

# Fare Media: Past, Present and Future

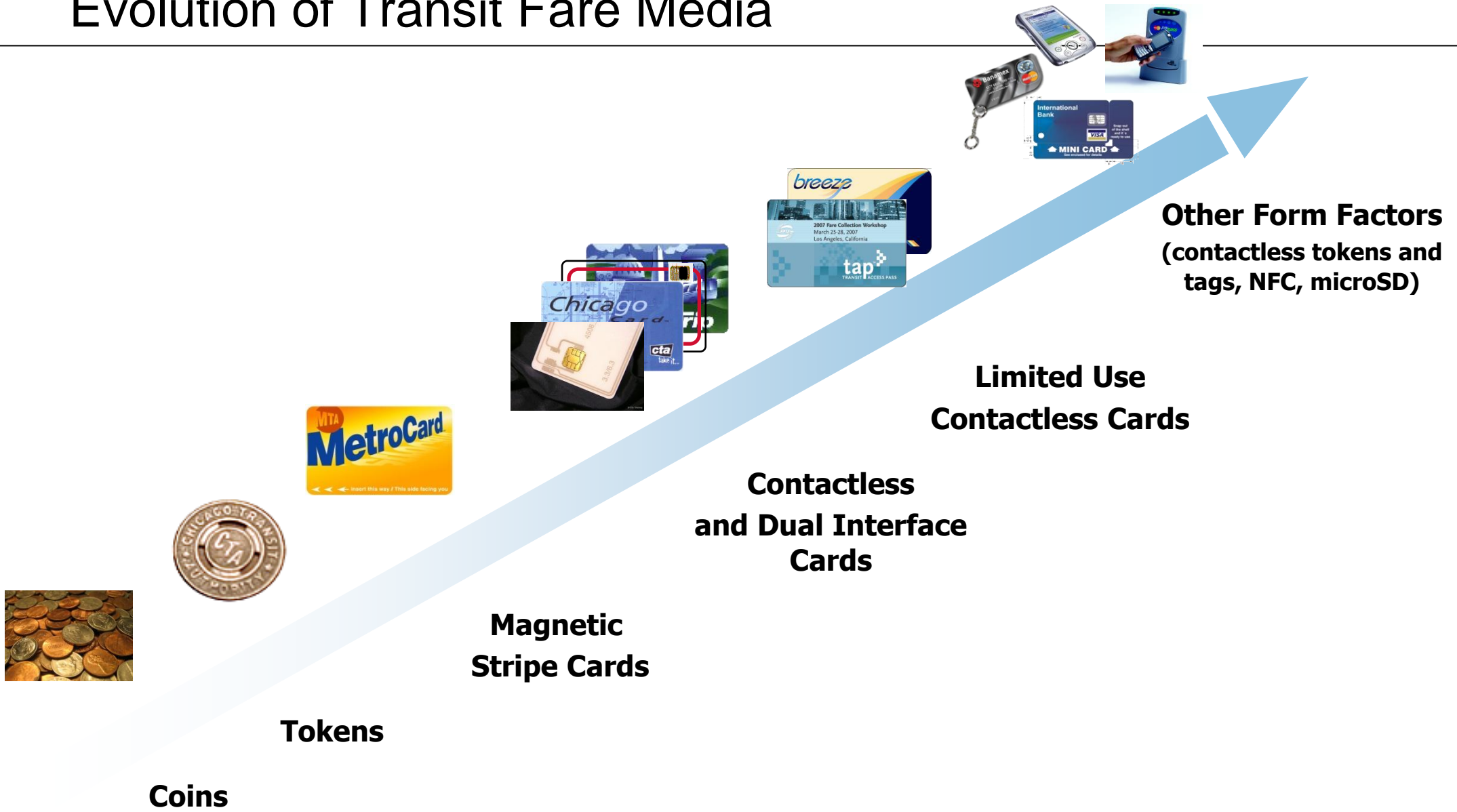


*Hassan Tavassoli  
APTA Fare Collection Workshop  
San Diego, California  
March 29, 2010*



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# Evolution of Transit Fare Media



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# Types of Fare Media

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- Magnetic stripe cards
- Contact only cards
- Contactless cards
- Dual Interface cards
- Limited Use tickets
- Other form factors (contactless credit cards, NFC phones, microSD, mobile stickers, etc.)



