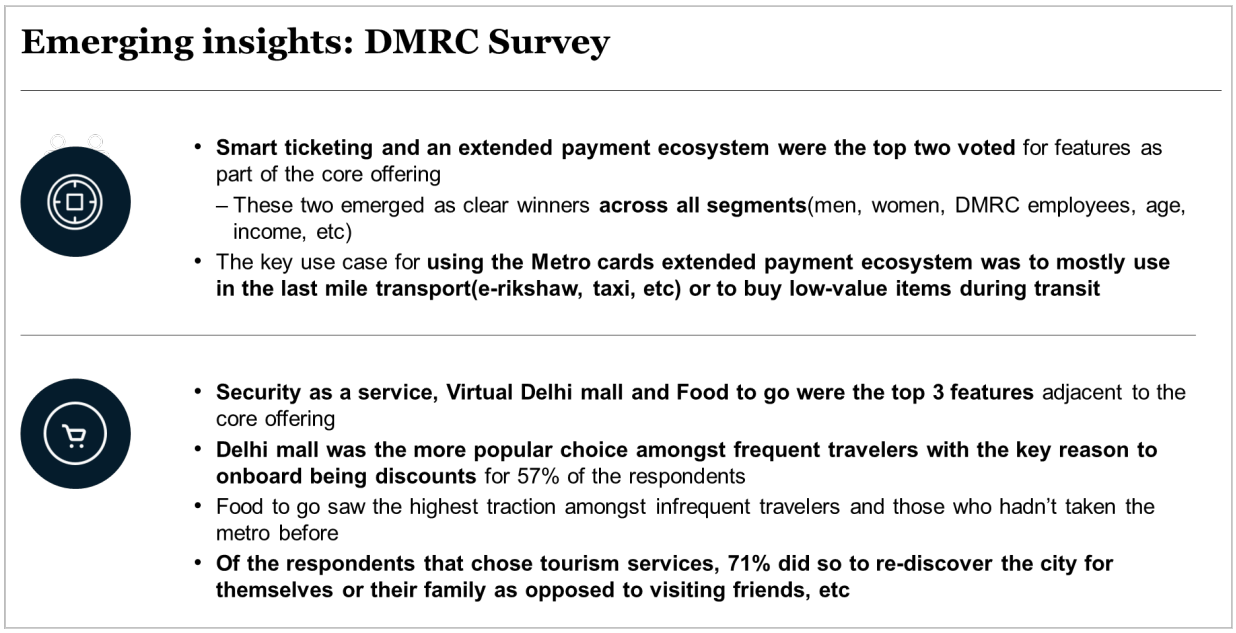


Figure 29 – Insights from DMRC survey

As for the results, when it comes to areas directly linked to passenger transportation, we found considerable interest in Smart Payments (being able to use a smartphone to enter and exit station ticket gates without using a card or token), and in an expanded payment ecosystem in partnership with partners such as Paytm or PhonePe that would make it possible to use a metro card for day-to-day payments outside of Metro stations (Figure 30).

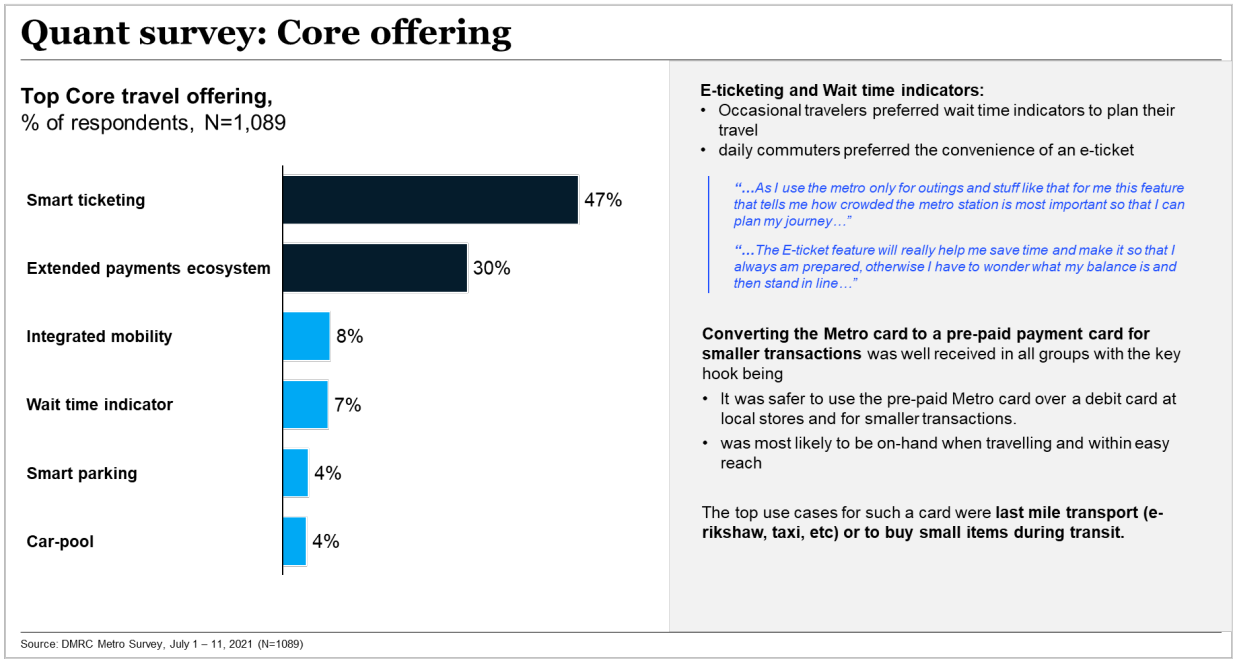


Figure 30 – Responses on core travel offerings

As for areas that are not directly linked to passenger transportation, there was relatively high interest in services such as Security as a Service, Delhi Mall, and Food to Go, but there was a difference between segments, with female users being more interested in Security as a Service, and male users more interested

in Food to Go. As for Delhi Mall, there are indicators that linking mall usage to a discount on train fares would be a key factor (Figure 31).

These insights we gathered further informed the decision in designing MVP in the next phase.

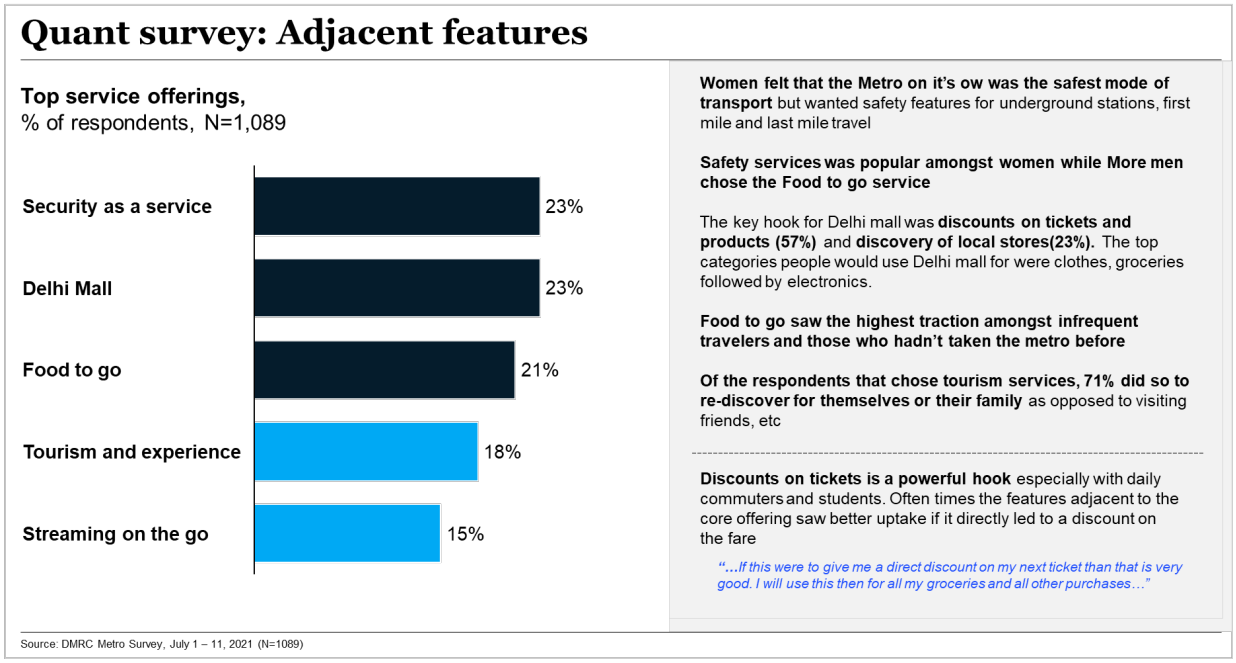


Figure 31 - Responses on adjacent features

Chapter 4 Idea evaluation and prioritization

The ideas obtained in this project can be largely categorized into ones that have already been implemented by overseas railways or smart cities businesses, and the ones that were supported by our hackathon, FGDs and surveys, but have not been implemented anywhere else in the world in context of public transit. As Figure 32 demonstrates, the former can also be categorized into seven digital use cases for Delhi Metro inspired from global examples. The use cases include next-gen ticketing, extended payment ecosystem, end-to-end integrated mobility, etc.

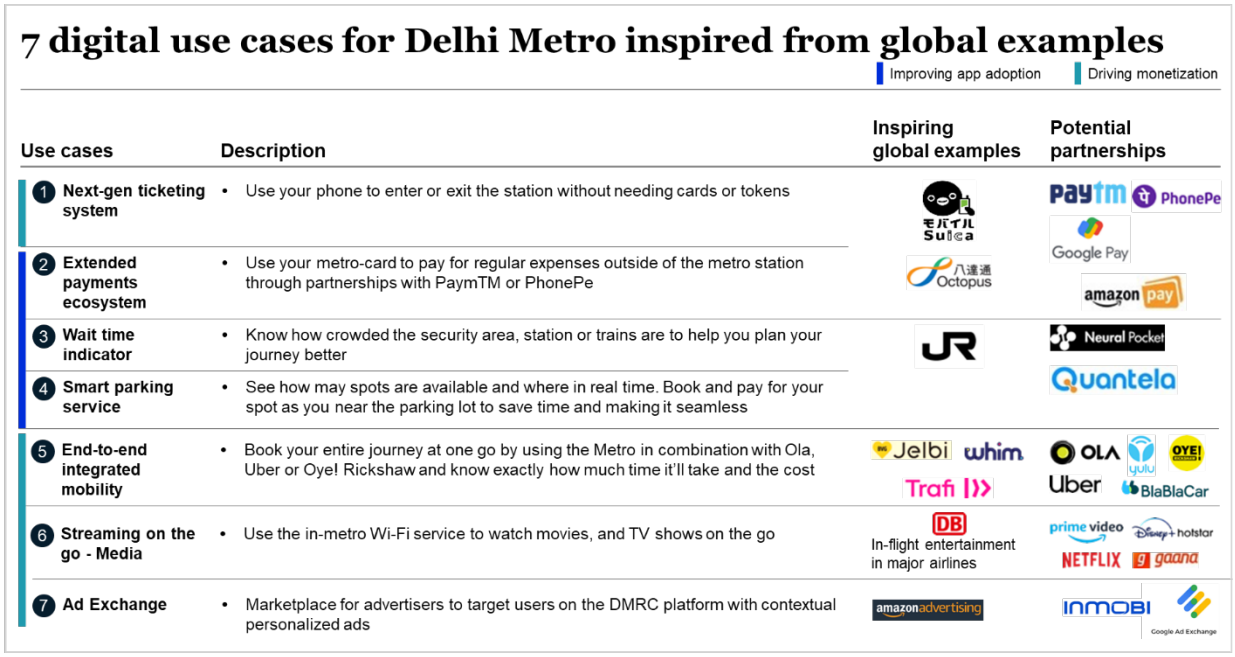


Figure 32 – Digital use cases for Delhi Metro inspired from global examples

In these use cases, there are two types: ones that can encourage people to adopt an app and guide them to a platform, and ones that can be directly linked to monetization. Even the ideas that have similar overseas case examples may not necessarily have been implemented as new revenue-generating businesses, because it is difficult to build a platform based only on monetized parts. It will be necessarily to pay attention to both types when investigating in more detail.

Figure 33 includes seven pioneer use cases identified during hackathon and FGDs mentioned in the previous chapter. These use cases include Virtual Delhi Mall, Smart offers, Travel and Tourism Hub to name a few.

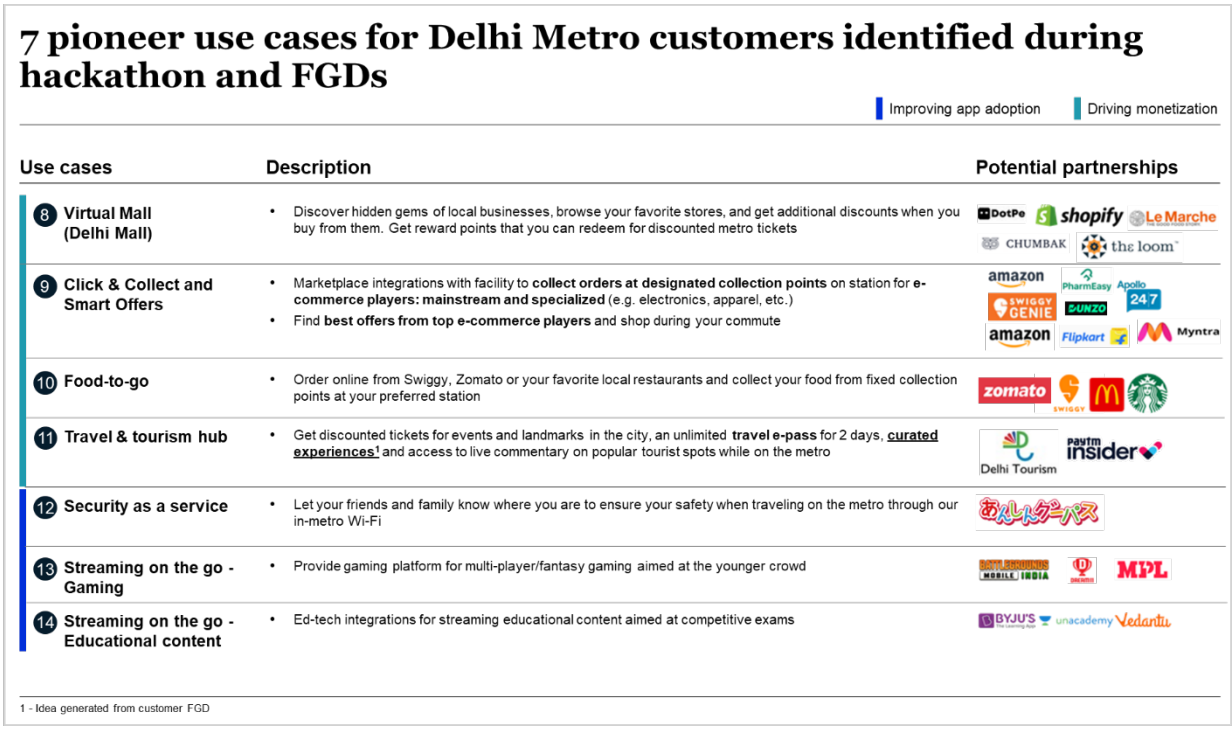


Figure 33 – Use cases for Delhi Metro identified during hackathon and FGDs

The ideas that have not been implemented anywhere else in the world in context of public transit or others are also mixed with ones that contribute to platform penetration and ones that can potentially monetize.

4.1.1 Idea prioritization and business model

Obtained ideas were scored based on three elements: impact (in terms of the contribution to user experience or revenues), feasibility, and confidence, and their priority was visualized by plotting them on axes of impact and feasibility. The scoring schema is described below in Table 1.

Table 1 – Scoring Schema

	Impact	Confidence	Ease
Description	The potential gain from the feature, in terms of business/ strategic objectives (e.g., revenue, customer experience)	The level of confidence in assessing the impact and ease of implementation	Degree of complexity involved in completing the feature (e.g., how long it will take to finish)
Scoring schema	1 – very low impact	1 – 3: High risk (many unknowns and little supporting evidence about the potential feature)	1-2 – long time frame (1-3 months)
	2-5 – minimal impact	4 – 7: Medium Risk (good information is available, but the blueprint for execution is still unclear)	3-5 – significant time frame (2-4 weeks)

	6-8 – definite impact	8 – 10: Low/mitigated risk (plenty of customer feedback and data points backing the feature)	6-7 – minimal time frame (1-2 weeks)
	9-10 – significant impact		8-10 – short time frame (<1 week)

Figure 34 shows the result of the prioritization. On X-axis, we have plotted the impact score, and on Y-axis, we have used the ease of implementation score. The size of each bubble represents the ICE score, which is a product of impact, confidence and ease scores. When we apply each of the above scoring criteria to the 14 ideas we have identified, we have prioritized 9 use cases as based on ICE to shortlist.

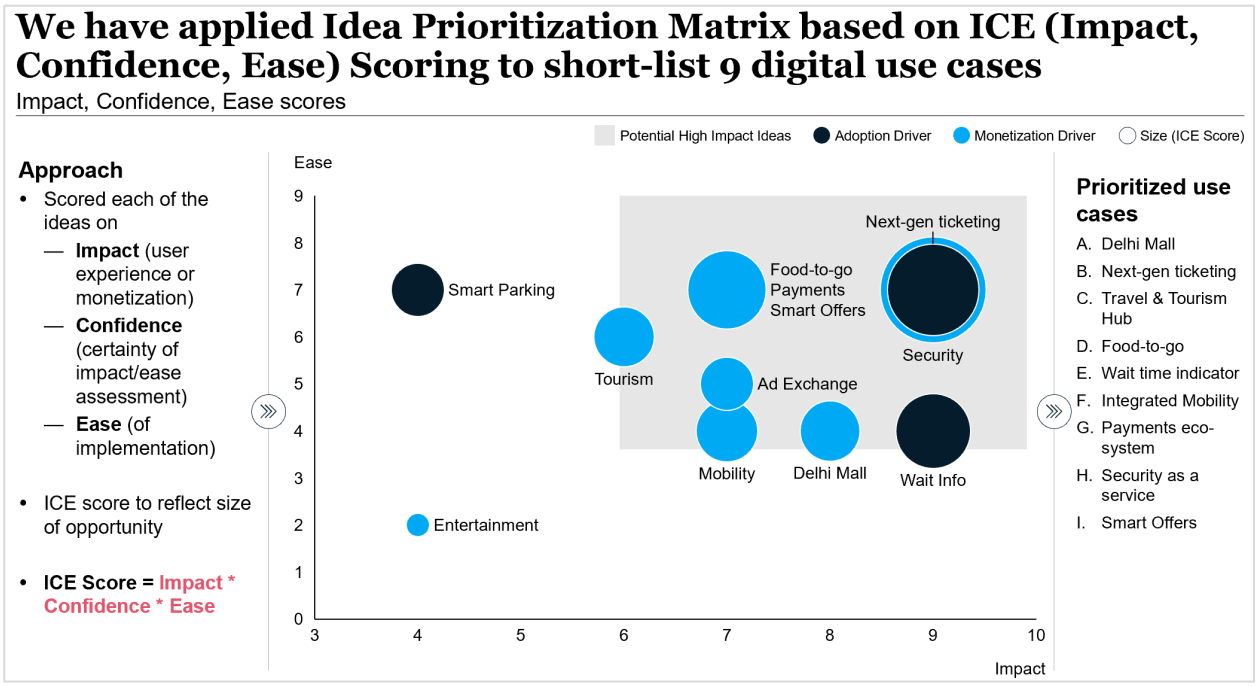


Figure 34 – Shortlisting of use cases

Figure 35 shows an illustration of these selected nine use cases - Smart offers, Virtual Delhi Mall, Travel and Tourism Hub, Integrated Mobility, Extended payments ecosystem, Security as a Service, Next-gen ticketing system, Real-time wait indicator and Food to go that are pivotal for adoption of DRMC's digital platform and generating revenue.

Because no use-cases with exceptionally large impact were found after performing a comprehensive investigation of prioritization and impact, and because the survey of customer trends indicated that both use-cases that guided users to the app (i.e., that encouraged its spread) and use-cases that would actually lead to revenues would be required, it was concluded that a platform should be built that pursued a relatively broad range of ideas simultaneously.

It is noted that as described in the next chapter, we decided to construct a new platform rather than renovate the existing app or website in the pilot, based on the existing initiatives of digital platform of DMRC. This new platform was decided to be a mobile app in order to provide easy on-the go access to the

users. As most of the users have smartphones, the app would enable the users to check for route, do smart card recharges, shop from virtual Delhi mall, etc. while travelling.

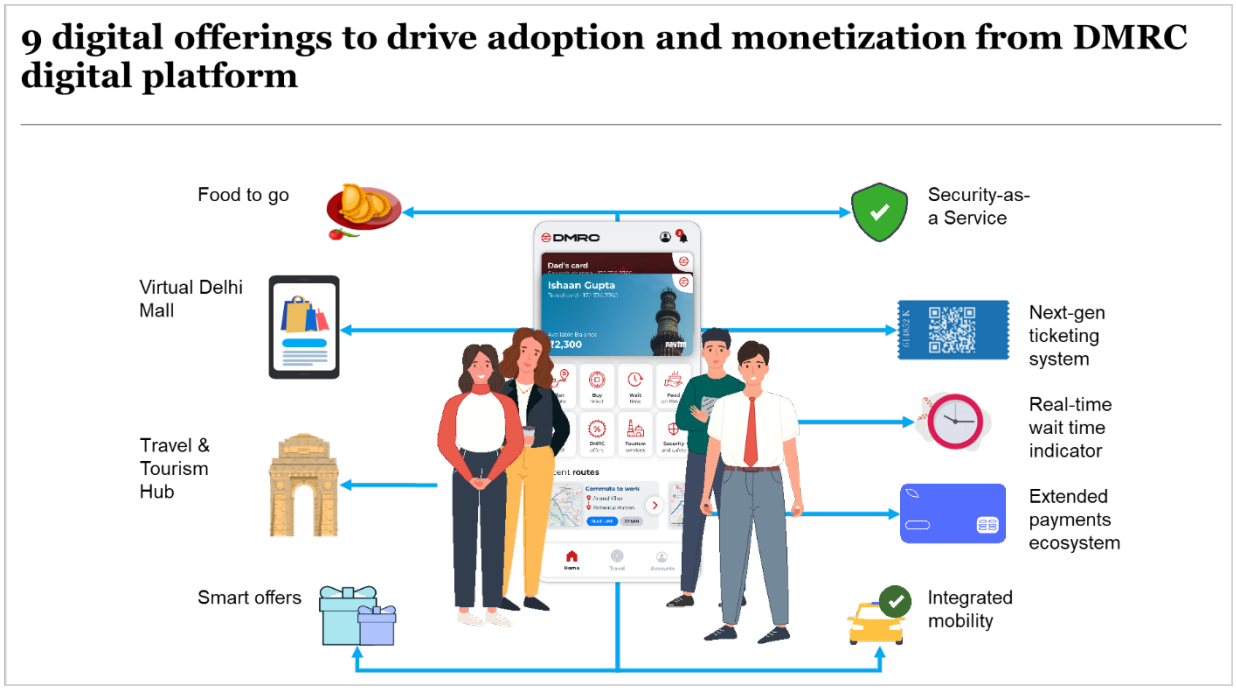


Figure 35 – Digital offerings to drive adoption and monetization

These use-cases have been designed to be mutually linked in a way that will encourage use, but it is important that the user be at the center of the concept, and that app development and partner company recruitment be used as means to realize the digital service.

