

INTEROPERABLE PAYMENTS SYSTEMS IN TRANSIT INDUSTRY

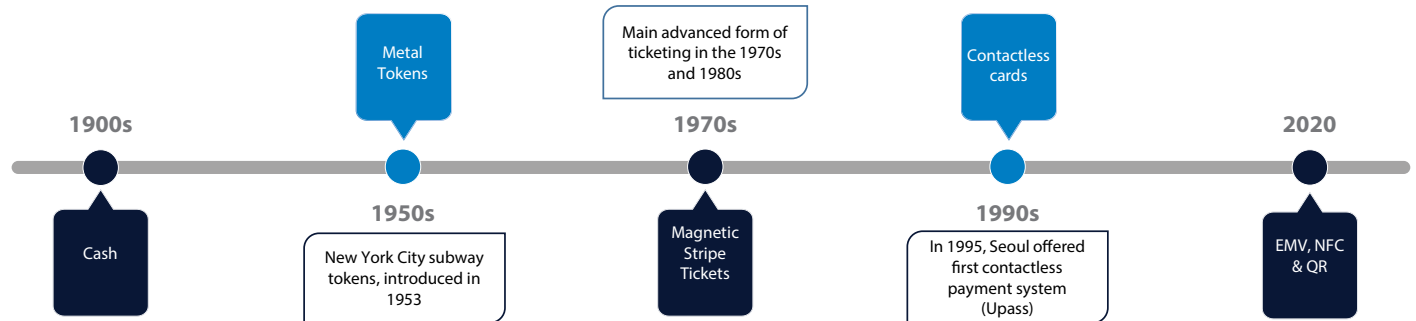
Introduction

Globally, due to rapid urbanization, the demand for convenient and efficient transportation infrastructure is increasing. The transit operators (or transport operators) are undertaking the digital transformation of their operating processes to offer disruptive and innovative products and services. This in turn is also helping these transit operators to meet changing

expectations, preferences of modern age urban commuters and finally achieve their business and financial goals (ridership, profitability, ROI, etc.) for long-term sustainability. Covid-19 pandemic has only accelerated the transformation in the mass transit industry.

Transit payments is one of such technology solutions that are widely adopted. With

inherent properties such as convenience, speed, and traceability of transactions, cashless payment solutions are gaining momentum across industries. Over the last century, transit payment solutions have evolved from cash-based payments to contactless payments i.e. payments using contactless cards, NFC (near field communication) wallets, etc.



Today the transit operators are adopting payment systems that are based on open, universal standards and specifications such as EMV (Europay, Mastercard and Visa) to achieve interoperability with other regional transit operators and provide a hassle-free payment experience to the commuters. Oyster-card used for Transport for London (TFL) and the EZ link used for MRT in Singapore are some of the examples of such interoperable payment systems. In India, the National common mobility card (NCMC) program is envisaging a unified

transit payment system across the country for transit payments.

The key considerations involved in planning and implementing an open-standards -based (i.e. EMV standards) transit payment system are

- **Right Deployment Model:** Closed-loop, semi-closed loop, or open loop?
- **Path to Truly Unified Payments:** Given the plethora of options and alignment among existing players a few transit

operators have a head start with certain models

- **Scope of Application:** Focus on Mass Transit vs Entire Transportation Industry (covering commercial vehicles, passenger vehicles, managed fleet etc.)

The subsequent sections of this point of view elaborates on these considerations, evaluates possible deployment models, describe use cases across the ecosystem, and finally presents our recommendations for planning and implementing transit payment systems.

Transit Industry – Understanding Key stakeholders and their concerns



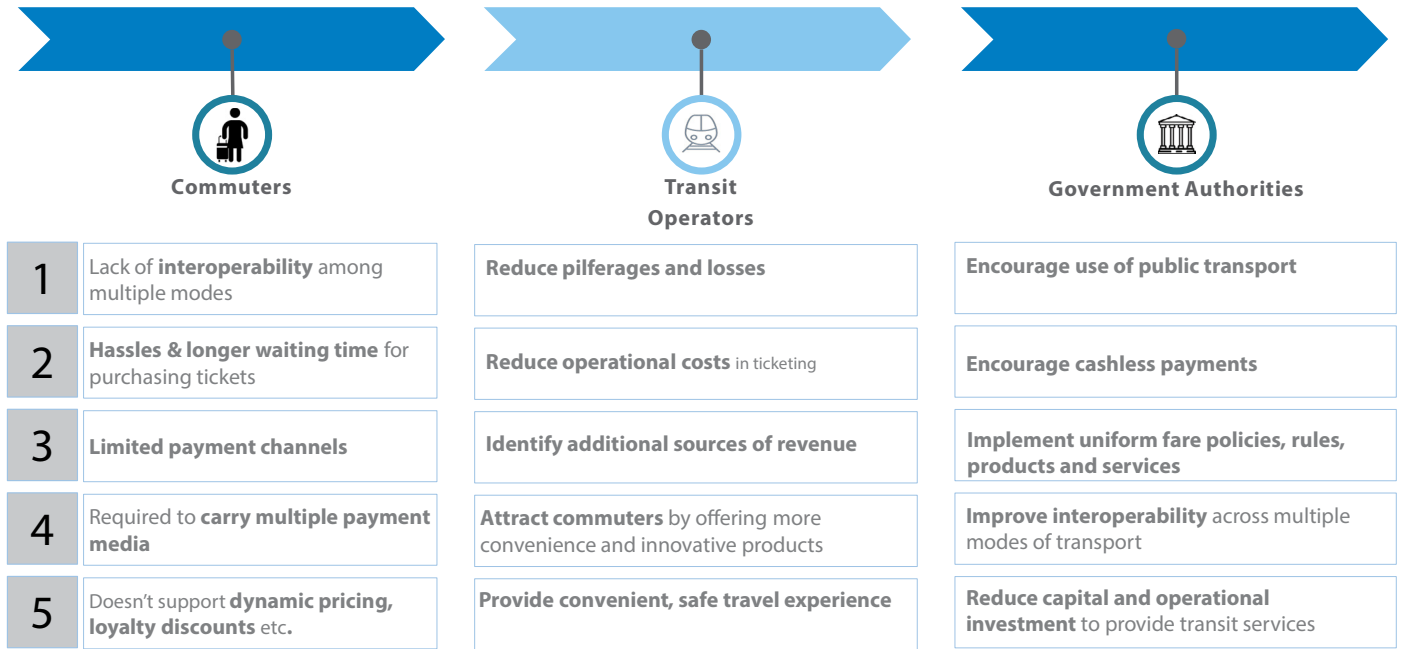
Key stakeholders of transit industry are as shown in the illustration.

- **The commuters / users** are at the center of transit industry and the entire ecosystem evolves to cater to their needs.
- **Transit operators and commercial vehicle service providers** (also referred to as "Transit operators")

provide transportation services. These include commercial operators providing mass rapid transport options, road transportation, buses, railways, commercial vehicles, shipping & aviation.

- **Government and regulatory authorities** set the policies, regulations and guidelines as well as perform regulatory oversight functions.

The key concerns of these stakeholders are as follows:

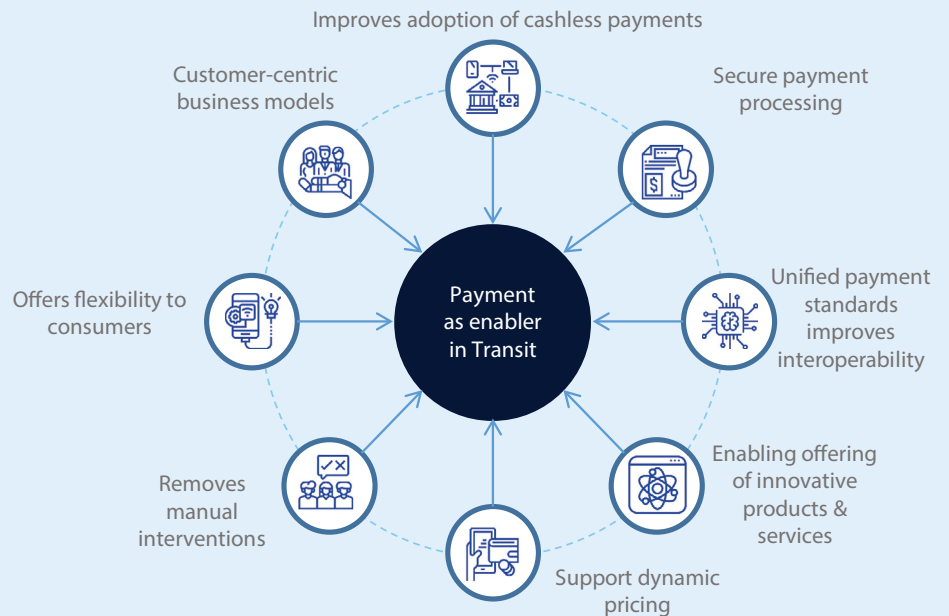


Transit payment solutions as means to address key challenges

The key value drivers offered by transit payment solutions help to address the aforementioned concerns of stakeholders.