Below we describe each of the use cases in further detail. Figure 36 shows the virtual Delhi Mall, the food-to-go and tourism hub.

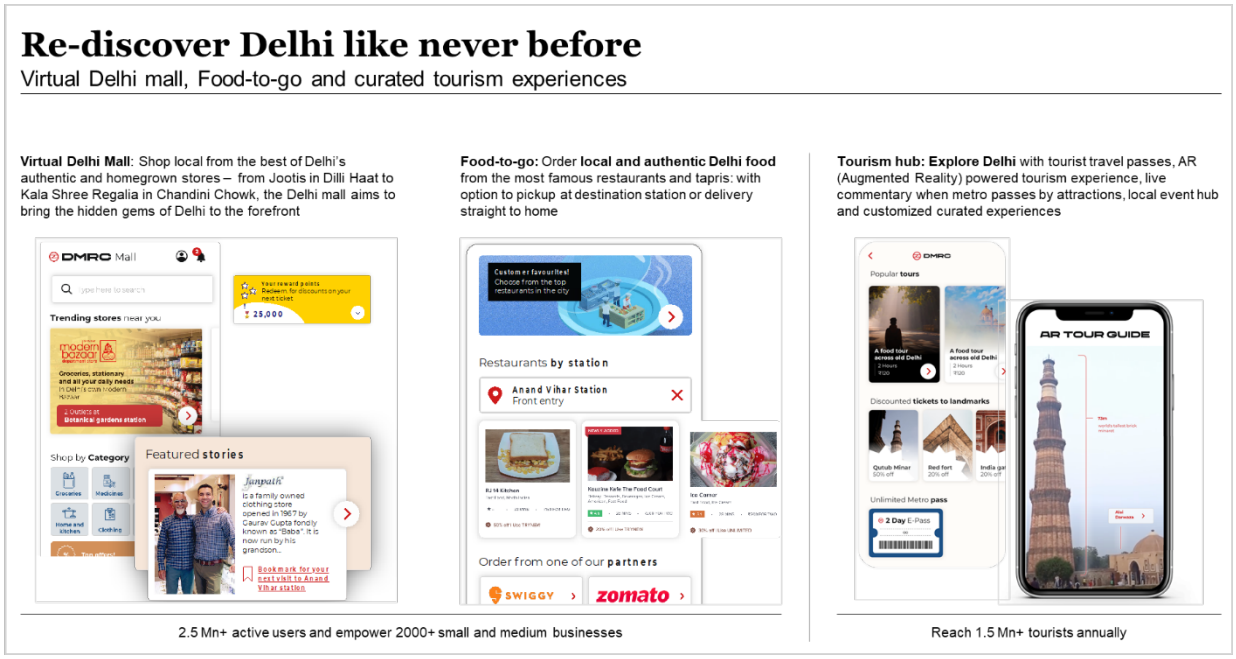


Figure 36 – Anticipated use case scenario for Delhi Mall, Food-to-go and tourism

- Through the **Virtual Delhi Mall**, the digital platform integrates with different small / medium local players who have a digital presence, facilitating seller-buyer discovery. The Virtual Delhi Mall hosts local partners like Janpath Online, Sarojini Market, Sadar 24, India City Walks, etc. who represent local ethos of Delhi. These partners have very limited presence on other virtual and e-commerce platforms like Amazon due to limited capacity and scale of business. Such partners can showcase their products on DMRC's digital platform providing the users local flavors of Delhi. Additionally, these local partners can aid in revenue generation through shared commission. The concept of virtual mall is not available on any other mobility platform in India and can be the USP (Unique Selling Proposition) for DMRC's digital platform.

- **Food-to-go** will enable the users to order local and authentic Delhi food from the most famous restaurants and tapris with an option to pick up at destination station or delivery straight to home. This will also allow the users to select from outlets available at the station and pick up the delivery after alighting from the metro at the destination station.

- **Tourism hub** will assist the tourists in exploring Delhi with tourist travel passes, AR (Augmented Reality) powered tourism experience, live commentary when metro passes by attractions, local event hub and customized curated experiences. The tourists will be able to select from specially curated walks and tours available on the platform which will allow them to explore Delhi like never before.

Figure 37 highlights smart offers, E-wallet and safer metro journey use cases.

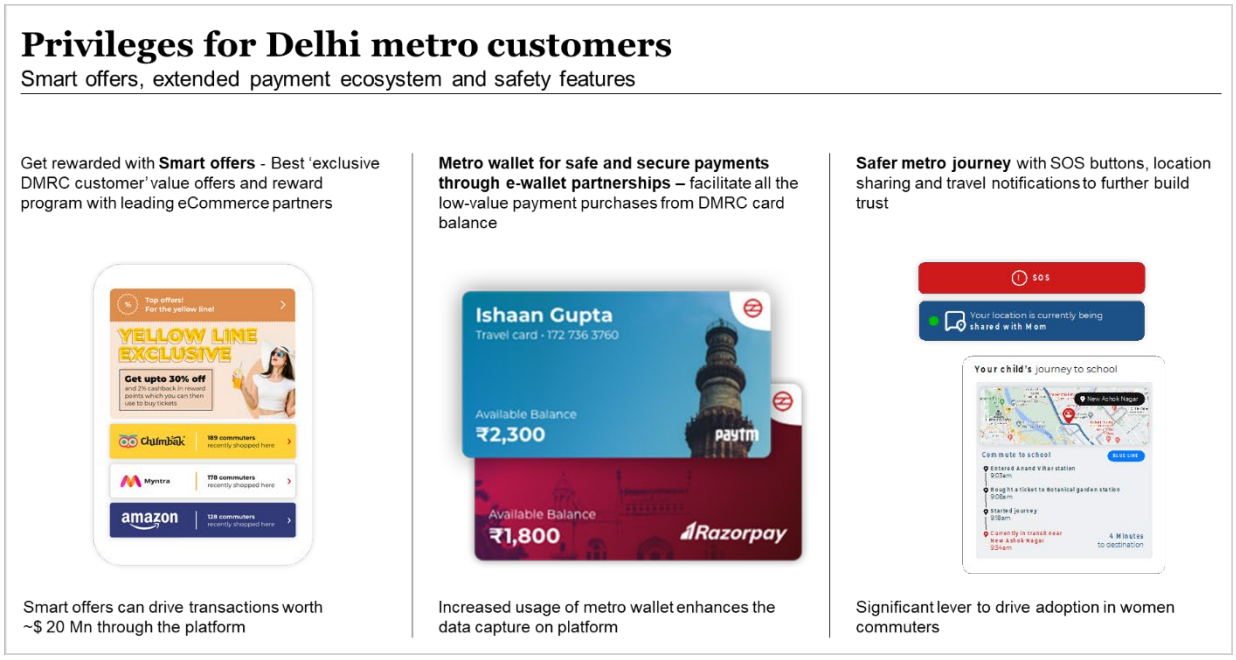


Figure 37 – Anticipated use case scenario for Smart offers, E-wallet and Safer metro journey

- The users will get rewarded with **Smart offers** and 'exclusive DMRC customer' benefits from reward program offered by leading eCommerce partners and also local Delhi partners

- The **Metro wallet** will facilitate safe and secure payments through e-wallet partnerships. This will also enable the users to make all the low-value payment purchases from the available smart card balance
- SOS buttons, location sharing and travel notifications will further build trust and enable a **Safer metro journey** experience for the commuters.

Figure 38 shows smart ticketing, integrated mobility, and live crowd meter and navigation support.

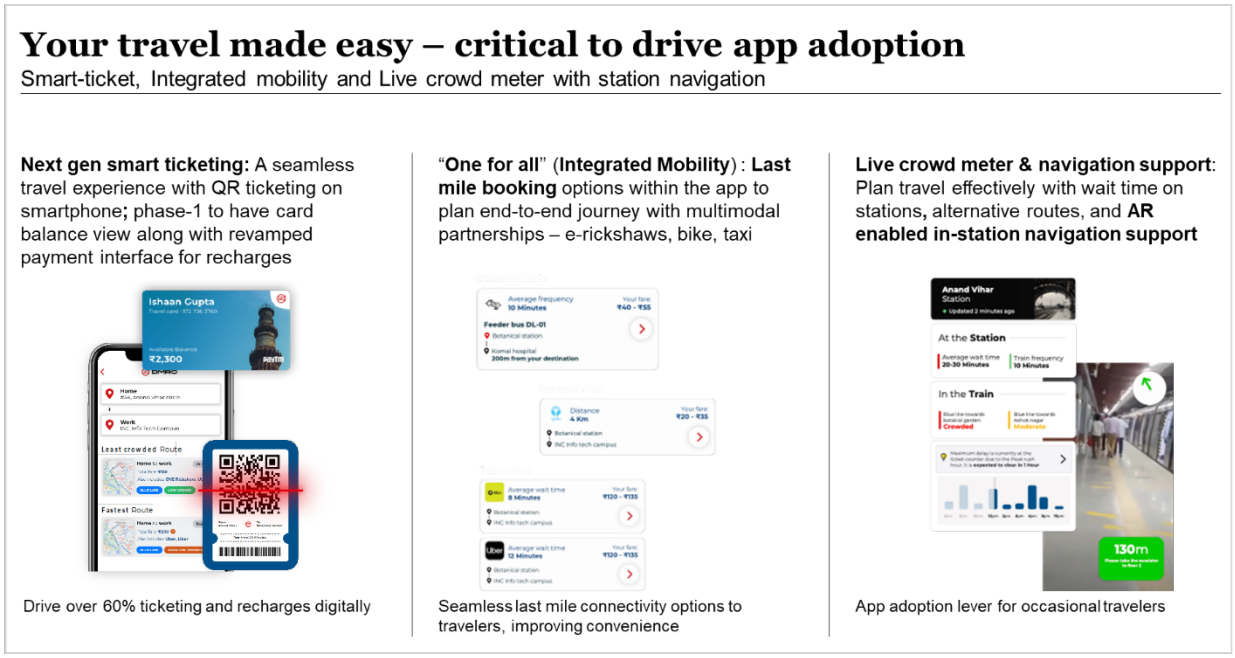


Figure 38 – Travel made easy

- The **Next gen smart ticketing** will provide a seamless travel experience with QR ticketing on smartphone. Phase-1 (MVP phase) will have card balance view along with the payment interface which includes the improvement of the existing DMRC's online recharge function.
- The digital platform will host mobility partners like Ola and Uber for "**One for all" (Integrated Mobility)**. This will ensure last mile connectivity with booking options within the app to plan end-to-end journey with multimodal partnerships – e-rickshaws, bike, taxi
- **Live crowd meter & navigation support** will allow the commuters to plan their travel effectively and efficiently. The options of knowing wait time on stations, alternative routes, and AR enabled in-station navigation support will enable the commuters to take informed decisions about the travel reducing the travel time required.

In conclusion, we have conducted an assessment of business viability risk assessment for nine use cases, and determined to implement four services on MVP for the pilot phase in this study: (1) Smart offers, (2) Tourism Hub, (3) Virtual Mall (Shopping) and (4) Mobility features - transit support, cooperation with feeder services like taxi, and smart card recharges. One use case that has not been implemented on MVP is the idea of using installed cameras on the stations and trains for Live Crowd Meter giving wait time information, which was pushed forward to the next phase through the discussion with the DMRC team who

was of the opinion that using the video information from cameras would possess legal and security risk to DMRC at this point of time. Similarly, there was less willingness among users to pay for Security services, and thus the idea of having security services in the MVP phase was dropped. Figure 39 shows the prioritization process from hackathon to pilot.

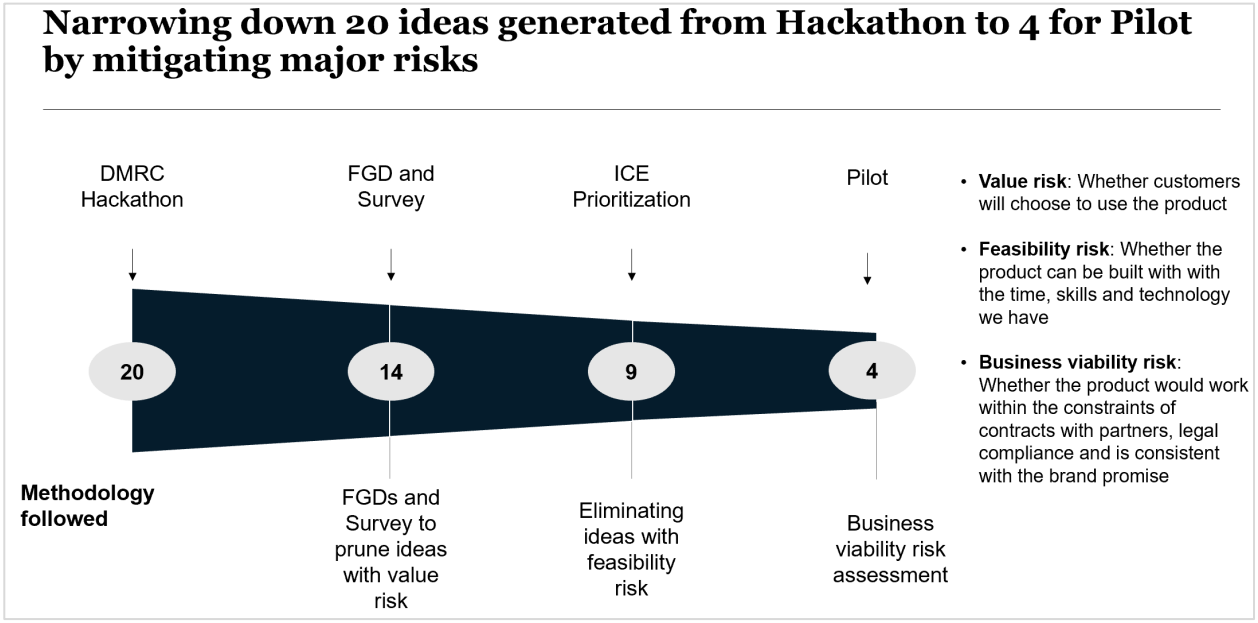


Figure 39 – Pilot usecases (ideas) selection

Chapter 5 A diagnostic of the digital experience provided by Delhi Metro

In preparation for the deployment of a digital platform, we surveyed the current website and smartphone app being provided by the DMRC. Overall, while they do provide a certain amount of information such as journey routes, station information with broad information on the website with easy-to-follow languages, their design does not address individual user needs. As a result, it was determined that there was significant room for improvement in the form of personalization, improvements to search interactivity, etc. if they were to function as the infrastructure supporting the digital platform. Figure 40 describes the areas functioning well for the current digital platform and also the areas that need critical fixes and improvements.

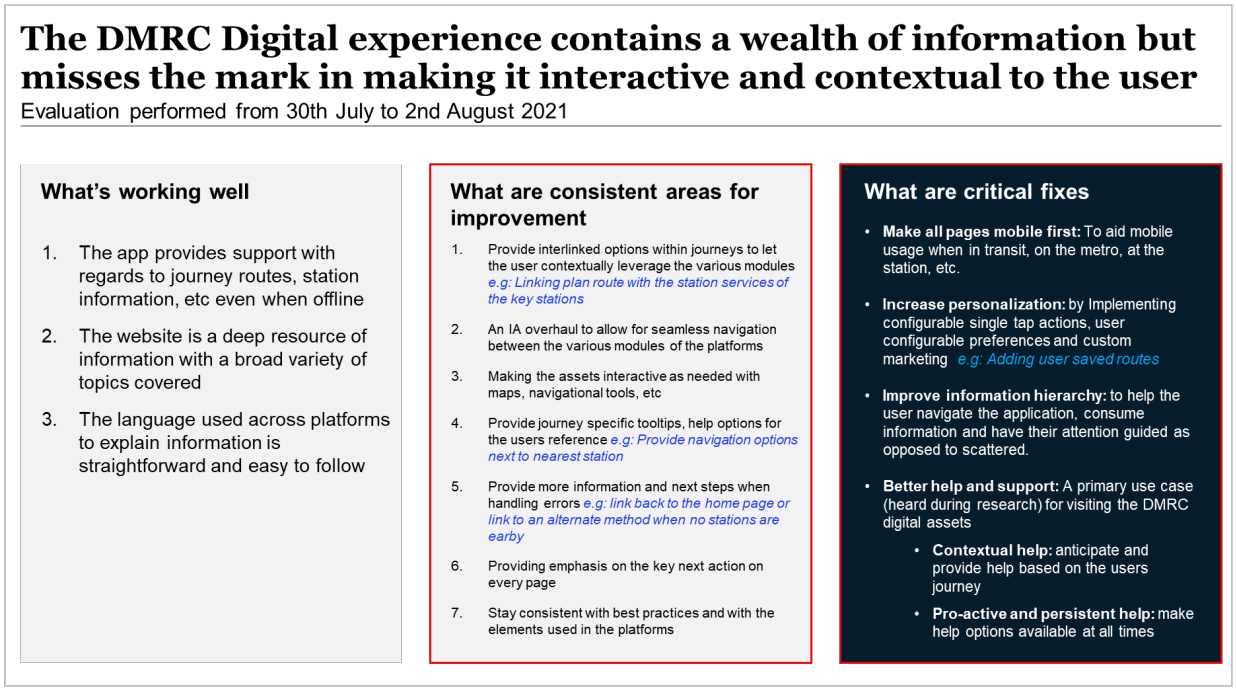


Figure 40 – Current DMRC Digital experience

5.1.1 User feedback on current DMRC app

Figure 41 describes the user reviews of the current DMRC digital app. From ~56,000 reviews available on the app, the average score stood at 4.2. Users found the app very useful, important and easy to use as the app provides information on Delhi metro's routes, fare and distance. Along with the positive feedback, many users have also made recommendations to enhance the app by introducing features like smart card balance checks, real time updates on fare, train timings, updated list of stations, better route planning facility, etc.

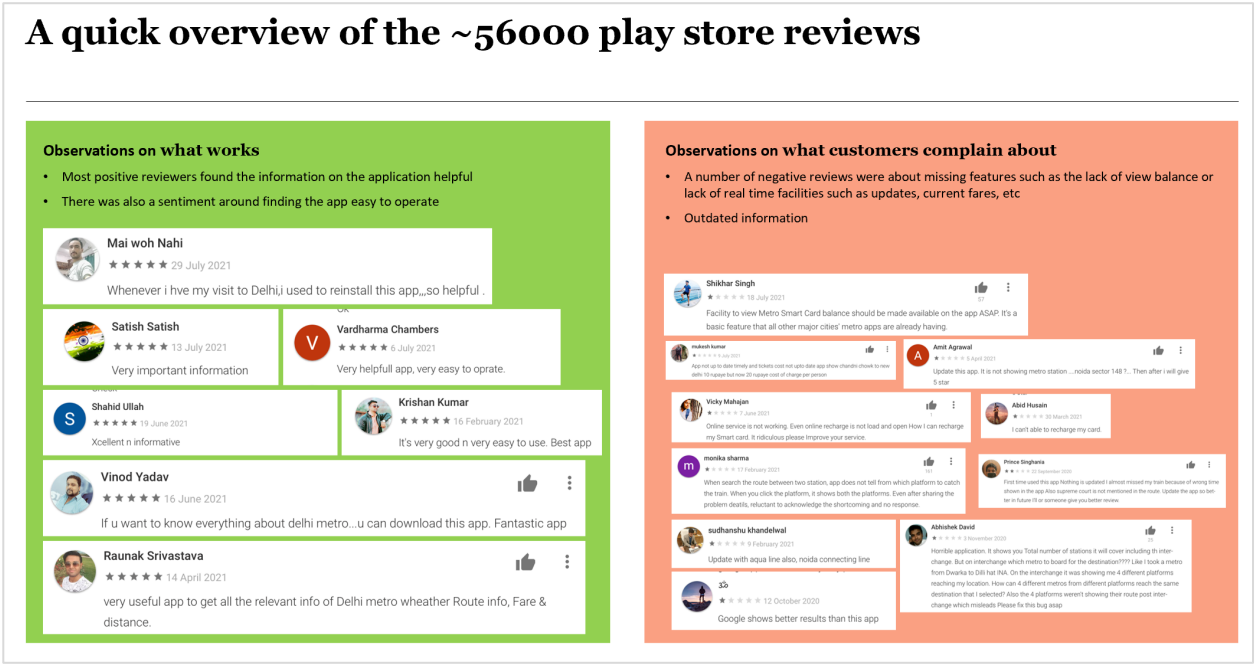


Figure 41 – Overview of app store reviews

DMRC conducted 7th Customer Satisfaction Survey in 2019 covering more than 1 lakh commuters spread over 60 metro stations and inside the trains. During the survey, feedback was received from commuters on all the important aspects of metro functioning such as availability & accessibility, facilities offered to customers, information, outside the metro area, quality of services, security, safety & comfort, etc. Table 2 shows a weighted average score on overall satisfaction and further details out the scores against each parameter mentioned above.

Table 2 – Weighted satisfaction of customer satisfaction survey 2019

TOPIC	Weightage of Overall Satisfaction questionnaire*	Weightage range of various questionnaires
Availability & Accessibility	6.60	5.57– 6.43
Facilities Offered to Customers	6.39	5.49 – 5.99
Information	6.37	5.79 – 6.47
Quality of Service	6.47	5.50 – 6.51
Customer Services	6.44	5.86– 6.47
Outside Metro Area	6.29	5.44 – 5.98
Safety & Security and comfort	6.74	5.71 – 6.47
Average	**6.47**	

* *Weightage of Overall Satisfaction questionnaire asked daily during the CSS 2019 separately*

5.1.2 Challenges on the current DMRC digital platform

The team conducted UI audit on DMRC's existing digital platforms including website and app to understand and uncover potential areas for improvement. The team also conducted Heuristic Analysis which is a usability inspection method of a product/ software that is effective to identify usability problems in the design. It generally involves examining an interface and judging its compliance with recognized usability principles (or heuristics). After Heuristic analysis, evaluation of the assets and expert interviews, the team came up with the challenges on DMRC's current digital platforms. The critical fixes required and the solutions to these challenges have been mentioned in Figure 42.

Critical fixes

Executive summary

Theme	1 Make all pages mobile first:	2 Increase personalization
Challenge	The website is largely not responsive and Journeys such as "recharge card" are not usable on the app and website since the webpage does not scale to a mobile screen.	The lack of any stored user information makes the platform heavily rely on the user remembering their card details and station names to complete core tasks on the app.
Solution	Making the website responsive and integrating key journeys like the recharge card journey into the app	Personalizing the app based on usage, pre-set routes, favorited locations, etc will help the user progressively complete tasks faster on the app
		

Critical fixes

Executive summary

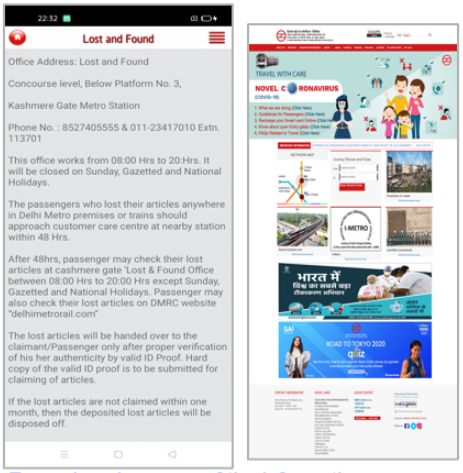
Theme	3 Improve information hierarchy	4 Providing better help and support
Challenge	Several pages use long paragraphs or scattered visual elements that distract a user or dissipates their attention	A primary use case is to get help and support but the platforms lack methods beyond the helpline number to get assistance
Solution	Adding the right visual cues to create a guided and easy to scan experience.	To provide contextual[1] help by anticipating the users needs in their journey and persistent[2] help to ensure the user always has access to the same
	 *Examples above are of the information pages on the application which utilize long paragraphs that is difficult to scan and of the home page of the website where key actions are easy to miss.*	

Figure 42 – Required critical fixes

Figure 43 below describes our recommendations for Delhi Metro Rail App and website. As mentioned earlier, the team conducted Heuristic Analysis and based on this analysis and discussions with experts, the team made the recommendations reflected in Figure 43.

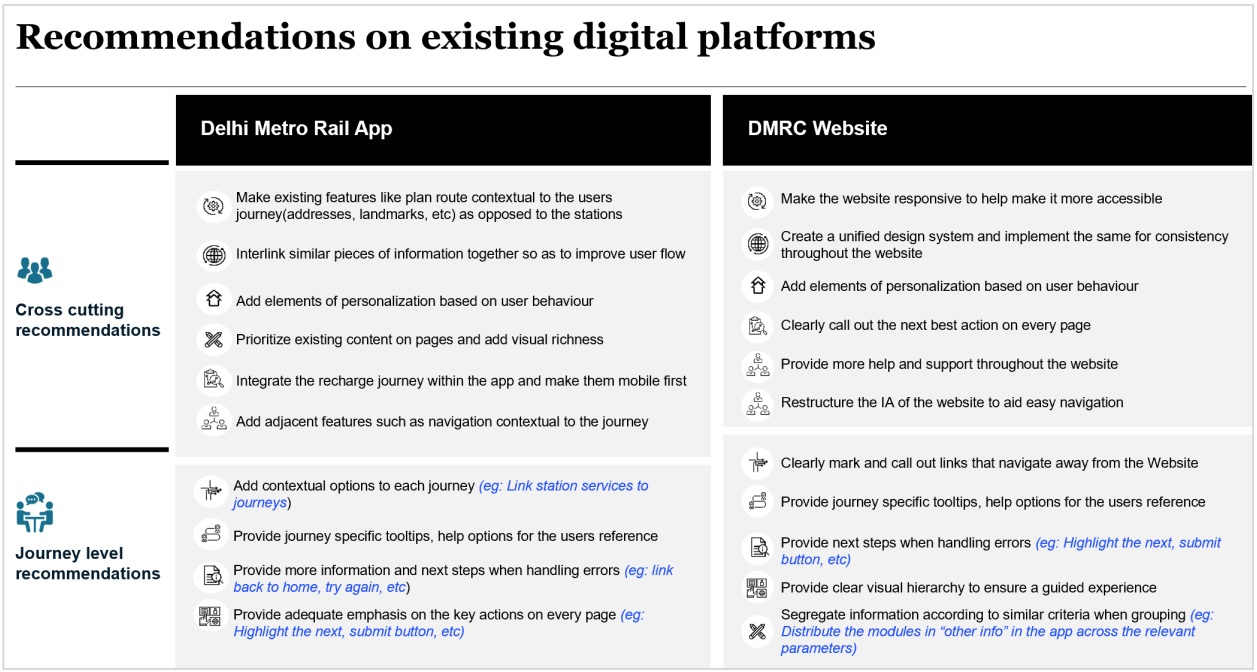


Figure 43 – Recommendations on current platform

5.1.3 DMRC's technical and data systems

In addition to the digital experience, the team while working with DMRC team on building the MVP product, made a note of the DMRC technical and data systems, which can be changed as per industry benchmarks. They have been summarized below:

(1) Ticketing System – Entrance Management

Current implementation of token-based and smart card ticketing is known for extremely high uptime and performance but restricted to the internal DMRC network. This system allows for entrance management, enabling the user to enter the stations through automated gates which open only using valid tokens (single journey use) and smart cards. DMRC is working towards upgrading the AFCs and enabling QR and app based smart ticketing.

Integrations and sharing of information to external systems can be centralized and be created as a plug and play service.

DMRC can explore options to make data exchange faster while not compromising on security and performance. For instance, right now smart card transaction data can be delayed by up to 2 hours. Exploring hot standby instead of periodic backups can bring that down to a factor of seconds.

(2) Master data management system

Information like station list, time, distance, and fare matrix is right now being worked upon using excel sheets. A centralized system is required which shall be the single source of truth for everyone to refer to.

Namely, improvements like following features are desirable:

- Easy to use, intuitive UI
- Support easy to integrate APIs behind strict security norms

Following are the options that can be explored:

- Off the shelf products, which have high licensing costs, customization and development time and learning curve for users
- One-time custom developed end to end product which caters to all use cases

(3) Train metrics

Improvement is needed such that information like load/ETA/destination which is displayed on an electric bulletin board at station platforms should be shown on the existing applications in real time. These can be critical information which DMRC can leverage to provide to relevant external major players, as a paid service. Moreover, the information can also be utilized for creating a USP for internal applications.

(4) Network and infra

Presently, all IT infra (e.g., CSC system for transaction history) is on premise and self-managed in DRMC. DMRC can also explore utilizing cloud services to expand and enhance network and security hereafter.

(5) Internal mail systems

As mail servers are maintained by NIC (National Informatics Centre), timely delivery and so forth can sometimes be an issue. As discovered during setting up DMRC GCP account, cases were found where time-bound OTPs were expiring because mails sent by Google were being received with a 20+ minute delay. This made onboarding and signing up tedious. Alternate options can be looked at, at part with international firms.

(6) Tech stack

DMRC needs to revisit architecture and data level decisions to replace legacy/licensed products with modern, more feature-rich options. Updating those products should help ensure licensing and renewal cost is restricted to a minimum.

Chapter 6 Evaluation of use cases and business plans

Globally, consumers have started moving from spending on individual companies to spending on platforms/ecosystems. Ecosystems are interconnected sets of services through which users can fulfill a variety of cross-sectoral needs, in one integrated experience. In any country, there are 12 distinct ecosystems have started to form, with mobility being one of them (Figure 44). According to McKinsey's estimate, an integrated ecosystem economy is expected to generate ~$70 trillion global revenue pool by 2030.

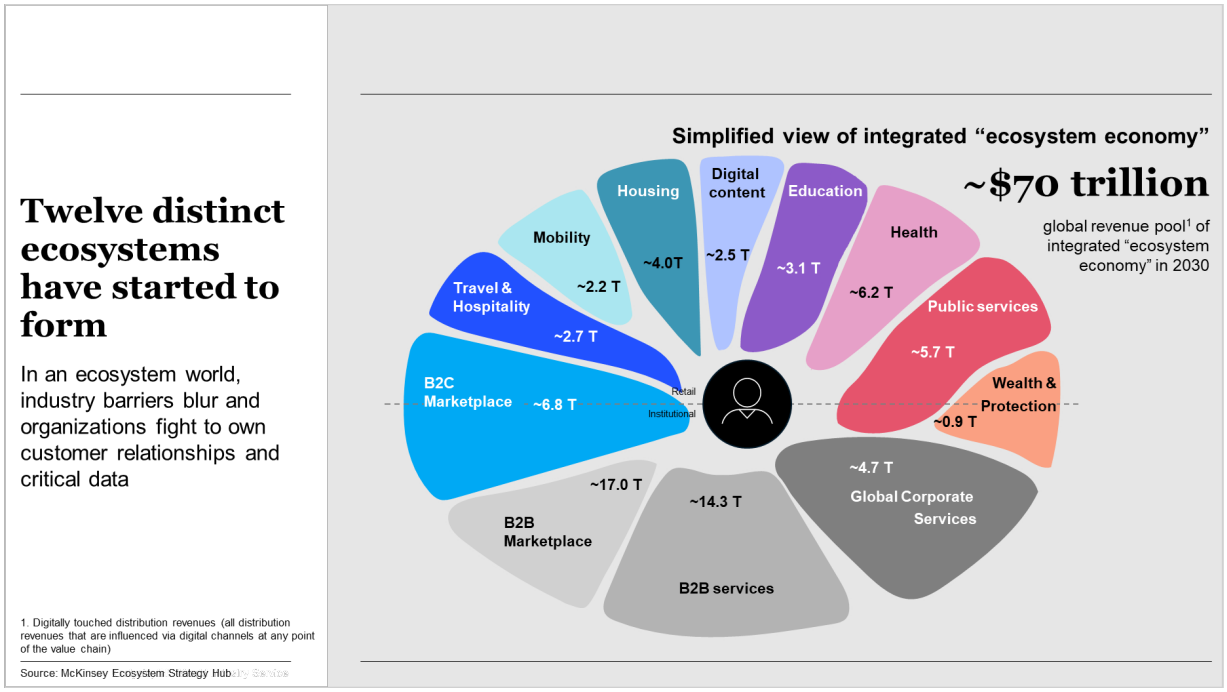


Figure 44 – Integrated ecosystem economy

Given that Delhi metro is at the heart of travel for Delhi commuters, building a digital platform ensures that DMRC controls the mobility ecosystem play in Delhi, and can strengthen coordination with external partners which will join in the ecosystem, thus enhancing its fare/non-fare revenues.

While this project has a certain guaranteed customer base in the form of the DMRC ridership, the aim is to expand the provision of products and services by partner companies, creating an ecosystem that will in turn stimulate further demand. This ecosystem not only has the potential to increase revenue from giving users access to multiple products and services, but also, through network effects and ease of use, increase the number of DMRC commuters themselves. The vast amount of data that will be generated through a complete digital user journey can also allow for customizing products and services being offered to the customers, thus enhancing the user experience.

Most of the local partners expressed willingness to be a part of the MVP and were subsequently integrated. Few large scale partners like Flipkart, Tata IMG, Tata Cliq, Urban Company, Big Basket, Google Pay, Paytm, Noise, WHSmith, etc. expressed limited or no interest due to the minimalistic scale of the MVP with just 100 users. Partners like Google pay and Paytm could not come on-board due to DMRC's existing contract with other payment providers, but these partners expressed willingness to be a part of the full scale-

up. Some partners refused technical integration at MVP stage, while some expressed willingness to be a part of the scale-up based on the success of the MVP.

Our conversations with multiple ride hailing platforms such as Ola and Uber indicated a strong desire to partner with DMRC platform and become part of the user journey on the DMRC platform. There was also a willingness of the partners to pay a premium to get access as the exclusive ride hailing partner. Subsequently, both Ola and Uber were integrated on the platform for the MVP phase. Figure 45 describes value proposition of the DMRC digital platform.

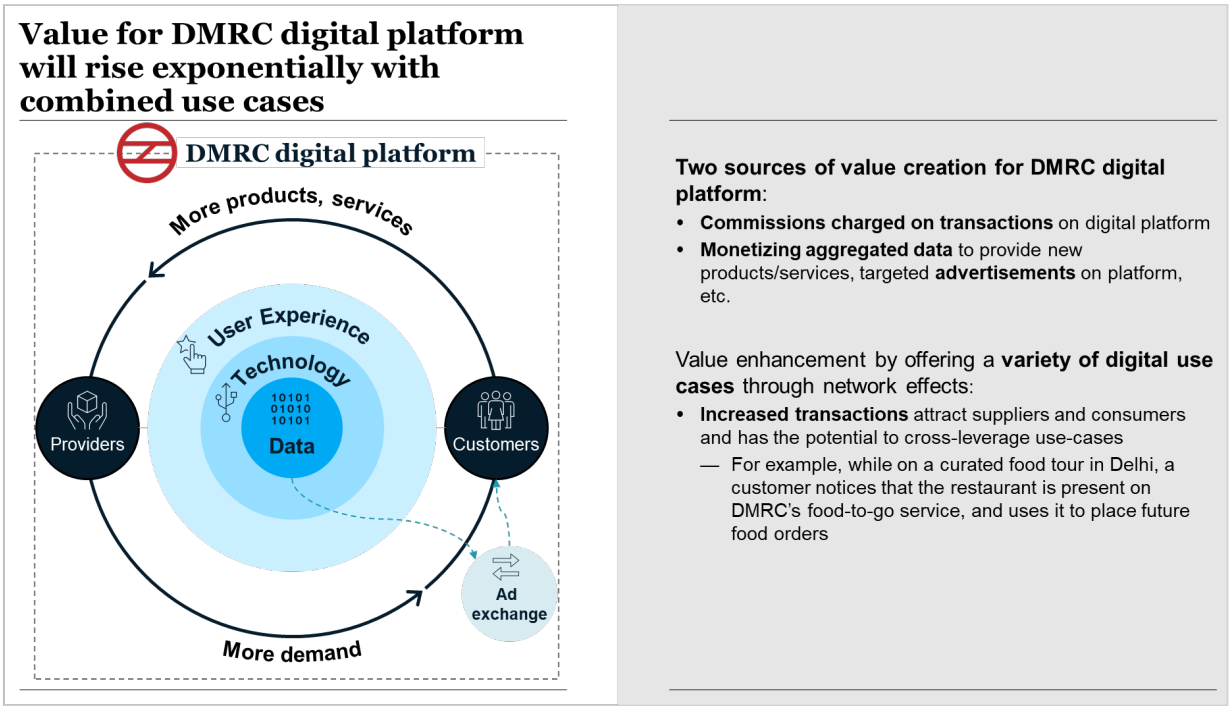


Figure 45 – Value proposition for DMRC digital platform

The economic value (revenue model) for the DMRC can be roughly categorized into 1) commissions charged for various transactions performed on the digital platform (this assumes that the services themselves will be provided by the partner companies), 2) the monetization of data such as feedback about products and services, reactions to advertisements, 3) farebox revenue growth by increasing Delhi Metro users caused by powerful engagement with those who will use the digital platform, etc.

Meanwhile, among nine use cases examined in Chapter 4, the uses cases of Travel and Tourism hub, Virtual Delhi Mall, Food to go and Smart offers would generate revenue through shared commissions. Similarly, the use cases of Integrated Mobility will also lead to DMRC's revenue generation in the form of commissions based on the rides booked by the users through the platform. The use case of Smart Ticketing can drive a certain percentage of revenue of DMRC in the form of tickets booked through the platform that the settlements are made by the payment gateway (Paytm, etc.). Data provided at cost by the platform for targeted advertisements and promotions would also add to the DMRC's revenue generated through the platform.

Furthermore, use cases such as live crowd meter or SOS for enhanced security might not lead to a direct increase in revenue, but will increase the app adoption and engagement, thus indirectly increasing the time users spend on the app, and accidently finding products and services they might want to buy. Such critical features will also have immense social value, through enhanced women's safety, improved usage and convenience and transferring the mode of payment from plastic cards to online.

Based on the points above, for each use-case, we estimated sales (service spending) and revenues for the DMRC. For the estimation, the customer segments were roughly divided by railway usage frequency, and then multiplied by the service penetration rate to arrive at the total user base, which was then multiplied by average spend to estimate market size. This was then multiplied by the estimated acquired share (although because customer response cannot be fully confirmed before development, this is really more of an aspirational value) to arrive at the estimated GMV.

The portion of the GMV that will become the DMRC's revenues was estimated by multiplying the GMV by the estimated commission rate for each service. All these numbers were obtained through global benchmarking for similar commissions, and discussions with DMRC team leading the development.

Based on this, we calculated the potential monetary impact of each use case to arrive at a business plan for the new platform. We estimated that by 2026, the app will have 3.6 million active users, and lead to a Gross Merchandise Value (GMV) transaction of $500 Million annually, leading to a revenue of $23–30 million for DMRC. The non farebox revenue will build up over time as the users adopt the app, and the purchasing behavior change over time with frequent usage of the app. By 2026, share of use cases except for smart ticketing is expected to reach 36% of overall spend on the platform on GMV basis, leading to 81% of total revenues for Delhi Metro. Overall, we estimate the valuation of the platform to reach $1–1.3 billion by FY 26. The detailed calculations are shown in Figure 46 below.

Benchmarking cases like the Octopus payments – HK and Suica-Japan were considered while arriving at the numbers for DMRC digital platform, regarding such as app users and user basis. Additionally, discussions with subject matter experts in the fields of mobility, e-commerce, technology, etc. were conducted to arrive at the numbers for current year and the numbers were subsequently projected for future based on discussions with these experts. For multiple other assumptions where the firms put up metrics on public domain, such as those related to e-commerce affiliate share, the standard benchmark values across e-commerce firms in India (e.g., Amazon, Flipkart, Paytm, etc.) were considered. Standard available resources like Customer Satisfaction Survey (CSS) and the other data available in the public domain was used wherever feasible.

Furthermore, we detailed out revenue generation on the digital platform through smart ticketing and other digital use cases and also the Average Annual Spend (GMV) per user (Figure 47). By 2031, we estimated that the revenue share of non-ticket use cases will be ~ 92% and the GMV share of non-ticket use cases will be ~ 50-60%. This is because in the earlier phase, the ticketing related offering will drive the adoption of the app, but once it reaches a critical mass of app users, the non-ticketing use cases will have significantly more growth. We expect this switch to occur around 2028.

DMRC digital platform can reach ~ 3.6 Mn active users and a GMV of ~$500 Mn by 2026

Preliminary sizing

App adoption amongst riders (2026)

Rider category	Estimated unique riders	App adoption	Active App users
Daily riders Frequent metro usage ~20-24 days per month	1.5 – 1.7 Mn	80%	1.2 – 1.4 Mn
Weekly riders Weekly rider with usage of ~6-8 days per month	1.7 – 1.9 Mn	60%	1 – 1.2 Mn
Occasional riders Weekly rider with usage of ~1-3 days per month	4.6 – 5.0 Mn	25%	1.1 – 1.3 Mn
Total	7.8 – 8.6 Mn		3.3 – 3.9 Mn

Monetization of digital use cases (FY 2026)

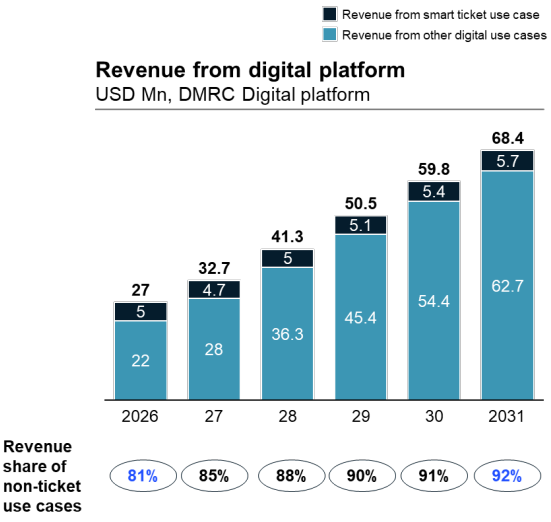
Use case	GMV	Revenue impact[1]	Average annual spend per user[2]
A. Digitizing experience	**$312-324 Mn**	**$4 – 5 Mn**	**$85-95**
1 Next gen smart ticketing	$312-324 Mn	$4 – 5 Mn	
B. New digital use-cases	**$158 – 190 Mn**	**$14 – 18 Mn**	**$45-55**
2 Virtual Delhi Mall	$86 - 103 Mn	$8 – 11 Mn	
3 Integrated mobility	$30 – 36 Mn	~$ 1 – 2 Mn	
4 Smart offers	$17 – 20 Mn	~$1 Mn	
5 Tourism hub	$15 – 17 Mn	~$3 Mn	
6 Food-to-go	$10 – 14 Mn	~$1 Mn	
C. Ad – exchange for app		**$4 – 6 Mn**	
Total	**$470 – 515 Mn (₹ 3475 – 3810 Cr)**	**$23 – 30 Mn (₹ 170 – 220 Cr)**	**$130-150**

1. Revenue impact is the incremental revenue from digital use cases
2. For a frequent traveler, total spend is ~$280 annually, of which $85-90 will be on digital use cases

Source: Survey responses & FGDs, DMRC CSS data

Figure 46 – Potential for DMRC's digital platform

New digital use cases (excl. smart ticketing) can drive ~92% revenue and 55-60% GMV on digital platform



1. Assuming ~5% growth in smart ticketing GMV, and 20-25% growth in GMV from other digital use cases

Source: DMRC annual reports and data (non-farebox revenue), Google digital consumer spend report

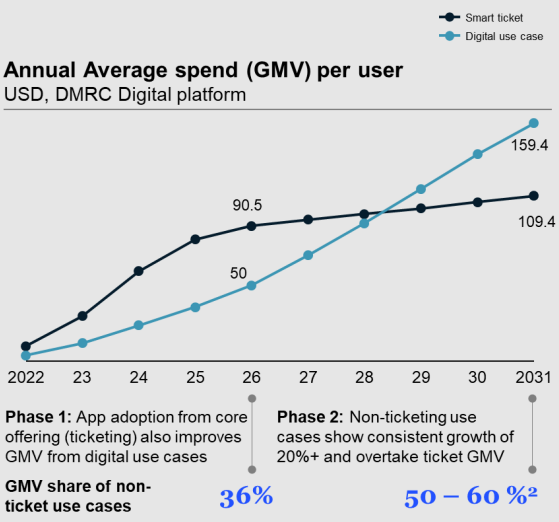


Figure 47 – Revenue generation and GMV on the platform by new digital use cases

Chapter 7 Pilot phase

A new business digital platform in a non-fare revenue area for DMRC was to be constructed with an objective to have multiple use-cases organically linked in order to increase their value, based on the examinations in Chapter 4.