To summarize,

- By providing more innovative payment channels in hands of commuters, transit payment systems are providing more convenience.
- The innovative payment channels and contactless payments can reduce the manual interventions involved in ticketing operations and therefore such payments systems can reduce the operating costs (up to 10% to 15% of fare-box revenue)
- The transit payment solutions improve fare payment compliance and therefore reduce pilferage.
- The adoption of payment system based on unified payments standards improves the interoperability amongst the regional transit operators.













Transit payment solutions - Commonly adopted deployment models

The modern age transit payment solutions accept electronic fare media (also referred to as “payment instrument”) such as EMV based contactless cards, NFC wallets, etc. Depending upon the deployment model and specifications (discussed in subsequent sections), these fare media may be issued by the transit operators or by the payment service providers (such as financial institutions).

At the entry and exit points of the journey, the commuter taps the fare media at payment terminals i.e. access gates or POS machines that are installed within transit operator’s premises. The transit payment terminals read the fare media and the appropriate fare amount is debited from the balance amount held in commuter’s fare media (in case of stored value cards) or underlying bank account.

The deployment architecture and operating models for implementing transit payment solutions vary from one transit operator to another. However, on a broader level, the payment solutions fall into three solution themes. The following table presents comparison amongst these three solution themes

	Closed Loop System	Semi Closed Loop System	Open Loop System
 Fare media	<ul style="list-style-type: none"> Issued by transit operator 	<ul style="list-style-type: none"> Issued by transit operator 	<ul style="list-style-type: none"> May or may not be issued by transit operator
 Payment instrument standards	<ul style="list-style-type: none"> Proprietary 	<ul style="list-style-type: none"> Non-Proprietary i.e. EMV 	<ul style="list-style-type: none"> Non-Proprietary i.e. EMV
 Usage	<ul style="list-style-type: none"> Only for transit payments 	<ul style="list-style-type: none"> For transit as well as retail payments 	<ul style="list-style-type: none"> For transit as well as retail payments
 Acceptance of retail payment instruments	<ul style="list-style-type: none"> Not accepted for fare payment 	<ul style="list-style-type: none"> Not accepted for fare payment 	<ul style="list-style-type: none"> Accepted
 Necessity to set-up issuance infrastructure	<ul style="list-style-type: none"> Transit operator has to set-up issuance infrastructure 	<ul style="list-style-type: none"> Transit operator has to set-up issuance infrastructure 	<ul style="list-style-type: none"> Issuance infrastructure is not required
 Clearing and settlement infrastructure	<ul style="list-style-type: none"> Required to be set-up and operated 	<ul style="list-style-type: none"> Transit operators can partner with financial institution(s) to leverage clearing and settlement capabilities 	<ul style="list-style-type: none"> Transit operators can partner with financial institution(s) to leverage clearing and settlement capabilities
 Service delivery channels	<ul style="list-style-type: none"> Limited due to proprietary standards 	<ul style="list-style-type: none"> Moderate as retail payment instruments not accepted for payment instrument 	<ul style="list-style-type: none"> Omnichannel support due to adoption of open, universal standards & specifications
 Vendor lock-in	<ul style="list-style-type: none"> Risk exists due to proprietary standards 	<ul style="list-style-type: none"> Risk doesn't exist due to non-proprietary standards 	<ul style="list-style-type: none"> Risk doesn't exist due to non-proprietary standards
 Interoperability with other transit operators	<ul style="list-style-type: none"> Lacks interoperability 	<ul style="list-style-type: none"> Limited interoperability 	<ul style="list-style-type: none"> Thrives through interoperability
 Fare media balance amount usage	<ul style="list-style-type: none"> Balance amount can be used 	<ul style="list-style-type: none"> Balance amount can be used for transit and retail payments 	<ul style="list-style-type: none"> No need to maintain transit balance separately. The funds available in payment instrument can be used for retail and transit payments

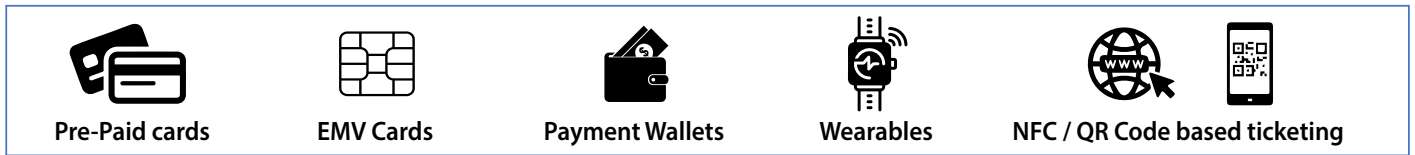
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Looking at various pros and cons and given better scalability, interoperability and lower risk of obsolescence, it is evidently clear that the semi-closed loop or an open loop-based payment system (both referred to as “interoperable payment systems” hereinafter) offers more value proposition to each of the stakeholders involved in the transit ecosystem as compared to a closed-loop payment system.

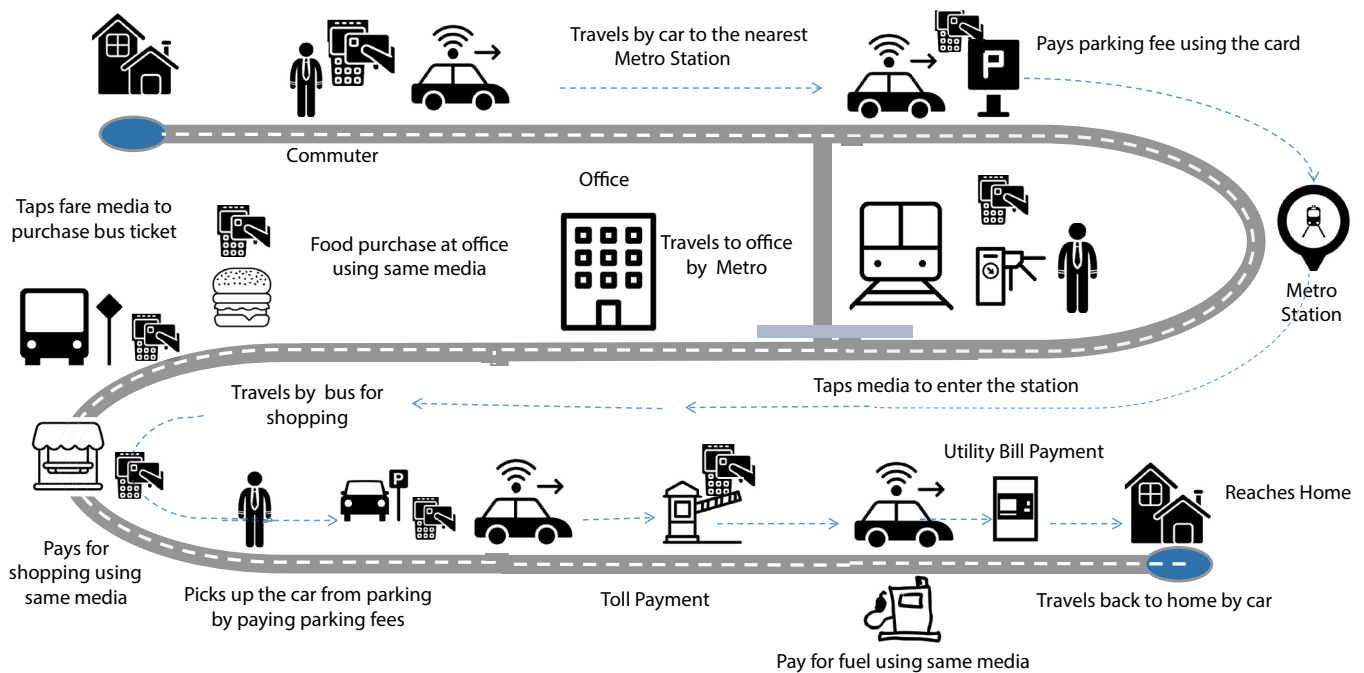
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Interoperable payment systems – Providing unified experience

Due to the adoption of open standards and specifications, interoperable payment systems provide seamless interoperability with other payment systems. While most semi-closed loop solutions accept stored value pre-paid cards as fare media, an open loop-based fare collection system is fare media-agnostic and offers the following choices for making payment.