Below, we include (1) overview of the pilot, (2) partner company value proposition, (3) user interface appropriateness, and (4) feedback from the users. We also note that we engaged a subcontracting local partner to develop digital tool which includes mobile app and related IT infrastructure, in order to conduct the pilot efficiently.

7.1 Overview of the pilot

To test the feasibility of such a concept, and the customer reaction to the DMRC digital platform, we launched a mobile app that incorporates four use cases as a Minimum Viable Product (MVP). First, we tested with 10 users before formal launch of the MVP to validate the business concept, then after incorporating the feedback from them, we launched the MVP to limited 100 users. These users provided quantitative feedback over a survey questionnaire, and we interviewed ten of them for additional feedback.

For the partner company value proposition, multiple partners were onboarded onto the app with the clear understanding that this is going to be a MVP product, with limited users, but will be scaled up later. The partners knew that in the full scale up, there will be commercial arrangements with DMRC, and were onboard with that concept at this stage. As seen in Figure 48, We have 13 partners and one aggregator (with more than 25+ offers) fully integrated on the platform, with multiple others which could not be integrated given numerous factors such as limited users, delay in putting the EOI live and delays from partners' end. Many partners have expressed willingness to continue being a part of the platform going ahead even during the scale up phase. As such integrated platform is currently unavailable and given the strong interest from partners like cab aggregators - Ola and Uber, OgaOne, and local partners like Sarojini and Janpath this platform can turn into the go to mobility platform for Delhi commuters.

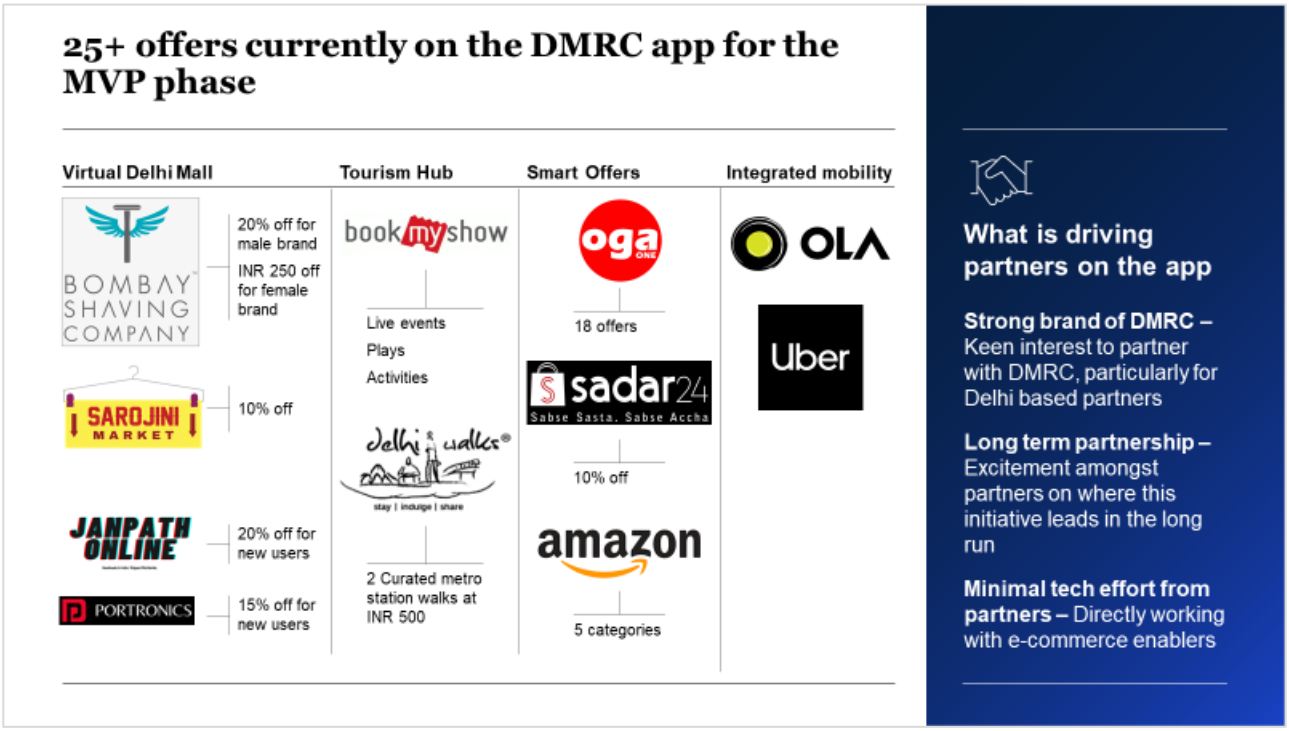


Figure 48 – Partners and aggregators integrated on the platform

7.1.1 KPIs

Figure 49 shows the KPIs that would measure the success of MVP phase of the digital platform. Out of the five mentioned KPIs, customer satisfaction, percentage of repeat transacting users, and number of partners onboarded has been achieved at the time of the writing of this report on February 18, 2022. The remaining two KPIs – percentage of transacting users out of registered users and percentage of non-transacting users out of registered users with >3 average page visits per session, could not be achieved due to the outbreak of third wave of COVID-19 in Delhi during the months of December 2021 to February 2022. Metro travel was restricted and not many people used the metro during the period thus impacting the usability.

Recap of KPIs to measure success of the implementation

Area of focus	Sub Area	KPI	Aspiration	Metric
User Experience	Usability	Customer Satisfaction Rating	> 3/5	4.54
		Percentage of transacting users out of registered users	> 25 %	13 %
		Percentage of repeat transacting users out of transacting users	> 10 %	33 %
	Engagement	Percentage of non-transacting users out of registered users with >3 average page visits per session	> 40 %	33 %
Partners	Onboarding	Total number of partners onboarded	>= 6	13

Figure 49 – KPIs measuring implementation success

To determine the use cases for the pilot, as detailed out in chapter 4, we used the idea prioritization based on ICE (Impact, Confidence and Ease) to rank all use cases. Based on the confidence of short-term agile build and potential impact of the use case, we shortlisted the following seven use cases to complete in the pilot phase:

(1) **Virtual Delhi Mall**: DMRC app integrates with different small/medium local players who have a digital presence, facilitating seller-buyer discovery

(2) **Tourism Hub**: Enhanced travel/tourism experience with curated events discovery of events, shows, art, monuments, museums, theatre etc.

(3) **Smart Offers**: Marketplace integrations and offers from e-commerce players

(4) **Live Crowd Meter**: Live crowding at metro stations based on ticketing analysis, coach occupancy based on load etc.

(5) **User Basic Profile**: Login, Notifications and Smart card balance check

(6) **Existing metro app features**: Fare calculator, route planning including last mile journey by using Ola and Uber, and smart card recharge

(7) **Rewards Program**: To build customer loyalty and ensure repeat purchase

Figure 50 shows the pilot scope and features to be delivered in the MVP phase. It captures monetizing use cases like Virtual Delhi Mall, Tourism hub and Smart offers and includes differentiating features like local sellers, offers and product discovery and user analytics under Virtual Delhi Mall use-case. Payments, Rewards, My account and Existing metro app features are other table-stakes mentioned in the figure.

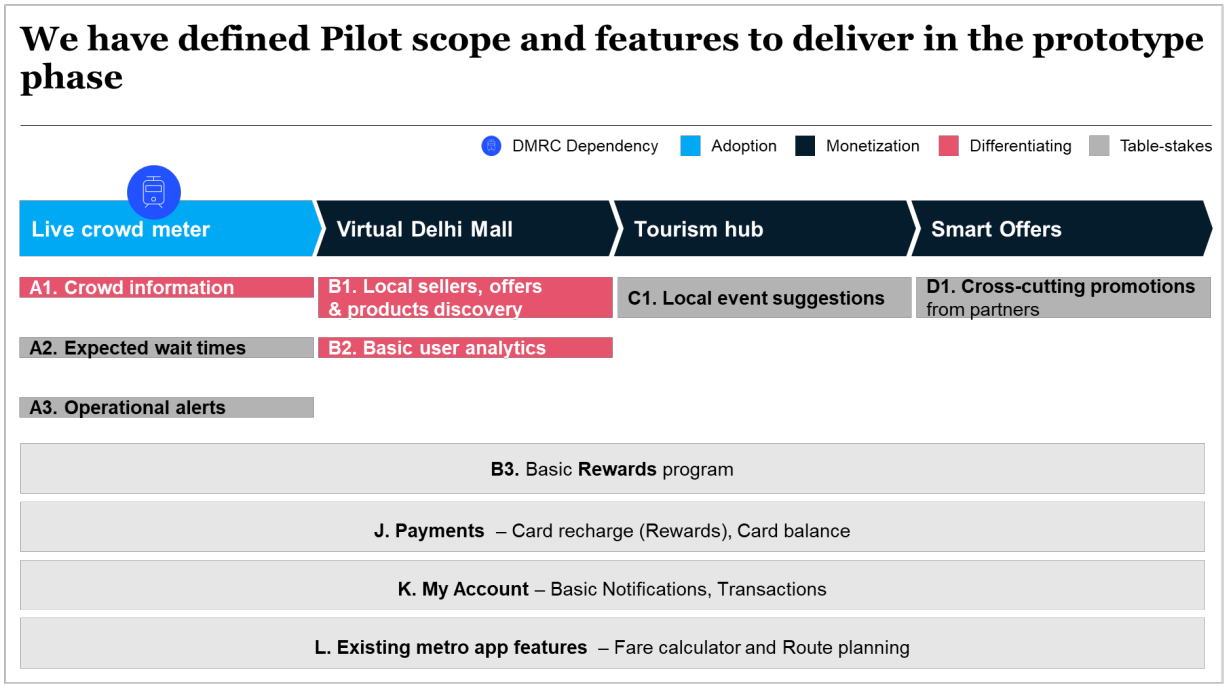


Figure 50 – Scope and features of the pilot

Through the MVP, the use cases of Virtual Delhi Mall, Tourism Hub, Smart Offers and Integrated Mobility were tested. User testing was carried out across these four use cases and feedback was collected.

As a part of integrated mobility use case, Ola and Uber were on-boarded to ensure last mile connectivity. These partners are hosted in the route-planning section of the app which enables users to book cabs directly while determining the route.

7.1.2 Timelines of the pilot

The build of the pilot was to be taken up in an agile manner accomplishing specific goals at six periodic intervals between August 2021 to December 2021. These 2-week periods are called sprints, and development takes place in a way that there is a usable product at the end of every sprint. The use cases were prioritized in these periodic intervals in a way to push out use cases which required large number of dependencies to later stage, ensuring sufficient time to debottleneck them.

The adopted agile sprints-based approach focuses on quickly removing roadblocks in implementation. The 2-week sprints start with Sprint 0 where the sprint (implementation) structure is prepared and finalized and vision, objectives and KPIs are defined. In the subsequent sprints the roadblocks are identified, improvement potential is identified and specific enables causing impact are defined. The last few sprints account for implementation and impact creation while incorporating stakeholder feedback if any. The identified roadblocks during sprints are eliminated through E2E communication between the stakeholders, improving process efficiency, implementing the defined organizational structure and systematic approach in working with continual improvement. This agile sprint-based approach ensures periodic monitoring of the KPIs, short iterations (if any), regular communication and feedback amongst the stakeholders, ensuring

that the implementation plan is on track and timely delivery of the end product. See Table 3 for cadences during sprints.

Table 3 – Cadences identified during sprints

Meeting	Objective	Frequency
Sprint Planning	Prioritize backlogged improvement enablers and agile tools to embark on the sprint	Once every sprint
Sprint Review	Asses target achievements, review KPIs	Once every sprint
Daily Scrum	Review progress towards sprint target, adjust planned work, check on sprint backlog	Daily – start of everyday
Backlog Refinement	Review backlog items to ensure appropriate items are included, are prioritized and previous backlogs are cleared and delivered	Twice a sprint

We adopted this agile sprint-based approach prioritizing the use cases in way to ensure use cases which required large number of dependencies were included in the later sprints, which allowed sufficient time to debottleneck them. Figure 51 shows the implementation plan during the pilot / MVP phase. The pilot was taken up between August and December 2021, followed by user testing and subsequently the MVP launch in January 2022. The periodic intervals are termed as sprints in this infographic.

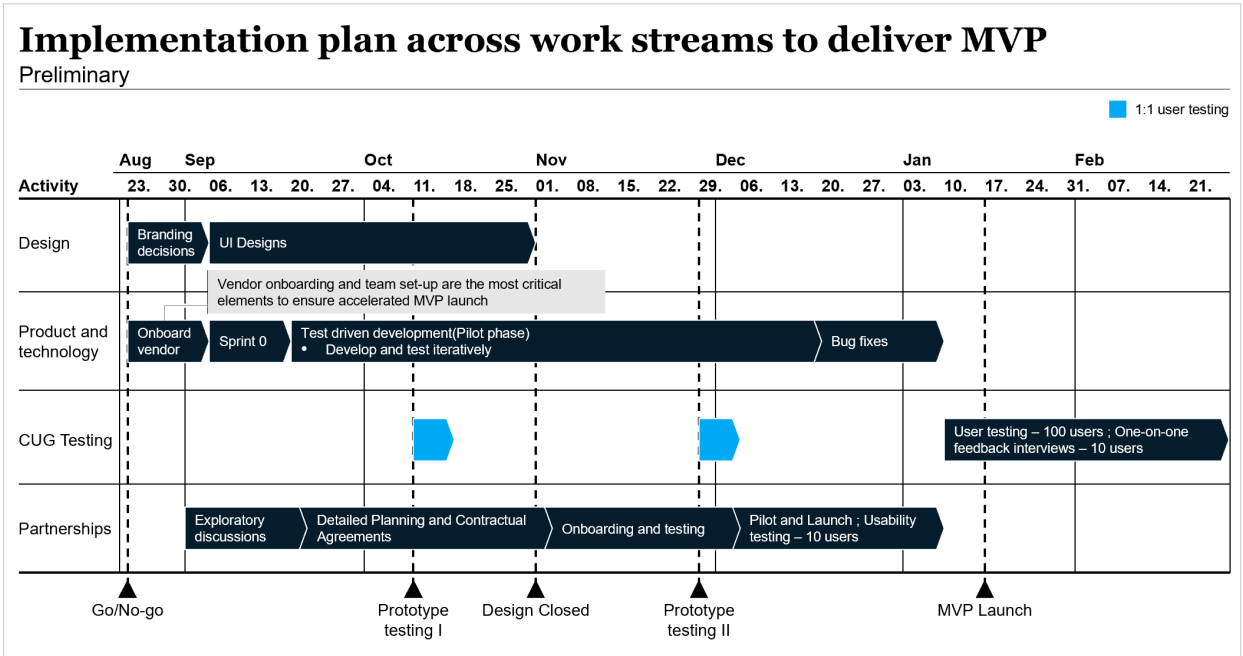


Figure 51 – Pilot Implementation plan

7.1.3 Key activities at start of pilot phase

At the start of the pilot phase, a tech vendor was onboarded to develop the MVP. Detailed conversations were conducted with 3 tech vendors, and feedback taken on adherence to timelines and capabilities to build such digital platforms. The team decided to go ahead with GIDA Technologies, a reputed Indian developer with past experience of working with leading Indian conglomerates such as Airtel and ITC.

At the start of the build, we deep dived into all the prioritized use cases for the MVP and came up with features which we wanted to prioritize in each use case. We also decided on a basic skeleton for the product, along with defining all the possible users for the app. There were five types of users as shown in Table 4, and for each kind of user, a detailed user journey flow was created, so that the design process can start for the app creation. Figure 52 shows the user journey on the digital platform across the three use-cases of Virtual Delhi Mall, Tourism and Travel hub and smart offers.

Table 4 – Types of users

User Type	Definition
Registered user	User who has logged in into the application
Visitor	User who has not logged in into the application
User	Authenticated User or Visitor
Admin	System administrators, logged in via amin portal
Support Representative	Supports users, works on user raised support tickets

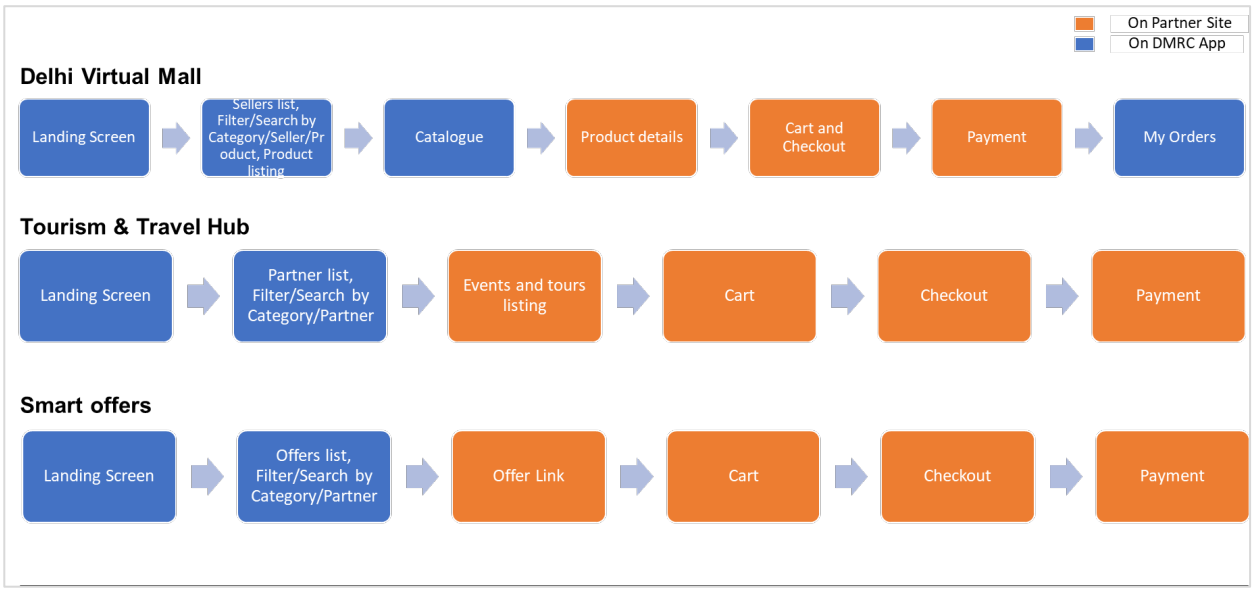


Figure 52 – User journey flow

Based on the type of users and the use case, a detailed product backlog was created, which contained very detailed user stories and acceptance criteria for these user stories (Table 5). A user story captures the experience of the user while using the product, so that the design and technical team ensure that the user is able to complete all the activities mentioned in the user story after the product has been built.

Table 5 – User stories and acceptance criteria

Sprint	Theme	User stories and acceptance criteria			
		As a/an	I want to…	so that…	Acceptance Criteria
1	Commuter Login	Registered User	authenticate myself	only I can access my profile	1. Users trigger an OTP by entering their mobile number 2. When user filled OTP matches the generated one, log-in is successful 3. Users should be able to re-fill OTP in case they make a mistake 4. Users can re-send OTP after 30 seconds lapse
2	Commuter Signup	Visitor	sign up for a profile	I can securely authenticate myself in the future	1. Users sign up by using their mobile number 2. Send an OTP to the mobile number entered and log them in if correct
3	Profile Creation	Registered User	create/edit my profile	I can access my saved details quicker	1. Signed-in Users can save information on Name, Date of birth (optional), Payment methods (optional), Bookmark stations with labels for easier reference (e.g., Home, Work, etc.)
4	Profile	Registered User	view my profile	I can check saved details on my profile	1. Signed-in Users can view saved information like Name, Date of birth (optional), Payment methods (optional), Bookmarked stations 2. Signed-in Users can also check their transactions on platform, number of trips they had taken on DMRC, etc.

Each sprint of the development started with a sprint planning workshop, which included detailing out all the products which would be built in that sprint. The tech and design teams started with the build based on the sprint backlog, which was the product backlog for features to be taken up in the sprint. All issues pertaining to external dependencies and delays were debottlenecked daily during the stand-ups. At the end of 2 weeks, there was a sprint review workshop, where the product was assessed, and feedback taken from the leadership team on potential changes to be made. A sample sprint backlog is shown in Figure 53. It shows the sprint log of sprint 5 where user stories and acceptance criteria across the use-cases are mentioned. It mentions the wishes of the users in order to achieve a certain milestone and the acceptance criteria associated with it.

Sprint	User stories and acceptance criteria						
	Theme	Items	As a/an	I want to…	so that…	Acceptance Criteria	Notes
5	Smart Offers	View offers	User	view offers on products/services	I can avail them to save money/time	1. Users can view offers from different players in form of redirect links	1. Set up mock data for OgaOne, URL change to happen in later sprint once their site goes live
5		Filter offers	User	filter/sort/search offers by category/time remaining/partner	I can find interesting offers easily	1. Users can filter offers by category/seller 2. Users can sort offers by time remaining on offer 3. Users can search offers by category/partner	
5		Smart Offers Management	Admin	populate system with offers from partners	I can populate Smart Offers section in the app	1. Admin interface can be used to configure offers from Tourism & Travel Hub partners (similar to offer configuration on Delhi Mall)	
5	Improvements based on feedback	Delhi Mall	User	see offers available on store at a glance	I can have seamless shopping experience	1. Users can see an offers icon above shopping web view which contains coupons they could apply on the store	
5		Route Planning	User	see multiple cab/public transit options	I can plan my journey better	1. Journey plan redesign on user flows, Uber integration and show multiple train options	1. Need API document (APIs to show nearest cabs, API keys for accessing APIs) by Wednesday 24 November to be included in Sprint 5
5	Customer Support Enablement	Contact Centre	Support Rep.	view tickets raised by customers	I can respond to them and act towards resolving user issues	1. Support representatives can view active tickets raised by customers 2. Support representatives can reply on active tickets or change their status (open/closed)	
5		Customer Support	Registered User	be able to contact support team	I can raise queries, complaints and provide feedback	1. Signed-in Users can create tickets for issues/complaints 2. Signed-in Users will get a confirmation over sms/email when their ticket is submitted 3. Signed-in Users will be notified upon changes to status on their tickets (replies, status changes, etc.)	1. Emails and ticketing system for pilot 2. Users can log a ticket via a simple form
5	Station info	Crowdsourcing data points (Design)	User	know the current status of crowd congestion on my station as reported by other commuters	I can plan my journey better	1. Given that user is within 20-50m of station location when their device location access is allowed, then they could input station crowd status when they open the app 2. Given that user is near location of station gate when their device location access is allowed, then they could input platform crowd status or confirm other user's input when they open the app 3. Station status display to also show when it was last reported (High crowd reported 10 minutes ago, etc.)	

Figure 53 – Spring backlog

7.2 Partner company value proposition

As part of the Virtual Delhi Mall, Tourism Hub and Smart Offers use cases, the team reached out to multiple partners to explore possibility of working together for the pilot phase, and ease of integration. Collaboration with partner companies is one of the typical characteristics of business development using digital technology. Because it is possible to realize the collaboration in a virtual space without having to construct a physical supply chain or make equipment investments, it lowers the hurdle for the collaboration on both sides.

Based on initial feedback from the partners and DMRC team, and the fact that the MVP phase would be limited to a set of 100 users, and hence limiting the commercial interests of any party, it was decided to go ahead with the MVP build without any commercial transactions. In addition, based on the feedback from the DMRC team, it was decided that in the pilot, aggregators will also be invited, who can manage

partnerships for the DMRC team, and hence ensuring agility in getting offers along with minimal spend by DMRC in setting up a partnership's division.

The team reached out to 60+ partners. Each partner was sent a detailed deck, describing the MVP launch, and what was expected from the partner and the benefits that they can get, followed by multiple partnership calls and tech calls for integrations. The below few figures are excerpts from the partner deck. Figure 54 describes DMRC's aspirations of the digital platform with nine key digital offerings. Figure 55 illustrates user journey across the use case of Virtual Delhi Mall across the digital platform and partner website. Finally, Figure 56 highlights the key benefits of the digital platform across customer acquisition, targeted access, business intelligence and promotions.

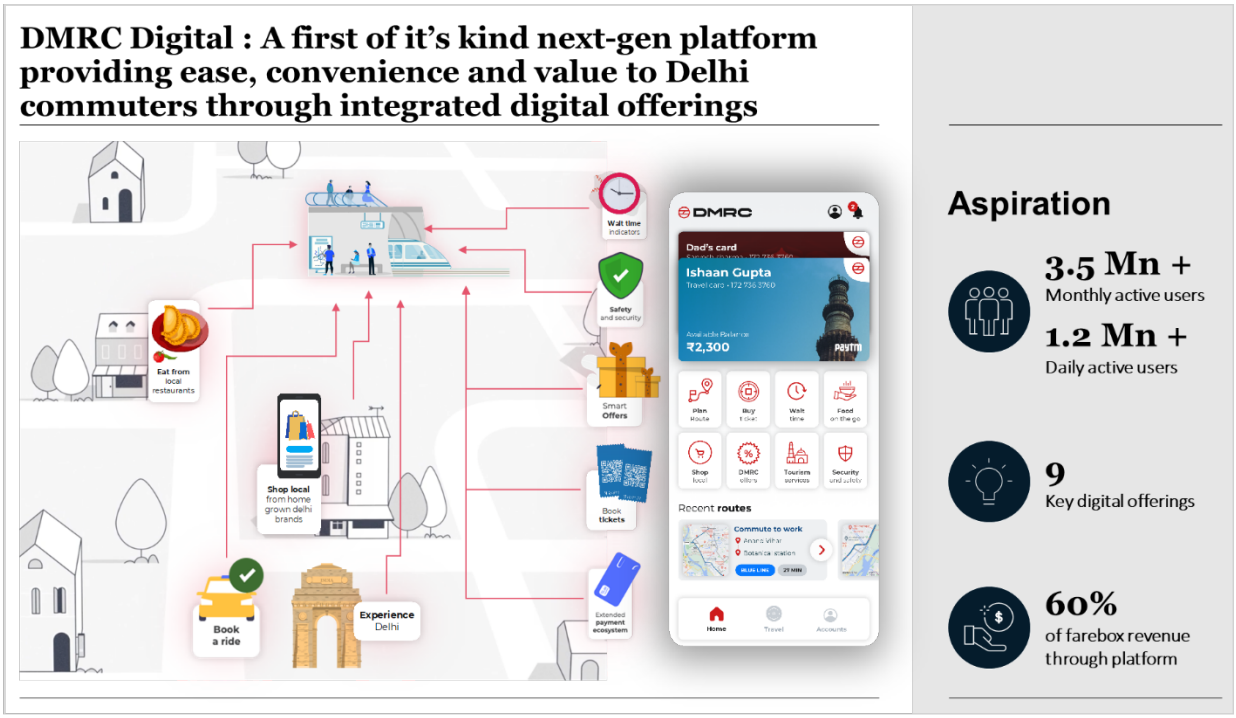


Figure 54 – Materials describing DMRC's aspiration to potential partners

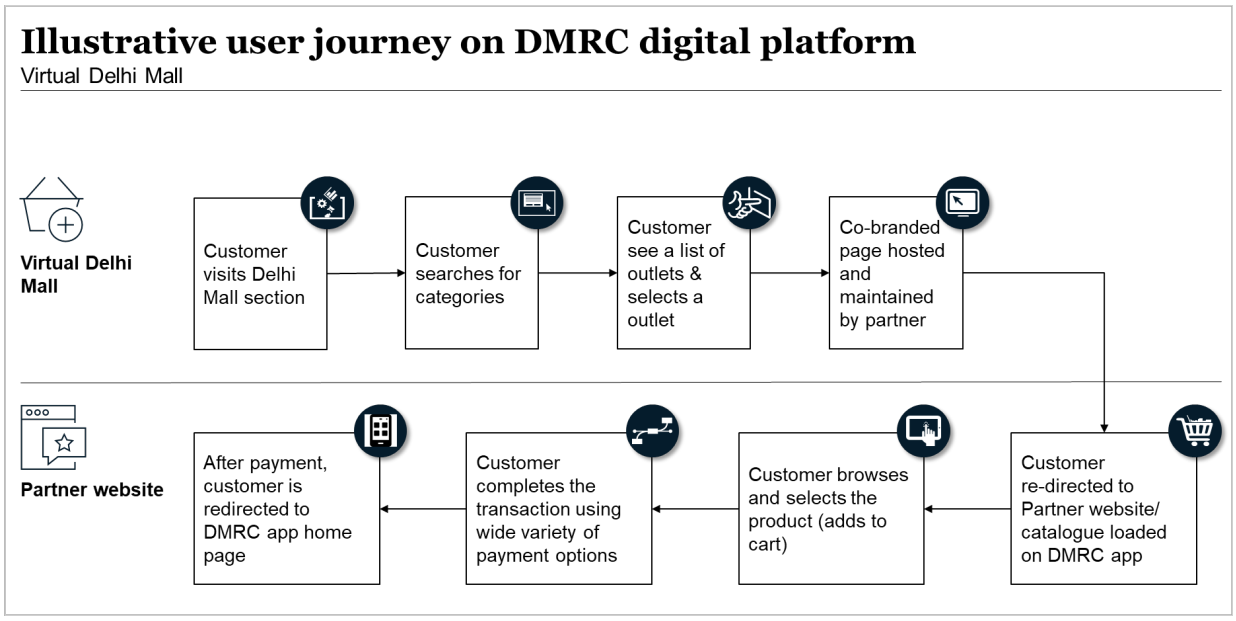


Figure 55 – User journey on DMRC digital platform

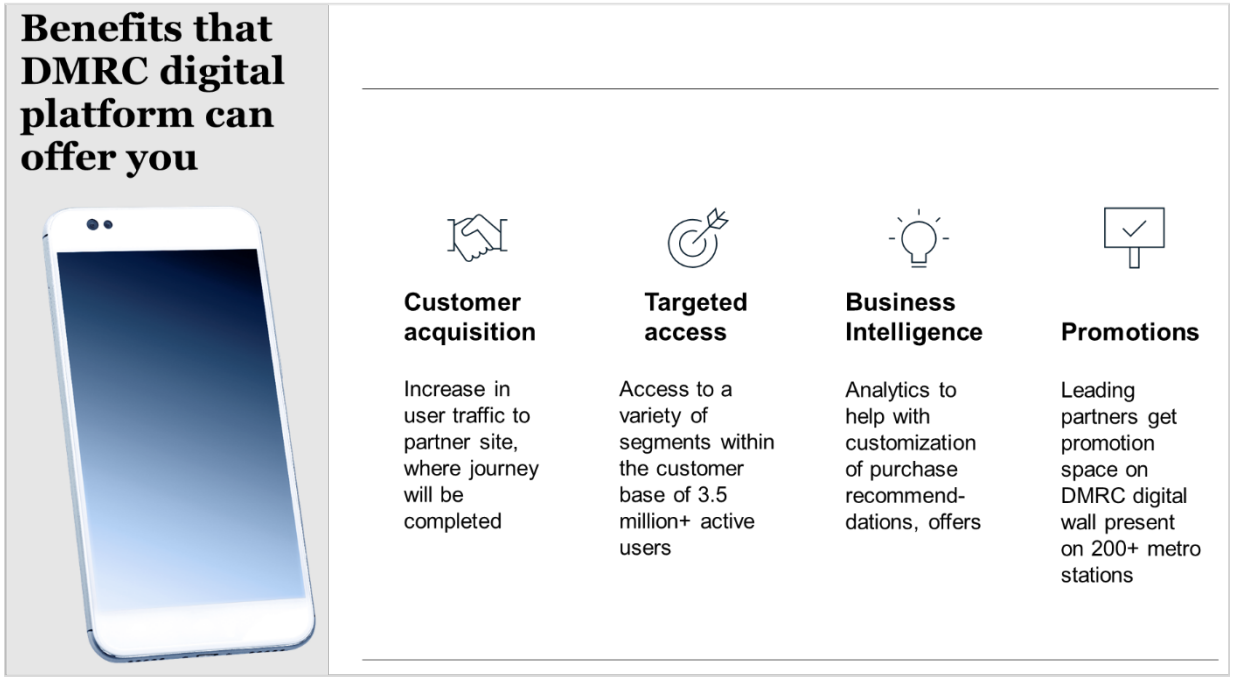


Figure 56 – Benefits of the digital platform

The detailed list of all partners, along with summary of interaction with them is mentioned in appendix 1. We finalized 26 partners, both through individual reach outs and through the aggregator, whose services were fully integrated on the app, which are listed below in Table 6:

Table 6 – Integrated individual partners

Partner Brands	Category	Discount/Rewards
Janpath Online	Handmade jeweler	20%
Sarojini Market Online	E-Commerce	10%
Bombay Shaving Company – Men	Men's grooming	20%

Partner Brands	Category	Discount/Rewards
Bombay Shaving Company – Women	Women's grooming	INR 250
India City Walks	Heritage Walks	Special DMRC walks
Book My Show	Live events	None
Sadar24	E-Commerce	10%
Amazon	E-Commerce	None
Portronics	Electronics	Multiple offers
Ola	Integrated mobility	None
Uber	Integrated mobility	None
Nextgen Technologies (mobiles)	Electronics	None
Prabhat Prakashan	Books	None

The partners which were sourced through the aggregator are also mentioned below in Table 7:

Table 7 – Partners sourced through aggregators

Partner Brands	Category	Discount/Rewards
Oyo Rooms	Hotels and Rooms	25.00%
Sony Liv	Entertainment	18.00%
Dineout Passport (Delhi-NCR-12 Months)	F&B	15.00%
MyGlamm	Online Beauty Shopping	14.00%
Jockey	Apparel	10.00%
Cult Fit/Cult Pass BLACK	Health & Fitness	10.00%
Pantaloons	Multi Brand Apparel	10.00%
Apollo Pharmacy (E-Gift Card)	Pharmacy	10.00%
O2 Spa	Wellness and Spa	10.00%
Crossword	Books and stationary	9.00%
Gaana (12 months)	Music	9.00%
Puma	Accessories	8.00%
Urban Ladder	Furniture	8.00%
Prestige Smart Kitchen	Home appliance	8.00%
Fastrack	Watches	7.00%
bOAt	Electronics/Accessory	6.00%
Myntra	Online shopping Portal	6.00%
Thrillophilia	Experience	4.00%

These partners and aggregator were onboarded through submission of EOIs. DMRC floated two EOIs – for partners and aggregators requesting interested parties to respond. During drafting of the Expression of Interest, DMRC team had made an effort to ensure onboarding of partners with minimal paperwork. Every partner had to submit the filled EoI, along with a draft sample partnership agreement (attached with the EoI). The partners could choose to draft a fresh agreement, which would have been vetted by the DMRC legal team before go ahead. In addition to these 2 documents above, the partners needed to submit their

certificate of registration as a corporate entity (Company, start-up etc) and provide a single page of information about their website, product portfolio and discounts. The partners had to mail this copy of EoI to the concerned person, JGM, Property Business, who will take an approval of the submitted EOIs with the MD, and issue Letter of Intent to these partners. From the partner's end, there was minimalistic paperwork. The response to EOIs were sent to Jt. General Manager/Property Business by the partners and aggregators after which they were finalized in consultation with competent authorities and MD at DMRC.

Given the fact that the MVP phase was just limited to 100 users, and the partners did not have a working product to assess the full functionality of the DMRC app, the team feels that the onboarding of 26 partners shows that DMRC can be successful in forging multiple partnerships during the full scale up phase. With multiple partners, the discussions were still ongoing at the time of launch of the MVP, and it is quite possible that they are integrated during the MVP duration, based on results of the MVP itself. This indicates that DMRC platform can act as an end-to-end mobility platform for all Delhi commuters, not just the ones using metro.

Feedback we received from participating partner companies through MVP was the following:

- Partners with better offers had more transactions. Few partners who had limited traction, were willing to provide new additional offers to attract the users and increase the traction.
- Some partners suggested that the offers and products should be updated periodically in order to provide better options to the users.
- Partners were eager to have more interactions with DMRC to understand the status on the MVP in a better way and were wishing for a periodic update / communication from DMRC
- There was a mention regarding streamlining the process for partner onboarding and issuance of Letter of Intent
- Partners were eager to understand the way forward for the digital platform after the MVP phase
- There was keenness to understand the commercial arrangements going ahead for the full scale up phase
- Partners wanted to understand what will be the liability sharing arrangement and dispute resolution mechanism for the full scale up phase

7.3 Verifying User interface

We designed the digital product UX/UI based on the user story in each sprint. We flexibly coped with changes to business requirements and development speed.

We used a design thinking approach where ideas were created by starting with customer needs and then fleshed out the customer journey, and this made it possible to quickly design an end-to-end customer experience, allowing us to complete the process from designing the UX/UI to designing the basic MVP in around 3 months.

As for the app, we emphasized usability while also using an innovative design that made it easy for customers to discover differentiating features and start to use them. Figure 57 shows the screenshots of the

DMRC app, such as Home-page, route planning page and Virtual Delhi Mall page. Specifically, these included providing station and platform congestion information that made use of UGC (user-generated content), route searches based on this information (see 1-a and 1-b) and purchasing products from partner companies using discounts only provided to DMRC app users (see 2-a).

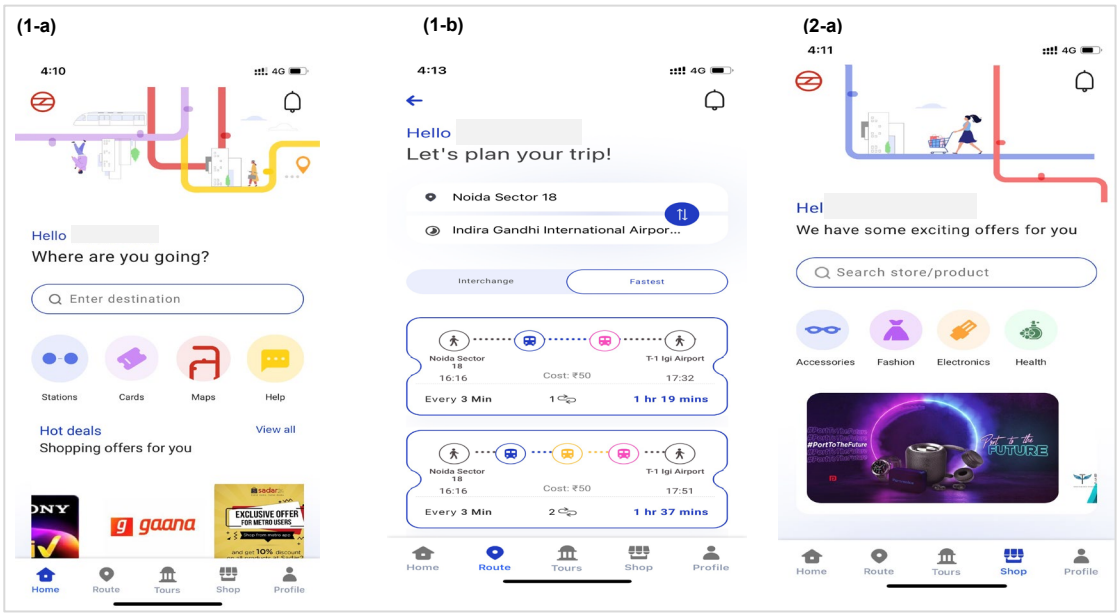


Figure 57 – Screen shots of the DMRC app

Similarly, a refreshed design was created for the tourism hub, offering users a choice for multiple partners in the tourism/events categories as well (3a, Figure 58):

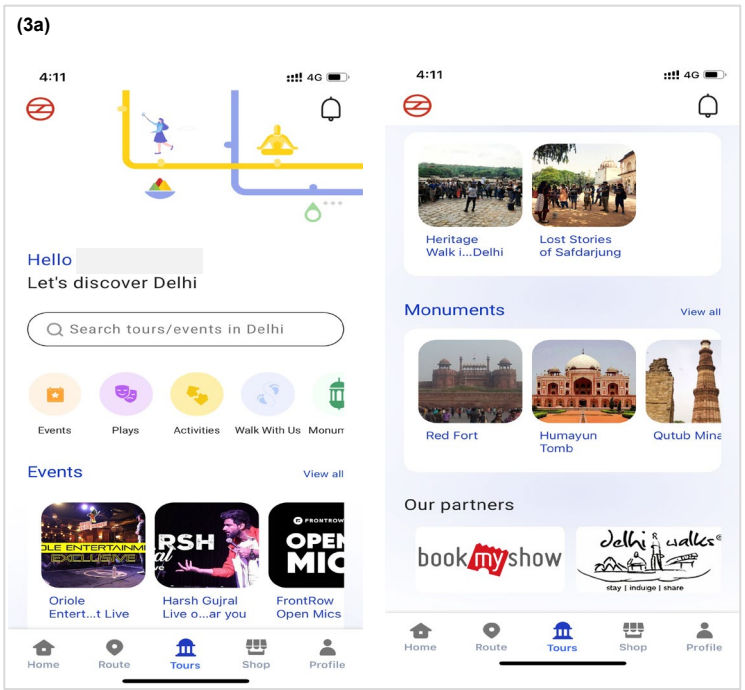


Figure 58 – Tourism use case

During development, the tools Miro and Sketch were used for service design, and Figma was used for UX/UI design. Members with design experience on the McKinsey side defined the MVP and conducted user surveys, and also performed coordination and process management with the vendor team that was performing product design.

Towards the end of the development, detailed usability testing was conducted, based on 3-hour one-on-one interviews with multiple users to understand issues with design of the product. The overall score for the product was 3.5 out of 5, and 21 changes were identified for pre-MVP launch, along with 6 changes to be made during the full scale up. An example of recommendations during product search is given below in Figure 59. The product discovery page of the new DMRC app enables the users to search for products on the app across Virtual Delhi Mall and Smart Offers section.

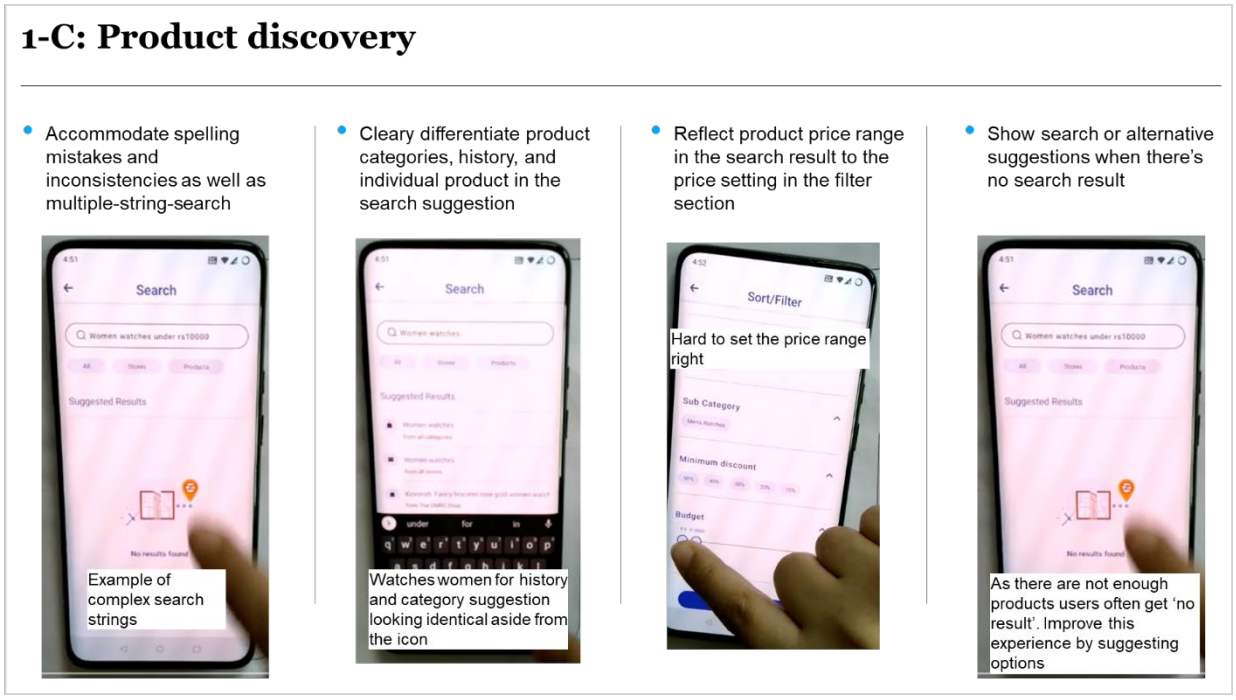


Figure 59 – Product discovery

Key learnings during the pilot build stage include the following:

- **Importance of a cross functional team:** A cross functional team from DMRC is needed to expedite the implementation – global experience working on multiple product builds shows that timely implementation is possible only by a structured implementation approach, comprising of a cross functional working team, along with regular reviews by a joint leadership team.
- **Buffer for conversations with DMRC partners**: Sufficient time had to be built in for conversation with multiple vendors of DMRC, given that was a point of significant delay in the implementation of multiple payments related use cases such as smart card balance check and smart card recharge
- **Dedicated partnership's team:** In order to build confidence of the partners, there has to be significant time investment from DMRC team, along with an effort to ease the onboarding for the partners. Given the fast scale up of multiple other digital platforms and an effort from them to onboard multiple partners as well, partners have abundant choices in terms of platform partnerships. The strong brand image of

DMRC in Delhi, along with the no commercial set up of the MVP, and minimal tech integration from partner's end due to a tech team building the app were the key reasons for onboarding multiple partners. Multiple partners also demanded greater DMRC visibility in the onboarding process, a roadmap for full scale up along with faster formal arrangement for onboarding through Expression of Interests (EOI). We saw multiple partners drop off, or delay interaction due to low visibility of the DMRC team, along with delay in getting approval for the EOI. Details of such partners is also mentioned in the exhaustive partnership summary in appendix 1. In addition, multiple partners were interested in getting onboarded only if there was a long-term commitment to the app build, and an incentive for them to get onboarded in the MVP phase, because of which they might get a preference during the full scale up.