Consumer journey perspective: An open loop-based payment system enable commuter to use her existing fare media for making retail as well as transit payments. As shown in following commuter journey, a unified and interoperable payment system can help to address all payment needs of transit industry and ecosystem.



Advantages of Interoperable transit payment system

The key advantages of adopting interoperable transit payment systems (semi-closed or open-loop) are as follows:

1. Payment system based on open standards such as EMV can provide interoperability among the transport operators, ecosystem players and therefore can attract ridership.
2. **Choice and Convenience:** The wider choices of payment media, provided by an open-loop payment system, can improve commuter convenience, and reduce pilferages.
3. **Data and Insights driven:** The electronic channels of payments can improve the data collection and reporting capabilities. The data analytics-driven solutions can open additional channels of revenue i.e. personalized location-based advertisement etc.
4. **Reduces the financial risks** by offloading the payment handling and settlement functions to the payment service provider.
5. **Lower TCO:** Multiple transit operators or service providers can come together to implement the open loop-based payment system; therefore, the cost of such a system can be shared by multiple transit operators thereby reducing the cost of ownership (TCO) for each transit operator. The solution, if hosted in a cloud environment, can reduce capital investments for each

transit operator and enable the transit operators to use the transit payment solution as a “Software-as-a-service (SaaS)” model. The consortium of transit operators can engage a technology service provider, who can provide the interoperable transit payment solution as SaaS.

Additionally in an account-based open-loop payment system, by accepting any payment instrument that is linked with a bank account such as contactless credit or debit cards, e-wallets, etc. transit operators can avoid costs to produce, distribute, manage, and track their proprietary fare media i.e. stored value card that is involved in a semi-closed loop-based payment system.

Though as stated above, the open loop-based transit payment system is the ideal choice and provides additional savings in operational costs, there are other challenges involved in implementing an open loop payment system that also needs to be considered:

1. **Delayed authorization** from the central system poses financial risks to the payment service provider resulting in potential revenue loss.
2. Transit terminals, fare media readers require **uninterrupted access** to the network so that it is always connected with a central system for real-time authorization.

3. In case **multiple transit operators** are involved, the operator settlement is tedious, and an independent apportionment and settlement body might have to be set up which may involve additional costs.
4. **Switching Costs:** Due to completely different solution architecture, the switching cost is higher in case the transit operator has implemented a closed-loop payments system.
5. **Dispute Management** (Cashback, money deducted twice, additional money charged) can be tedious, effort-intensive in a multi-operator transaction.

The national common mobility guidelines (NCMC guidelines) were prepared by the Government of India (GOI) to help mitigate some of these challenges. Evaluated more closely in the Indian market context, semi-closed loop solutions deployed as per NCMC guidelines overcomes the following challenges

- Offline processing and eliminates the need for uninterrupted network access across payment terminals.
- NCMC based pre-paid stored value card reduces the financial risks by providing instant authentication and authorization of fare amount and lends itself better for interoperability across payments systems.



Extended use cases and their business potential

Specifically, in Indian context, its amply clear that an interoperable transit payment system offers much more benefits as compared to a closed-loop system. There is huge potential in addressing a problem of this size, estimated at INR 300 Bn per year (considering only metro and bus rapid transport in India).

The pie only gets bigger if we further

consider other transit operators such as railways and sub-urban trains and extend application to other adjacent use cases like the ones listed below