- **Potential of the platform:** Based on the feedback from multiple partners, and through the DMRC team and vendors, it is a great opportunity for DMRC, given the captive user base using metro daily, as well as the strong brand image. This platform has a potential to become an all-encompassing travel related platform for commuters in Delhi, especially with addition of last mile connectivity, and a larger portfolio of partners for shopping and food.

7.4 CUG testing results: MVP Feedback

Once the MVP was developed, we have conducted a two-phased user testing. First, we carried out a user testing with 10 users between 13th December 2021 and 15th December 2021, where we asked 10 potential users identified through research agency to use the app and provide feedback. After incorporating their feedback, we launched the MVP app as a beta version on 17th January to an additional 100 friendly users identified through research agency and conducted a closed user testing as well as a quantitative survey and qualitative feedback interviews.

Below, we describe the details of the user feedback.

7.4.1 Interim user testing

First, usability testing was carried out on the digital platform build which was initially tested with 10 users before the MVP launch and the feedback was collected from these test users. The testing consisted of:

(1) Understanding participants

(2) 6 UX testing tasks with prototype + observation

(3) 1 potential feature test through open-ended questions

10 users for interim user testing were identified by research agency based on the following criteria:

- Mix of gender (50:50)
- Age between 21 ~ 44
- Resident of New Delhi
- Customer of Delhi Metro

- Engage with online shopping services twice per week

Interim user testing was carried out prior to the MVP app launch where we set tasks for 10 users to complete through the app and observed them closely to identify improvements. User response was positive with an overall rating of 3.5 for the app.

With the initial 10 users, we received the feedback about the app features that the users liked or disliked as reflected in Figure 60. Smart card balance check, one-stop go to app, information on entry gates, etc. were the most liked features while improvements were suggested on 'search option'. Based on the feedback, we implemented 14 UI/UX changes across various parts of user journey based on our learnings, as shown in Figure 61.

Figure 60 – Key quotes captured during user feedback

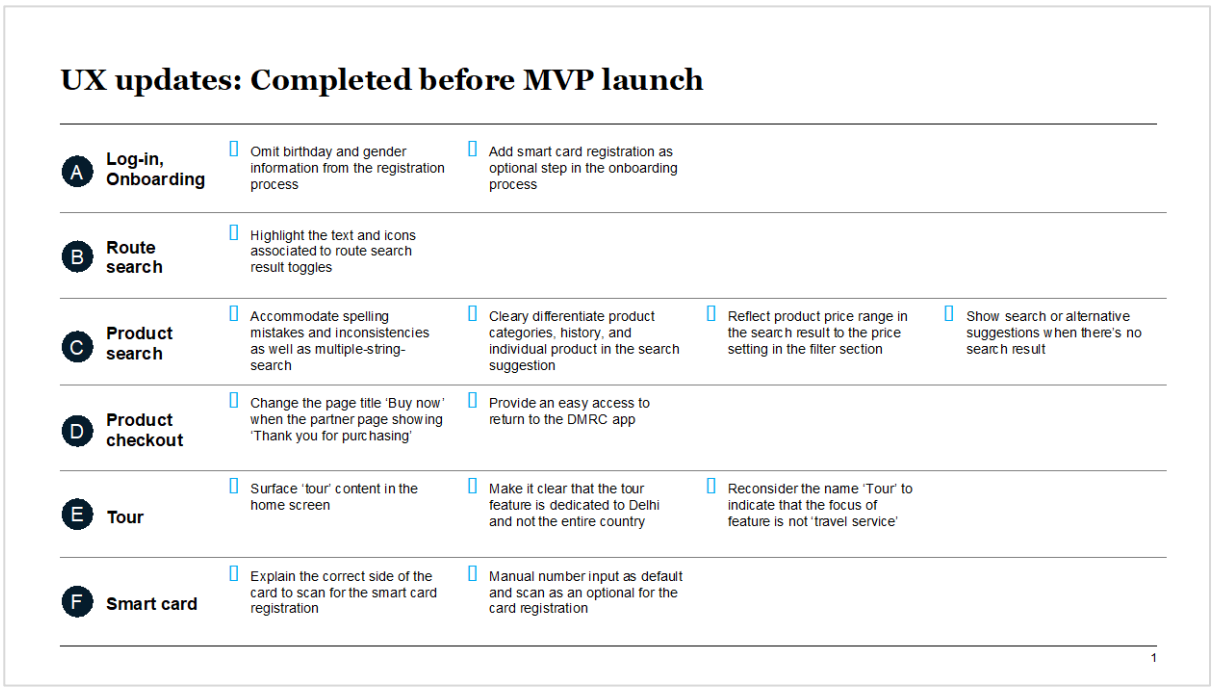


Figure 61 – UX updates: Completed before MVP launch

The feedback from the 10 test users helped in measuring implementation success KPIs like Customer Satisfaction Rating which was rated 3.5/5. Another KPI of closing partnerships with six or more external partners for operating four cases has also been achieved before the MVP launch of the platform. Several design changes to the platform were undertaken and post launch recommendations were noted based on the user feedback received while testing. The key findings from the testing are as follows:

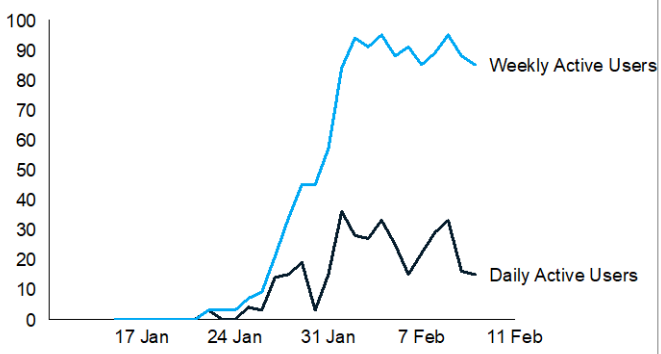
- Despite no major wows as an MVP build, testing participants reacted positively to the app
- There is potential for this app to become a super app, an end-to-end mobility platform
- Scale up recommended with careful inclusion of content centered around DMRC user with relevant services
- Search experience identified as an area of improvement, to enable fuzzy search for spelling mistakes or similar products being available on the platform with different name. These changes have been made on the platform before the MVP
- Very positive sentiment towards smart card balance check and travel history features, could be further enriched through in-app recharge

7.4.2 Formal launch of MVP to 100 users

After the MVP app launch, we were monitoring usage closely. We initiated the feedback collection process once users had been exposed to the app for 2-3 weeks and were familiar with the application. As seen in Figure 62, the app has seen high user engagement with ~90 weekly active users averaging 16 mins per session. The virtual mall and the tourism hub pages accumulated ~3,400 page vies, while Portronics and Sarojini Market Online had maximum unique user visits on the app.

We have seen high user engagement for the app

Sustained user engagement for the MVP



Key Metrics	MVP result
Weekly active users	~90
Average time per session	16 mins
Average sessions per day per user	1.25
Smart card page views	86
Smart card balance check page view	546
Route planning page viewed	~1000
Virtual mall/tourism hub page view	~3400

Virtual Mall unique user visits

Partner	Unique user visits
Bombay Shaving Company Women	15
Sarojini Market Online	33
Portronics	39
Janpath Online	27
Bombay Shaving Company	21

Figure 62 – User engagement for the MVP

7.4.3 Overall Feedback

The focus of quantitative survey was to broadly understand user sentiment while the qualitative interview's focus was on drilling down to understand user behavior better and draw recommendations for the future from them. The fact that more than 79 percent of survey respondents were eager to share their detailed feedback on the app shows that DMRC is a brand that carries high amount of trust and credibility. Given our results from last round of interim user testing and experience launching similar pilot programs in the past, we expected a rating around 3.5 out of 5 in the quantitative survey.

However, as reflected in Figure 63, we recorded an average satisfaction rating of 4.54 out of 5 from a sample of 77 users which far exceeded our expectations.

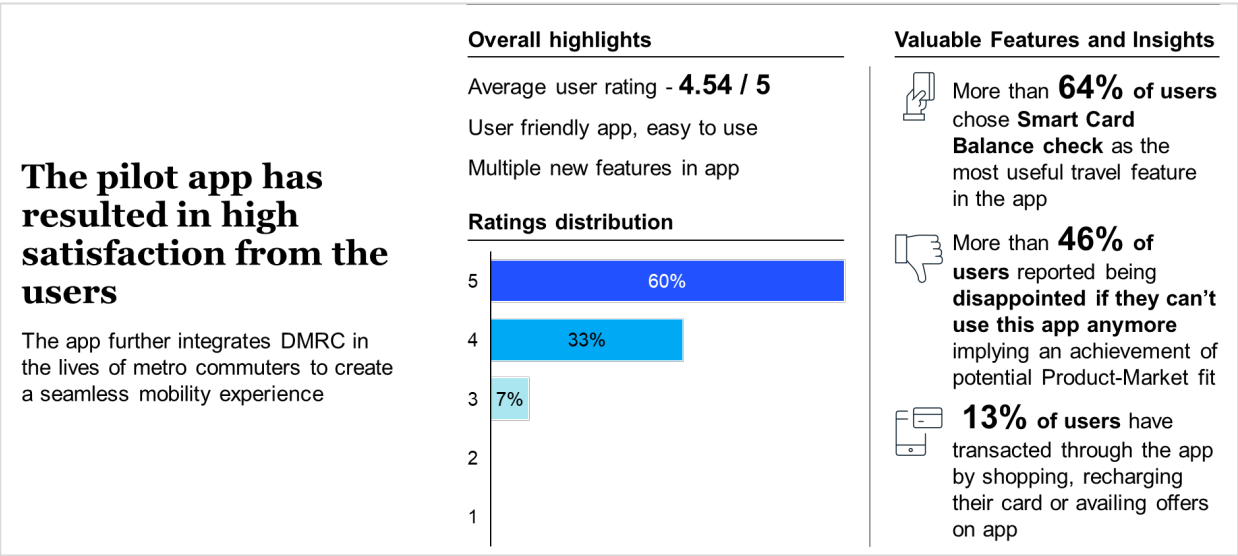


Figure 63 – Rating distribution

Users were highly satisfied with the app's easy to use and clear user interface as well as the breadth of use cases supported. Reinforcing our finding during usability testing, users also see a potential for this app to eventually become a super app with multiple services tied together into one app. This validates our broader vision for the app and is in line with our ambitions for the eventual scale up.

7.4.4 Valuable features and insights

Main themes that will be detailed further in this section are:

- **Travel features:** More than **49% of users** chose **Smart Card Balance check** as the most useful travel feature in the app
- **Product-Market fit:** More than **45% of users** reported being **disappointed if they can't use this app anymore** implying an achievement of potential Product-Market fit

- **GMV Potential of platform: 13% of users** have transacted through the app by shopping, recharging their card or availing offers on app

(1) Travel features

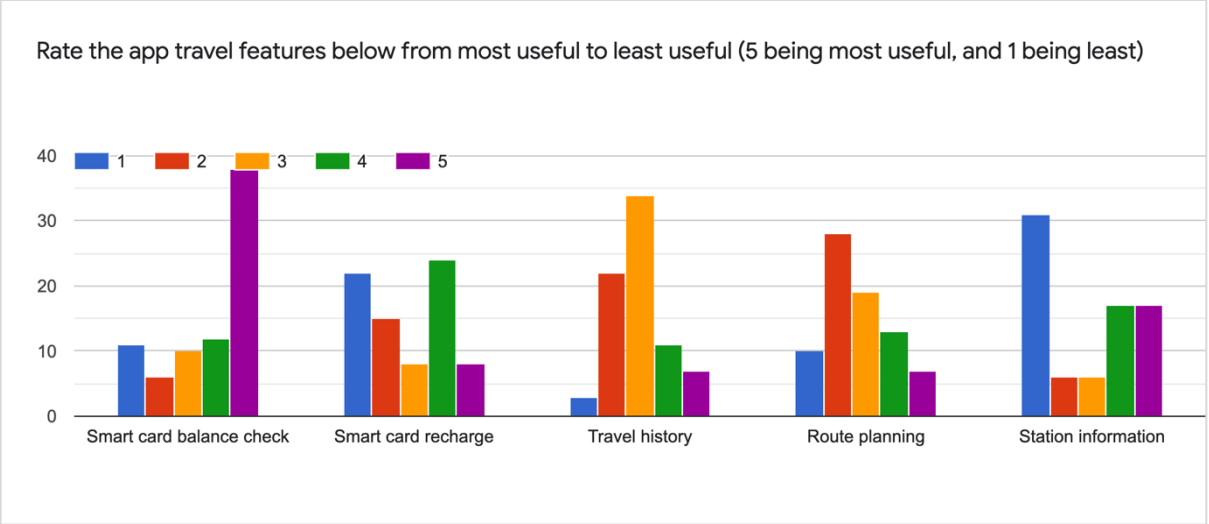


Figure 64 – Travel features ratings

Figure 64 shows that the users found great value in being able to see smart card related information on the app with more than 45% users rating it a 5/5. There was also steady usage observed across other transit related features like station information, route planning with integrated mobility, smart card recharge and travel history.

Users were excited to do all of these through one app since they currently rely on multiple apps or mix of apps and offline methods for the same.

(2) Product-Market fit

In product terminology, Product-Market fit refers to how well a product satisfies market demand and is known as the first step to building a successful venture business. To test this, we employ Sean Nellis test where users are polled on how they would feel if they could no longer use the product. If 40 percent or more users claim to be disappointed, then the product has achieved Product-Market fit. In the case of our app around 45% of users claimed to be either disappointed or somewhat disappointed if they can’t use this product anymore.

This is a great sign for a Pilot product since onboarding new partners and expanding use cases would increase the value to customer. Network effects due to a captive commuter base would give partners a huge incentive to be on this platform.

(3) GMV potential of platform

Within 2 weeks of launch of the MVP we had tracked about 13 percent of the 100 users had transacted worth ~ 5000 INR through the app at least once to either buy products through Delhi Mall, avail smart offers or recharge their smart card through the app. These numbers are expected to go up as the MVP progresses given increasing user familiarity with the app.

Delhi Mall's usage was moderate with 33 percent users reporting that they hadn't shopped through the app. As seen in Figure 65, user feedback suggests bringing in better offers and bigger brands to increase uptake and to include bigger brands on the app. During the scale up we should focus on these points and incorporate relevant nudges from Delhi Mall as in-app notifications to improve usage while being unintrusive.

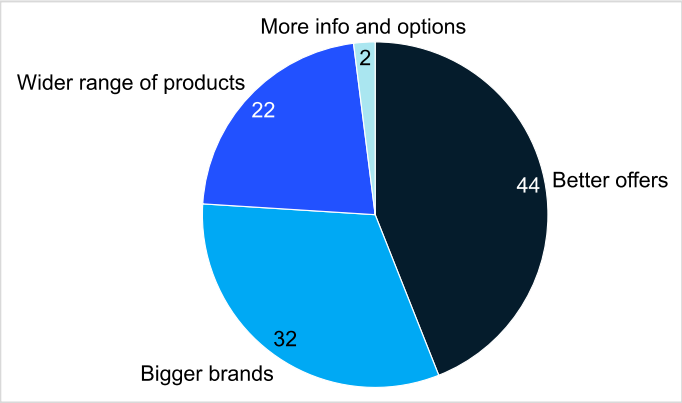


Figure 65 – User feedback on Delhi mall

7.4.5 Snapshot of one-on-one user feedback interviews and quantitative survey results

Representative comments are shown below, as detailed transcript of each interview is given in Appendix 7: Transcripts of user feedback interviews.

- "We get everything in one app - online bookings for monuments, smart card balance check, shopping"
- "I input my smart card number and it returned my balance right away in 1 click"
- "I am waiting for the full launch so I can share and advocate its usage with my friends and family"
- "Smart card balance check saves a lot of time and effort"
- "This app is very useful; I don't see how I could delete this"

The quantitative survey results depicting the most liked aspects of the app and the aspects that need improvement are shown in Figure 66 below. Users found the app easy to use and responsive, smart card balance check and virtual shopping were also found useful by the users. Recommendations were made on providing more shopping options and improving the payment mechanism.

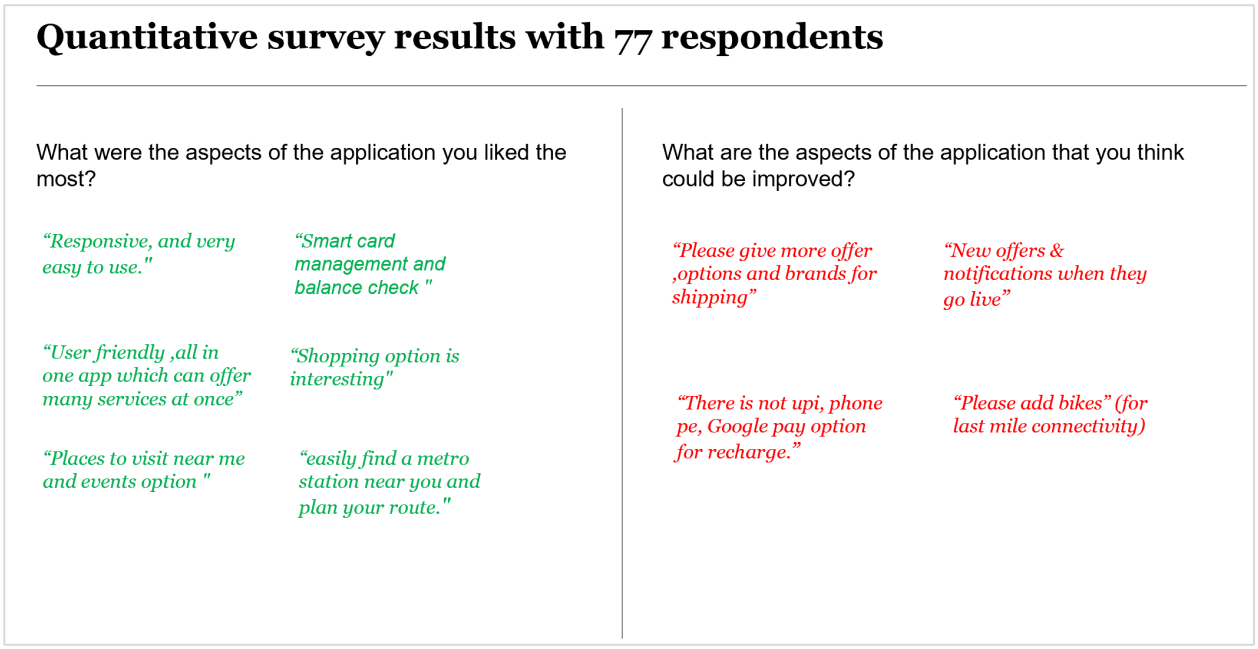


Figure 66 – Quantitative survey results

7.4.6 Recommendations

Based on user inputs and feedback we suggest the following for the roadmap ahead:

- Onboard more payment partners for convenient in-app recharge to enable seamless recharge for smart cards
- Include information on food stalls and businesses within or near metro stations for user's convenience
- Build notification engine with smart nudges to sustain high app usage to serve context sensitive notifications on
    - New incoming offers from partners and aggregators
    - Potential metro service disruptions along user's frequent routes
    - Reminder to recharge smart card balance by certain date based on usage history
- Integration with more last mile transport players for integrated mobility such as Bus, Bikes, or other low-cost means
- Adding more features to support users' lives with holistic way - users are unconsciously looking for a super app that allows user to search less and think less
    - Ability to pay utilities bills and buy essential products/services
    - More Delhi specific features such as increased coverage of ticket booking for monuments and local attractions
- Partnerships with deeper integrations to enable automated lead tracking and establishing criteria for partners to enable smooth user experience on platform.

Figure 67 depicts the key recommendations across the use cases. Adding more partners and better offers was one of the key recommendations along with increased products and services across shopping, travel and integrated mobility. There were also recommendations on adding bill payments and smart card recharges while also making the recharge and balance check real-time.

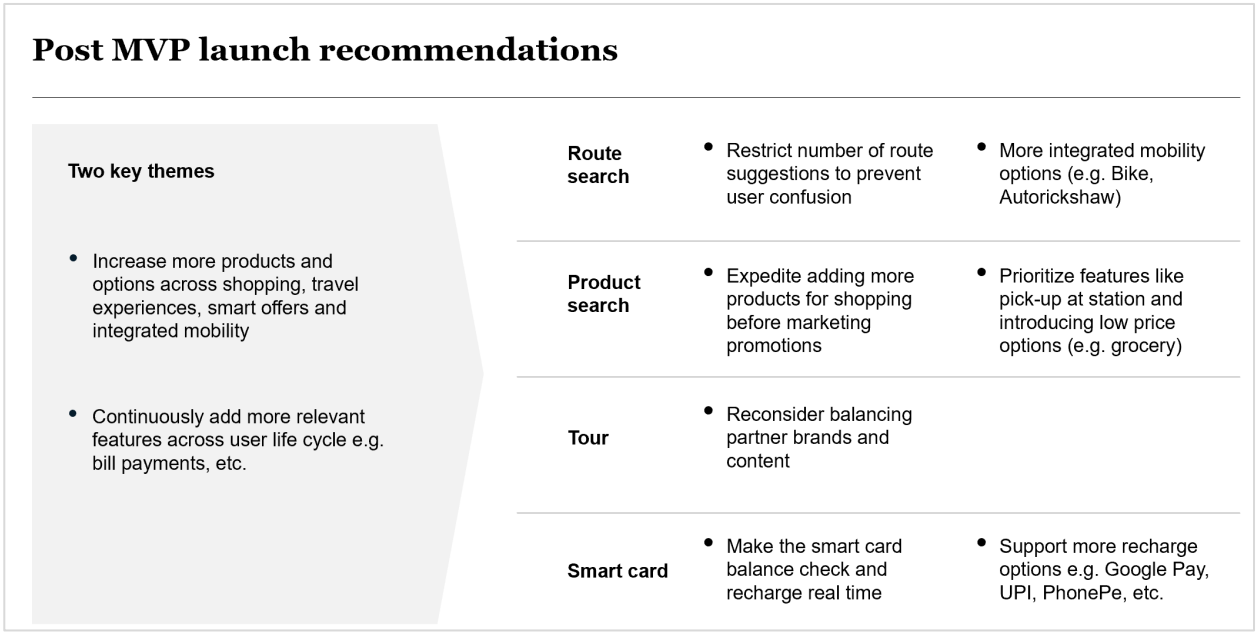


Figure 67 – Post MVP launch recommendations

Chapter 8 Full scale-up of the digital platform

Post the MVP phase in this study, the DMRC team needs to scale up the product to realize the potential from building the digital business. The overall implementation roadmap for DMRC digital platform is given below in Figure 68, which captures the implementation roadmap across the MVP stage, platform launch and ramp-up and rapid scale up of the digital platform. It highlights the various milestones, enablers and timelines for achieving the milestones. By 2026, the app is expected to host ~3.6 Mn active users and achieve GMV of ~ $500 Mn

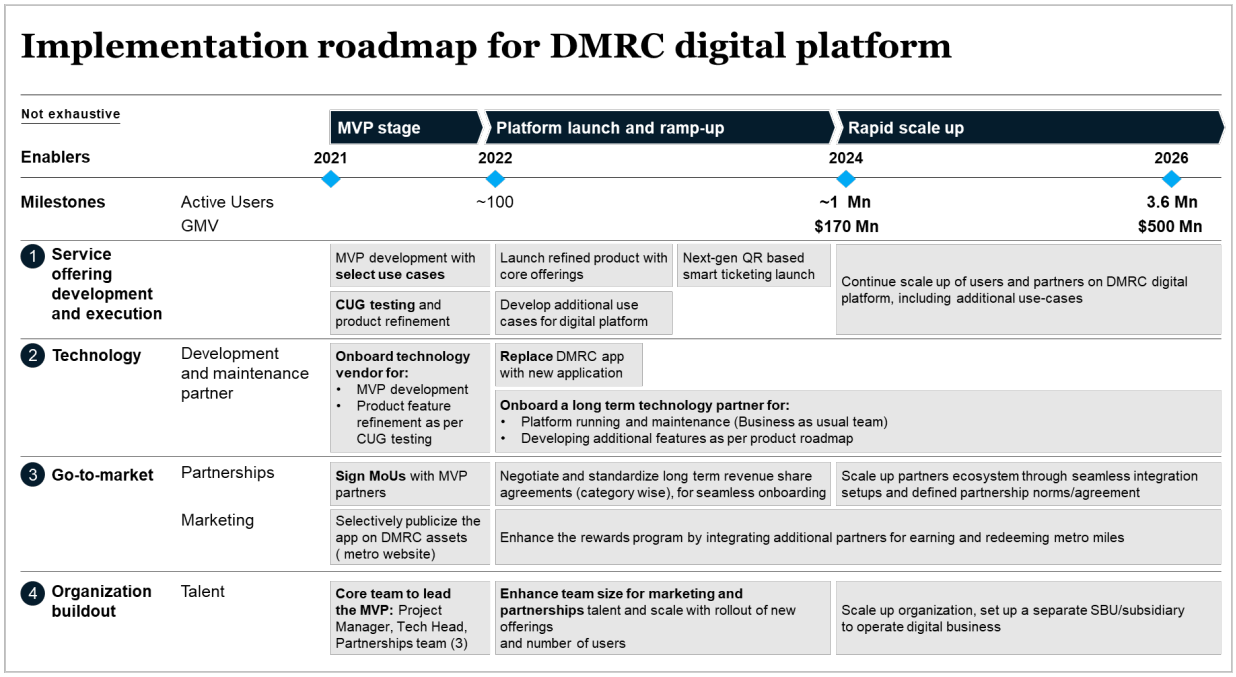


Figure 68 – Implementation roadmap

8.1 Key enablers for business building

For a seamless transition from MVP build to the full scale up of the digital platform, DMRC needs to consider the following factors of business build: Organization, budget, and infrastructure upgrade.

8.1.1 Organization structure

A dedicated team comprising of multiple roles and responsibilities needs to be set up to take ownership of the digital platform as well as MVP role out. The team needs to be formed immediately to take ownership of the MVP and ensure there is sufficient handover from the DMRC team from the team building the MVP. Figure 69 shows an organogram highlighting the roles and source of deployment of the team members.

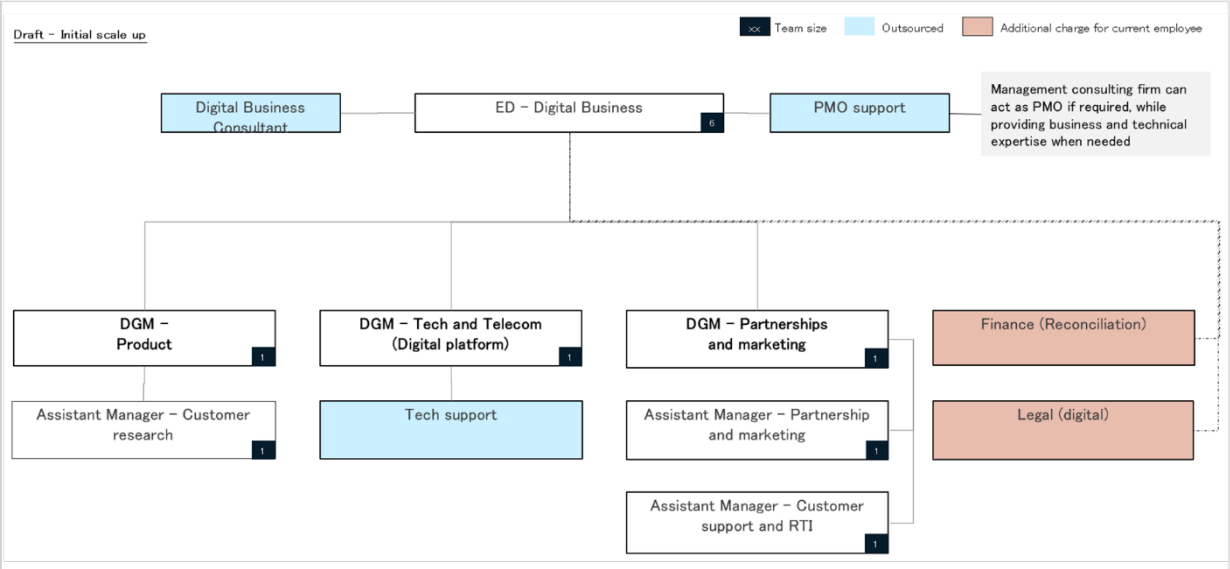


Figure 69 – Organization structure required for scale up

The responsibilities of all the roles needed in this crack team are also substantiated below (Figure 70):

Roles and responsibilites

	Role	Key Responsibilities
1	ED – Digital Business	CEO and owner of the P&L of the digital platform. Responsible for the scale up and functioning of the digital business
2	DGM – Product	Owner of the product – initially will plan improvements in the current build, along with planning how future use cases will be placed on the app
3	DGM – Tech and Telecom (Digital platform)	Owner of the tech stack – initial responsibilities include onboarding a long-term tech partner for scale up and maintenance of the current app
4	DGM – Partnerships and marketing	Owner of all non farebox use cases involving partnerships with third party vendors; looks at end to end relationship management with third party vendors for the app
5	AM – Partnership and marketing	Reach out to partners to pitch the DMRC app; Preparing tender documents for onboarding/negotiating offers
6	AM – Customer research	Analyse the customer data being generated from the MVP build of the app, while working on understanding user feedback to plan new features
7	AM – Customer support and RTI	Managing all customer complaints related to the digital platform, and answering RTI queries related to the platform

Figure 70 – Roles and responsibiloties of key team members

The team comprising of above mentioned seven roles would be required immediately to take ownership of the MVP build phase of the digital platform and also take charge of the next phase of the build.

For the full-scale launch, DMRC would need to deploy a larger team comprising 70–80 members, with multiple functions outsourced to ensure agility. One key aspect of the new organization would be an expanded partnerships team, and a tech team managing outsourced tech vendor. A detailed organogram depicting the structure of the entire organization that may be required in the next couple of years is

illustrated below in Figure 71. This includes team members required across departments such as Product, Tech and Telecom, Partnerships and Marketing and Digital Business.

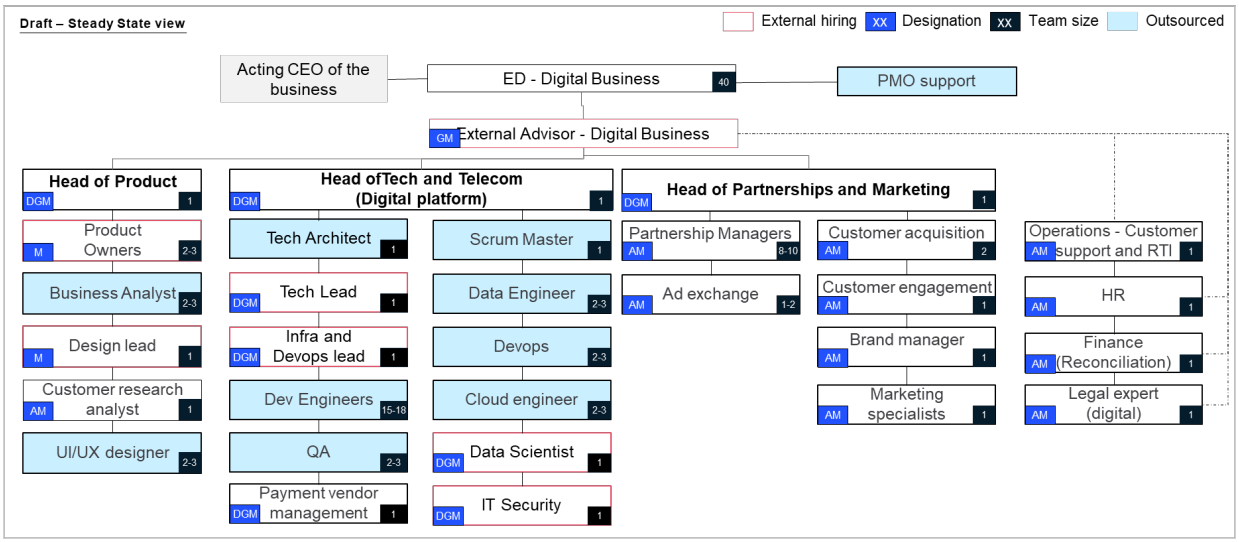


Figure 71 – Detailed organization structure for full-scale launch phase

The organogram mentions the team size, source of deployment, designations, and sub-heads under various departments. The end state DMRC digital platform organization could be a lean, agile organization with tech development being outsourced as illustrated above.

8.1.2 Budget

We have estimated the total cost of the build out by various cost line items. The following cost items have been taken for consideration, and costs calculated for three years of the build (Table 8):

Table 8 – Budget required for next three years

Cost heads	FY23	FY 24	FY 25
Tech infra cost	2	6	14
IT development & maintenance costs (outsourced)	6	11	15
Marketing costs	2	9	33
Staff costs (other than tech)	4	5	6
Other miscellaneous	1	2	3
PMO support	10	0	0
Total	**20–25**	**30–35**	**70–75**
Total (JPY)	**~ 310–380 Million**	**~ 460–540 Million**	**~ 1.1–1.15 Billion**

Mentioned costs are in INR Crore, unless stated otherwise

The details of the constituents of each cost head are defined below:

1. **Tech Infra Cost:** This includes cost of the necessary infrastructure needed to run the app. This includes the cost of cloud server, which scales up as more users are added to the platform. In

addition, it also includes the cost of **Google Maps API**, which would be incurred every time a user uses any of the map dependent features on the platform, such as route planning. In -addition, DMRC will also incur a **minimal cost for every SMS** sent out for notifications, such as a purchase made, or user log ins.

2. **IT Development and maintenance costs:** These include the cost of **maintaining an outsourced IT vendor** for development and maintenance, along with other professional services such as functional testing and IT security. As the app builds up, the tech team scales up in number of agile squads deployed based on the requirement.
3. **Marketing Costs:** The marketing costs include **cash backs** given for various farebox and non-farebox use cases. Based on various benchmarks, it is estimated at 5% of GMV spend for non-farebox use cases and 0.8% of GMV spend for farebox use cases. As the GMV scales up rapidly with customer acquisition, this cost would also scale up quickly.
4. **Staff cost (other than tech):** This is the cost of the inhouse team that DMRC would deploy for running the digital platform business. As detailed out in the organogram, this includes members of the product/tech team, the partnerships team, and the overall leadership.
5. **PMO support:** This is an **optional cost header** if the new team deployed by DMRC wants additional project management support from a management consulting entity for ease of cross functional collaboration and implementation. This has currently been factored in for the first year of the development, to ensure strict delivery timelines are adhered to, along with deep functional expertise on need basis such as on go to market strategy and product/design ideas.

8.1.3 Infrastructure upgrade

Fast-track upgradation of AFC to enable app based smart ticketing (QR and NFC) to rapidly drive digital adoption is required. The infrastructure upgrade must happen rapidly, to ensure a digital moat of exclusive access to QR based ticketing around the app as it scales up, thus increasing the adoption and usage, as well as reducing the marketing spend needed to acquire and retain customers.

DMRC is currently upgrading the AFCs in order to enable the National Common Mobility Card (NCMC) allowing NFC, QR code and other smart ticketing features regarding One Nation One Cart Initiative that the government of India is developing. Upgrading of the AFCs to accommodate NCMC will have both technical and financial implications for scale up of the digital platform the has been developed in this project as follows -

Technical implication – In the scale up of the digital platform, we will identify the means of card top-up for NCMC and implement that either through open APIs or third-party integration.

Financial implication – The revenue generation in the form of one-time fees paid to DMRC by payment gateways like Paytm will be reduced due to limited usage of the smart card recharge option. On the other hand, the commission paid from DMRC to such gateways will be reduced leading to lesser expenses. The

number of users on the digital platform may increase after integration of NCMC given the inter-operability between different means of transport.

Delay in starting the pilot was due to delay in floating of EOIs from DMRC. Without any official arrangement, the pilot could not be launched as many partners were apprehensive regarding on-boarding and integration without any official documentation by DMRC.

In future, the delay can be avoided by better coordination between the team at DMRC and dedicated efforts focusing on releasing of such official documentation.

8.2 JICA's and DMRC's roles in the scale up of the digital platform

The budget is estimated as INR 20–25 crore (310–380 Million JPY) for the first year of development, along with INR 100–110 crore (Approximately 1.5–1.7 Billion JPY) needed in the subsequent 2 years. Initial estimates of the EBITDA projections indicate that the platform will only be able to acquire sufficient scale in FY25 to be able to turn to EBITDA profitability. Hence, it is an important issue to secure a development budget for initial three years until business profitability can be secured.

As for the financial needs, JICA can consider supports through JPY loan project JICA will execute or plan hereafter for DMRC, and technical assistance. Namely, JICA can consider the DMRC digital platform budget of INR 20–25 crore (Approximately 307–384 Million JPY) for the first year plus a new ODA loan for the budget from FY 23 and FY 24 (1.5–1.6 Billion JPY) as a loan target of the ongoing JPY loan project for DMRC.

DMRC would need to monitor the entire scale up of the platform business with the help of a dedicated team and ensure the platform users reaches its estimated scale up over the next 2–3 years.

Additionally, JICA can consider following actions for effective program management –

- Set up a cross functional team between JICA, DRMC and PMO
- Follow structured implementation cadence

Weekly meetings between JICA and DMRC to ensure smooth and timely implementation of the planned activities. Additionally, DMRC would need to completely and strongly own the digital platform and ensure smooth functioning. A dedicated team needs to be formed which will look after the platform and plan for the scaleup phase. The team would have to plan for scaleup, partnerships and look after operations and maintenance of the app. Strong ownership by the DMRC is required as well.

8.3 Value generation after platform scaleup

While we focused our efforts in this survey to build the new digital business platform, impact of this initiative goes beyond immediate revenues and profits DMRC can generate. As seen in Figure 72, there are four levels of impact, and we believe impact creation in these four different levels can create additional potential for DMRC to take advantage of this digital platform as a way to leverage further economic and

social impact. It should also be noted that the effort for digital platform building in this study is focused on level 2.

- Level 1: The digital platform building centered by the mobile app could lead to increased engagement and touch points with 1.5 million Delhi Metro passengers, who uses the app on average 1-1.5 hours / day on the train or in other places. This means not only people movement data but also could include purchase data and behavioral data to be accumulated by DMRC.
- Level 2: DMRC can enhance non-fare revenue through cooperating with partners providing goods and services on digital platform. Moreover, providing those attractive services on the platform, is expected to increase DMRC riders (i.e., fare box revenue increase).
- Level 3: DMRC can consider new businesses and measures (e.g., dynamic pricing on metro riders, personalized ads, improved marketing ROI, etc.) by applying data analytics leveraging data accumulated from levels 1 and 2 and hence further improve its revenue generation capacity.
- Level 4: DMRC can further enhance its economic impact by providing Software-as-a-Service (SaaS) and advisory support to other metro operators and generate revenue. In addition, it is also expected to serve as social impact by fostering women's empowerment, decarbonization, development along the railway lines, and regional development and so forth, through which DMRC's corporate value will be enhanced.

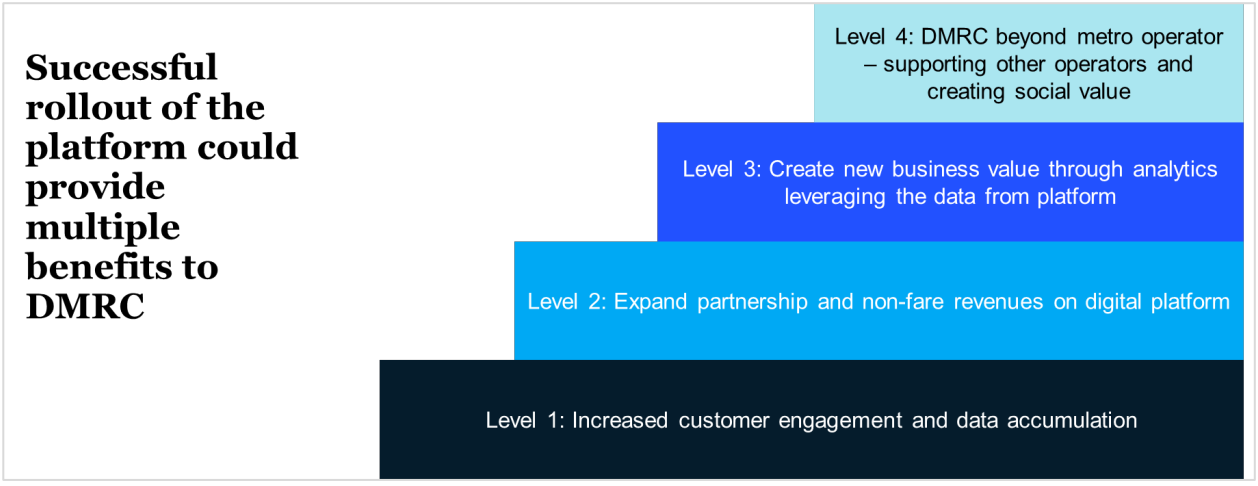


Figure 72 – Four levels of benefits to DMRC

8.3.1 GMV and revenue generation

We have also run preliminary estimate on the impact of GMV and DMRC revenue through the four levels of activities mentioned above (Figure 73). While there are many assumptions, we believe that the four levels of activities will contribute to an increase of DMRC revenue from 154 billion JPY today to 172 billion JPY in 2029, a 12% increase in the revenue which also leads to the same level of improvement on their EBITDA. The investment it takes and revenue uplift we could expect from such digital business platform is very different in nature than the large scale capex project (e.g., extension lines) – the digital business platform

could be much more nimble and limited in upfront investments required. This is the benefit of diversifying DMRC's revenue sources.

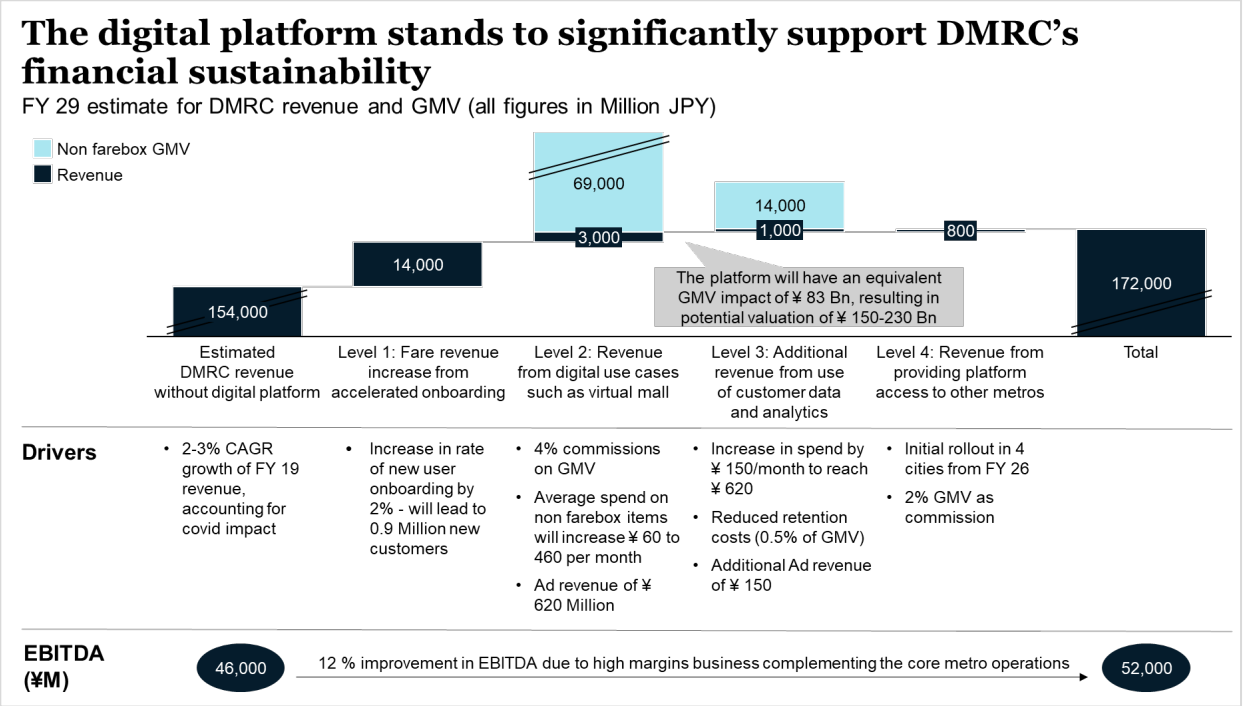


Figure 73 – Supporting DMRC's financial sustainability

The below Figure 74 depict how through different drivers the digital platform would support DMRC's financial sustainability by 2029. This shows that with the expected increase in active users, DMRC's revenues through commissions will increase dramatically from years 4 and onwards, turning the EBITDA to positive number. This type of trajectory is common with the digital business building. Figure 75 describes assumptions for each of the levels.