1. Toll Payments
2. Fuel Payments
3. Road Safety and Compliance
4. Corporate Wallets

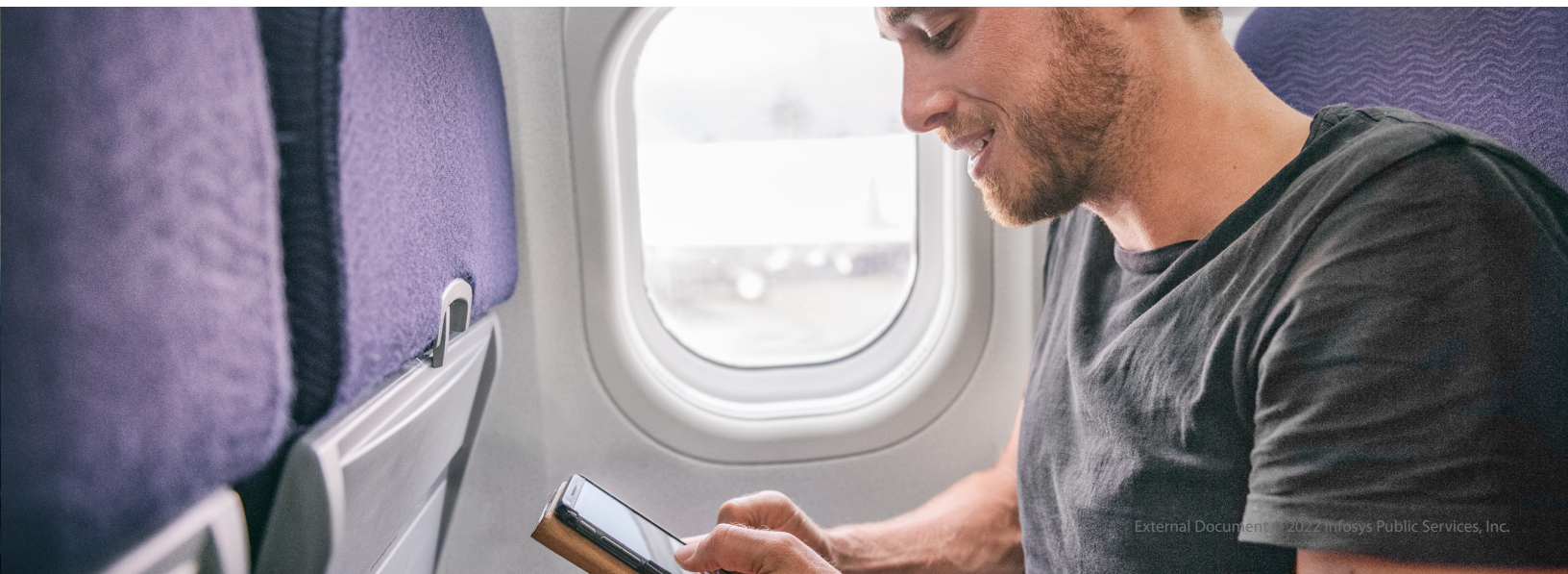
Extending unified payments to these other use cases would eliminate the need of issuing separate fare media and form factor (i.e. fast tag in India) to travelers, therefore reducing the operating costs as well as providing more convenience to various categories of commuters or consumers. The estimated market size per annum for transit payments and extended use cases are presented in the below illustration.



*Estimated annual market size for each of the extended use cases in Billion INR

¹As per NETC fast-tag portal <https://www.npci.org.in/statistics>

²As per based on the database of NIC (VAHAN, SARATHI): <https://parivahan.gov.in/analytics/>



Our recommendation

While an open loop-based payment system can provide much higher interoperability with other payments systems including retail payments but the inadequacy of supporting infrastructure (particularly in emerging markets) such as lack of uninterrupted network connectivity across terminals etc. may make it infeasible to implement such a system. Moving towards a semi-closed loop-based transit payment system may be the right choice under such circumstances.

A well-balanced deployment model should be selected by deliberating over various factors including but not limited to

- Regulatory guidelines
- Financial assessment including switching costs from the current system

- The consumer behavior factors such as spend habits, preference for payment types
- Penetration of electronic payment instruments and lastly
- The business objectives and priorities

Further, implementing a transit payment system needs careful adherence to following key guiding principles

1. Build a strategic big picture view
2. Collaboration with industry forums – regulators, transport operators, financial institutions – to build partnership
3. Analyze through DFV (desirability-viability and feasibility) lens to identify the right deployment model

4. Build a business case with what-if scenario - to substantiate investments (IRR, Payback, TCO)
5. Entrepreneurial spirit with focus on disruption – work like a startup while delivering at scale
6. Digital stewardship and progressive vision
7. Strategic alliances with technology / consulting partners - to make right technology choices and ensure solutions are built to last
8. Flexible and agile digital organization – to respond and deliver faster changes in ecosystem
9. Data and insight driven platform that helps make smart decision

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