As a standalone business, the Digital Platform could be financially attractive

Preliminary estimates

Key assumptions

Average revenue share from partners:

- Farebox: **~1–1.5% of GMV**
- Non-farebox : **8–10% of GMV**

40-50% of revenues from GMV (non-ad revenues) passed as **rewards:**

- Travel rewards: ~0.8%
- Purchase rewards : 4–5%
- As business scales up, lower rewards to be given to attract customers

Major cost heads of the platform to be marketing costs for customer retention (rewards) and IT infra cost, including maps API cost

- Blended person month cost:¥ 0.3 Mn
- Annual salary increment inflation adjusted : 5–10%

	2022	2023	2024	2025	2026	2027	2028
Active Users (Mn)	0.2	0.6	1.2	2.7	3.6	3.9	4.1
Spend/User/Month (¥)	115	284	568	1,074	1,382	1,604	1,688
GMV (¥ Mn)	283	2,092	8,366	34,292	59,695	74,817	82,900
Revenue through commissions (¥ Mn)	15	96	385	1493	2536	3246	4051
Revenue through ads (¥ Mn)	76	152	304	532	645	721	721
Costs (¥ Mn)	458	693	943	1988	2536	2788	2986
• Cloud & Tech Infra cost	21	86	193	383	673	784	816
• IT Development costs	138	176	241	255	271	287	304
• Customer acquisition cost	61	122	182	425	228	70	50
• Customer retention cost	8	50	201	782	1200	1470	1629
• Organization cost	65	88	99	105	112	118	125
• Miscellaneous costs	11	18	27	37	53	59	62
• PMO Support	154	154	0	0	0	0	0
EBITDA	**(367)**	**(445)**	**(254)**	**37**	**645**	**1179**	**1786**

Figure 74 – Detailed projections for DMRC's digital platform

Across 4 stages of growth, DMRC would need significant capability build up

	Phase	Metric	From	To	Conditions for success
1	**New commuter growth**	Unique commuters (Million)	8.5	9.4	The marketing and partnerships team to device a **Go to Market strategy** for customer acquisition
					Incentives for new users to sign up on the platform
					Provide **integrated platform** which combines other modes of transport for an improved passenger experience
2	**Increased non fare spend per user**	Spend per user (I¥ per month)	60	460	Large number of **attractive offers** by eminent brands, along with an **improved transaction experience** across all modes of payment on the platform
					Loyalty program for repeat transactions and retention
3	**Accelerated increase in non farebox spend per user**	Spend per user (¥ per month)	460	620	Leveraging database of customers to push **personalized offers** based on spend and demographic data
					Onboarding targeted merchants in popular categories through partnerships team
					Increasing user engagement through push notifications based on usage patterns
4	**Providing SAAS services to other metro operators**	Metro Tie Ups	0	>4	A **sub-unit** for SAAS effort within the platform team, which will use DMRC experience to build and scale up platform for other metros

Figure 75 – Four levels of growth

Figure 76 shows a few major metros that we have assumed DMRC can partner with, in providing SaaS services to other metro operators in level 4.. Since the business potential is large as there are 20+ operational metros in the country over the next 5-10 years, it is important then DMRC moves relatively quickly before other operators replicate or there is an entry from other sectors in this area. It is generally alleged that SaaS platforms can earn 2% to 5% of GMV of new platform.

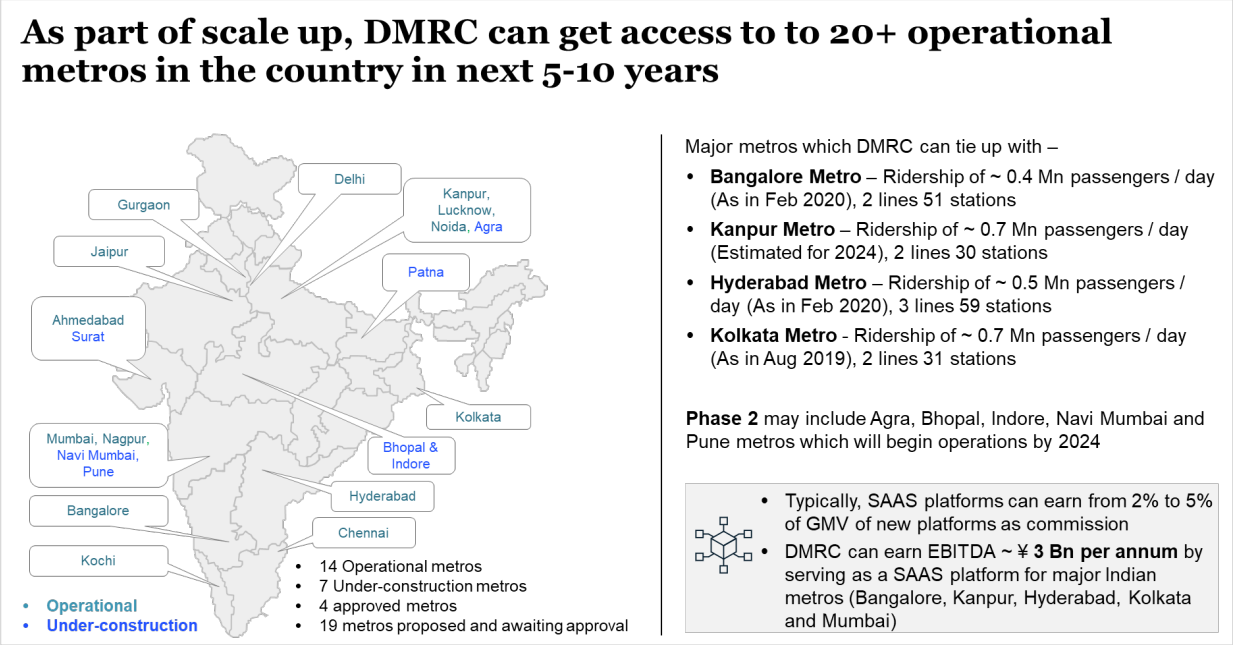


Figure 76 – SAAS platform

8.3.2 Social and Environment Impact

When discussing Level 4, there are some social and environmental impact creation we could expect from the expansion of the digital platform. For example, because of the last mile connectivity and safety SOS features of the app, enforcing transportation safety of 2 million women in Delhi who commutes every day and ticketing digitization may also further contribute to the alleviation of congestion at stations as people no longer need to line up to get tickets and charge smart cards. In addition, there could be cost savings of 130 Million JPY from going ticket-less using smart cards. DMRC issues ~12,000 smart cards daily, which comes out to ~4.4 million smart cards. At an approximate cost of INR 20 per card (range of such smart cards ranged from 10-30 INR), we can estimate yearly savings of ~9 crore INR (=130 Million JPY).

Furthermore, the digital platform can increase the number of commuting people using Delhi metro instead of other higher emission means by 0.9 million, which could be equivalent to reducing 5,400 tonnes of carbon dioxide reduction per day (Figure 77).

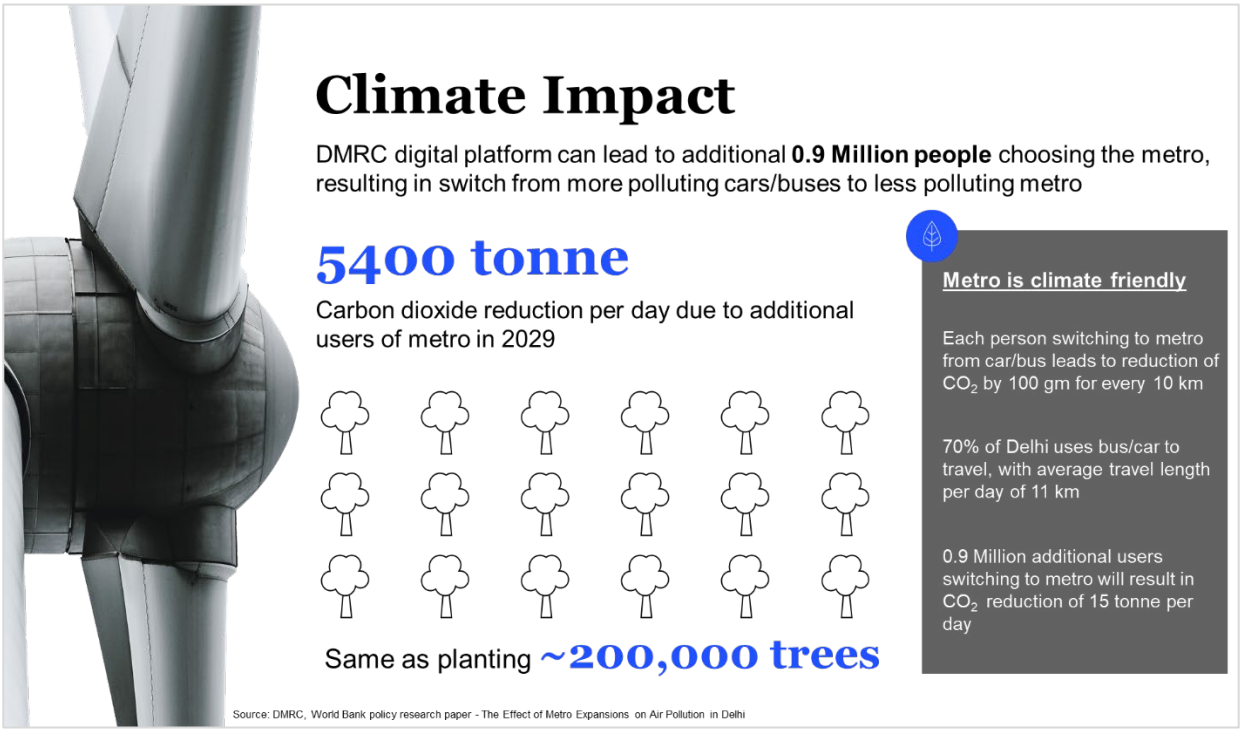


Figure 77 – Climate Impact

Chapter 9 Implications for Japanese companies and potential for utilization

Working in parallel with the pilot, we conducted a number of interviews to grasp the interest of Japanese companies and investigate how this platform could contribute to the activities of those companies.

9.1 interviews Summary

First, for consumable goods in the healthcare area, where economic development in developing nations is presumed to lead to increased demand, we conducted interviews with manufacturers making and selling hygiene products such as disposable diapers, as well as with people related to healthcare/pharmaceutical companies making healthcare supplies such as thermal cooling sheets and investigated the impact that the use of consumer access and data could have on their businesses.

Next, for a different approach from that of manufacturers, we also interviewed a startup that is setting out to open experiential stores, where it is possible to experience and purchase new products that have been curated across different manufacturers and brands, and we also interviewed a market research expert with experience working at a railroad-related company.

(1) Consumer goods manufacturer interview

- Demand for healthcare/hygiene-related products undergoes irreversible growth once per capita GDP exceeds USD 3,000, so they are considering entry with a positive attitude, while keeping an eye on the level of economic growth. They are actually currently entering Southeast Asia/China, followed by Southwest Asia.
- Because they are consumable goods, establishing a business in the markets targeted for entry requires securing sales volume. Although they feel there are tailwinds for Japanese brands, global consumer goods/healthcare brands from the US and Europe have a large presence and significant interest in emerging markets, so it will be necessary for them to closely examine which regions and products can lead to success for their company.
- The most important thing when entering a market is to not allow other companies to get there first and claim market share. Although customizing to fit the customer is important, this can be adjusted while getting information after entry. Therefore, when making a decision about whether to enter a market, the most important considerations are securing a partner to establish local production, building commercial distribution to secure sales channels, etc.
- When entering a market, a manufacturer never builds all new sales channels or captures all user touch points on its own. Therefore, they will be selling through existing local wholesalers or drugstore chains and will place an emphasis on their relationship with the trading companies or dealers that have relationships with these companies (B2B2C).
- There is some interest in reaching the millions of consumers in the urban area. However, with regard to the effectiveness of specific marketing/sales approaches, while they may have some impact in increasing recognition, they will not actually secure space on drugstore shelves. And if data about

potential customers are limited to a single city, that data will not be attractive enough to affect a decision about whether to enter a market, even if it is several million people in size. But it could be nice to have when it comes to using the data for marketing purposes, so depending on the cost they might try using it.

Thus, for a business that has fixed products and customer touch points, and that requires low-margin and high turnover, the significance of this digital platform would be for marketing/advertising purposes. It would primarily be for one-off uses such as campaigns, and cost-effectiveness would also be called into question.

(2) Interview with a company operating experiential stores

- With an experiential store, general consumers are given a physical touch point that allows them to actually see and try out products, while digital data about customer traffic paths, pause time in front of products, eye movement, etc. are recorded, analyzed, and provided to sellers.
- At present, the business model involves sellers paying fixed fee. Therefore, the elements that are directly driving business growth are physical growth of the number of experiential stores, and increases in the number of companies using them. They are trying to use digital technology to increase added value.
- It seems that sellers are divided on the question of whether experiential stores should be treated as part of their sales channel, or just as a place to get feedback from customers.
- If the digital platform of a transit agency is seen as a medium that can broadly reach millions of customers, then companies that want to increase awareness of their products or services should be interested in it. In fact, there were comments indicating that many startups are interested in collaborating with transit agencies to promote awareness of their products, and that there have been private talks from transit agencies about exhibiting at an experiential store, doing a limited-time deployment, etc.

Because experiential stores are a location for promoting and selling high-added-value/high-margin products, even if their quantities are relatively limited, as a business it can be said to be the opposite of the previously mentioned consumable goods targeting the mass market. These interview results can be said to be consistent with that.

(3) Market research expert

The areas where railroad company-related companies could utilize data obtained from contactless cards can be roughly divided into 1) improving the company's own business, 2) providing services to other companies, and 3) changing consumer behavior.

In terms of impact, using passenger flow data for "1) improving the company's own business" was the biggest. Although they have had information about the tickets and train passes that have been sold, and so could have theoretically collected this kind of data, actually collecting data from contactless card entry/exit records is completely different in practical terms from what was "theoretically possible," so it can be said that the introduction of contactless cards greatly advanced the use of passenger flow data.

They not only analyzed railway operations, but also commercial operations. This included a trade area analysis of affiliated department stores, analysis of convenience stores inside stations, etc. Using this to improve return on investment and cost-effectiveness had significant implications for monetization measures.

By contrast, monetizing by "2) providing services to other companies" was not easy. Not only was data representation not taken into consideration during the design, the value of passenger data as a panel is small. Even with data for millions of people, its value as marketing information is not very high.

Although it is of course useful when selecting a location for a new store, this is only temporary demand for each customer. Advertising provides a constant opportunity for use, but the market rate for data use is at most 5–6% of advertising costs. And if you eliminate the portion used for verifying whether advertisements are being used appropriately, the amount used for targeted marketing is likely at most 2–3%. Most of the remaining portion is used for things like content creation and media buys.

In addition, limitations on the use of personal information are growing. When actually performing targeted marketing, the trend is toward using data other than what can be obtained from contactless cards, such as smartphone positioning information or camera resolution, so it is not as though contactless cards have the power to control everything about a platform.

3) Changes to consumer behavior can be achieved if the passengers from which the data are obtained are thought of as a membership, but in the end how to monetize it or how consumer behavior should be changed are difficult questions.

In reality, railroad services themselves have many repeat users (users who have already been captured), so it is difficult to use loyalty marketing to produce additional impact. And there is also a pitfall in that even if a campaign results in a temporary increase in customers, there is no point in encouraging congestion when providing a public service.

Non-railroad areas are the natural target when pursuing additional impact. For example, in cases where there had been ideas that ended up having poor cost-effectiveness, such as attaching paper coupons to credit card receipts, it is possible to realize more cost-effective marketing by eliminating the paper and using digital technology to push coupons to customers.

If you take into account this increased range of possibilities when performing the analysis, the biggest reason is simply that individual smartphone ownership and smartphone capabilities have increased, expanding what is possible via consumers' own devices beyond the services provided by the rail operator. There have actually been attempts to make use of the fact that public services restrict users' time, but the

evolution of smartphones has been so fast that it has become mainstream to use devices that are more personalized than those installed in stations or onboard trains. If it was possible to control things from the stage of providing the data communications network, as is done on airplanes, then communications that do not go through smartphones might have some significance.

It is also necessary to pay attention to data ownership and usage rights. As a general trend in most countries, infrastructure companies monopolizing data for their own use will likely not be common. Things like GDPR and limitations on cookies have also advanced rapidly, signaling a major shift in the data utilization area. The concept that data belongs to the user is starting to take hold, and it will likely become mainstream for data to be stored on the user side (in the cloud or on their device), with the user having the right to decide whether or not to provide it.

Although alternative technologies for data collection are appearing, generally speaking loopholes are being closed, and it is thought data collection that has no benefits for the user will become more difficult.

However, one exception are countries with systems like China's, where the government can collect data for the purpose of performing optimization without taking user intent into account. It is likely that the direction will differ greatly depending on the country.

This concludes the outlook that takes into account the railroad company's internal viewpoints and marketing survey/data utilization trends. At present, a partnership with a smart card similar to Suica or Pasmo (and the rail operator) seems the most promising. Because it is possible to easily reach a million or more users, there are many inquiries from companies that want to conduct various types of campaigns. Startups are also interested.

Among individual rail operators, Tokyu is particularly enthusiastic about collaborating with companies. They have a rail line with high disposable income, and it seems that continuously investing in it to increase added value and promote non-railroad businesses has resulted in the funds coming back to them.

To generalize from these interviews and the responses of the pilot phase partner candidate companies, it can certainly be said that a platform with membership in the millions is somewhat attractive to non-platform companies (including Japanese companies), particularly during the phase when they are appealing to consumers.

At the same time, it is not as though major business impact from selling goods or services can be achieved only by appealing through the platform, and also the attractiveness of a platform to a company is closely related to its cost-effectiveness. Thus, until platform competition settles down, it will be necessary for the DMRC to pay particular attention to cost competitiveness when providing services.

Of course, the one that is likely to enjoy the most benefits from a platform will be the business entity running the platform. The platform business by its nature is winner-take-all, with companies fighting to become the de facto standard through mutual opening/partnering and member capture. Although the platform provided by the DMRC can guarantee a certain size in the form of its ridership, because temporary

sales promotion costs (campaigns to promote use, etc.) may be required, there is room for external partners to take part in the planning in order to split up the costs and risk.

In addition, in order to realize the services provided through the platform, moving forward it is likely that the DMRC will have to adjust its hardware and software (including the algorithm). Specifically, this would include things like the communications devices required for using smart tickets, the cameras and sensors required for congestion monitoring, etc.

We had a few interactions with Japanese companies as part of this project. Given the MVP timelines, and the hardware spend required from DMRC, these conversations could not go through for the MVP phase. They are detailed out below:

(4) AI advertisement start up

It is an AI led advertisement firm and the conversations were centered around using it for customized advertising. Based on discussions with the DMRC team, it was decided that this use case can be taken up during a full scale up phase of the product.

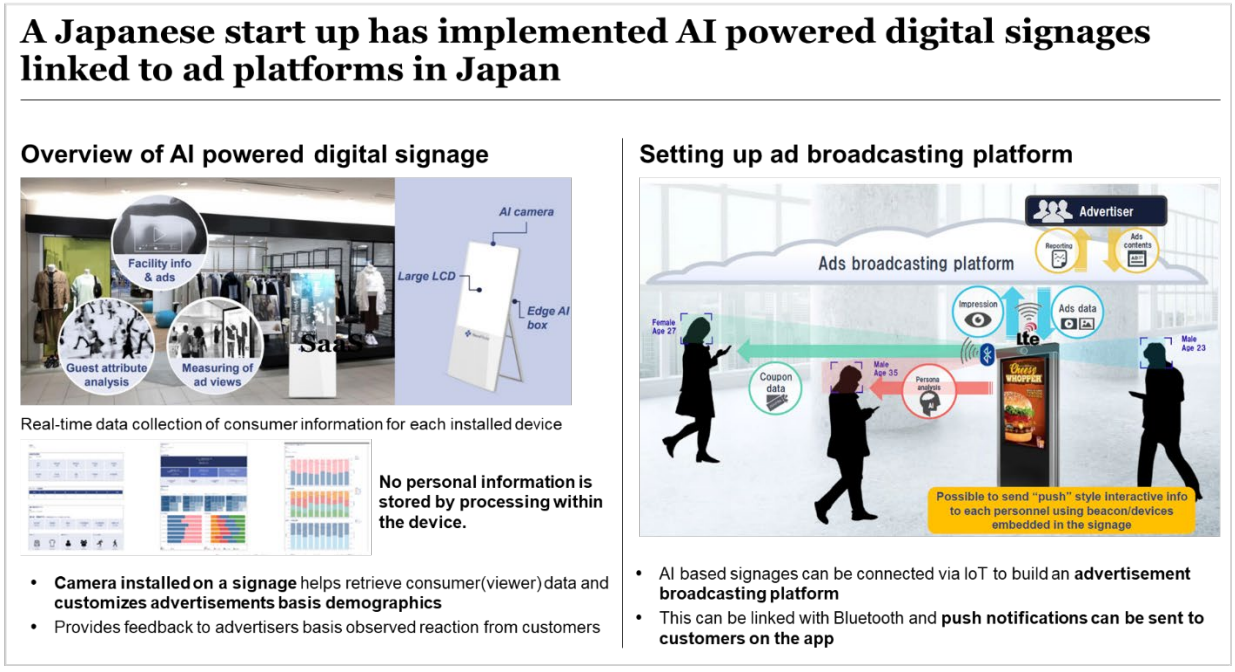


Figure 78 – Implementation of AI powered digital signages in Japan

(5) TransferJet

TrasnferJet is consortium led by Sony, Toshiba and 3 other Japanese firms to promote the TransferJet technology, a point-to-point wireless personal area network (WPAN) technology introduced in 2008. It can transfer data at speeds of 13 Gbps upon close contact. We held a discussion to understand feasibility of partnership for "content", where users can download games and movies while swiping their phones for entering the platform, given that large files, such as movies, could be transferred to the phone in the time it takes to touch the phone to a scanner.

Here as well, given the software integration needed for app integration with current MVP, as well as the need for hardware upgradation (funded by transfer Jet, but with significant lead time) and hardware chip to be installed on user phones, it was decided to explore this partnership in full scale up.

9.2 Analyzing interviews results

Based on the interview results above, opportunities for Japanese companies are reflected below in Figure 79.

DMRC platform presents an opportunity for Japanese companies for to expand business through select use cases

Priority Use Case	Description	Examples of Japanese firms
Content Streaming	Faster content streaming for metro users for watching videos	• Transfer Jet • SONY
Smart advertisement	AI based digital signage on platforms	• Dentsu • Neural Pocket
Integrated mobility	Last mile travel through eco friendly EVs	• Terra Motors • Japan Taxi
Virtual Stores	Virtual store on metro stations for home delivery of grocery	• AEON • Rakuten
Crowd Meter	Detection of crowd density on platform and coaches	• Canon • Elix

Figure 79 – Opportunity for companies in Japan