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# Magnetic Stripe Cards

- The classic machine readable media
- Magnetic stripe can be encoded with fare data; expiry date, value, etc.
- Magnetic stripe is reuseable

## Advantages

- No cash handling
- Provide improved ridership data
- Inexpensive for single or occasional use

## Disadvantages

- Susceptible to fraudulent use
- Extensive reader maintenance required
- Dirt, grime or chemicals can interfere with the reader heads and degrade card and reader performance and reliability



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# Contact Cards

- Smart card with an embedded memory or microprocessor and contact interface
- Contact points for power and data transfer
- Can be either memory or microprocessor
- Used as SIM cards, ID card (logical access), bank cards, loyalty cards, etc.

## Advantages

- Reduced maintenance costs and extended life of system
- Easy handling and convenient
- Offers a step up in security from magnetic cards

## Disadvantages

- Limited transaction speed unsuitable for high transaction volumes
- Physical contact between cards and readers reduce lifetime of cards and readers



# Contactless Cards

- Card has one chip with contactless interface
- Most desirable smart card available today
- Widely used in transit and banking applications

## Advantages

- Versatile
- Multi-application
- Cost effective
- Easy, fast and convenient to use

## Disadvantages

- No identified disadvantage for transit
- Expensive for contactless credit or debit card applications



# Dual Interface Cards

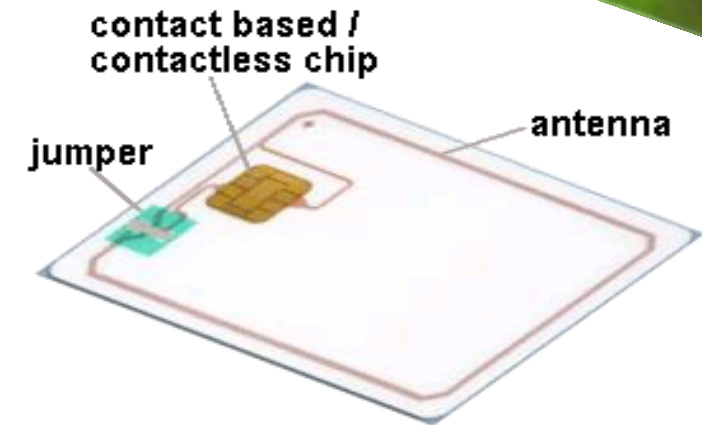
- Card has one chip that can be addressed by two interfaces
  - ISO 7816 for contact
  - ISO 14443 for contactless (13.56 MHz)
- Most versatile IC cards available
- Widely used in banking, retail and e-commerce

## Advantages

- Versatile
- Multi-application
- Easy and convenient to use

## Disadvantages

- Expensive
- Less reliable than other card types due to manufacturing complexity
- Contact applications may be uncertain or irrelevant for transit



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# Limited Use Ticket

- Similar to contactless cards, it has one chip with contactless interface
  - Small memory
  - Basic but sufficient security
  - Same ISO standard as other contactless cards (ISO 14443)
- Used mainly for single use rides, specific ticketing event, etc.

## Advantages

- Low cost of ticket, and the reader
- Uses the same infrastructure as contactless cards (i.e., installation of an additional reader is not needed)
- Quick, seamless travel between bus and rail
- Lower maintenance cost than magnetic stripe tickets
- Serialized; fraudulent activities can be tracked



## Disadvantage

- More expensive than magnetic stripe cards

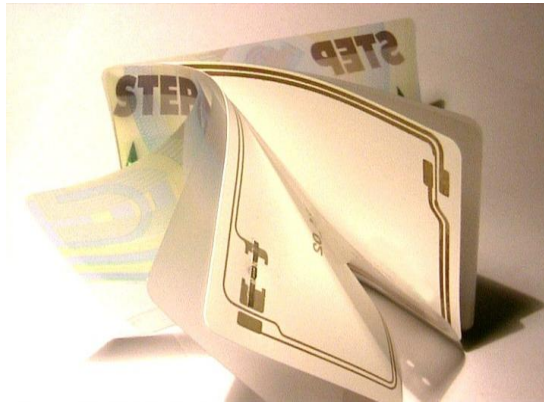


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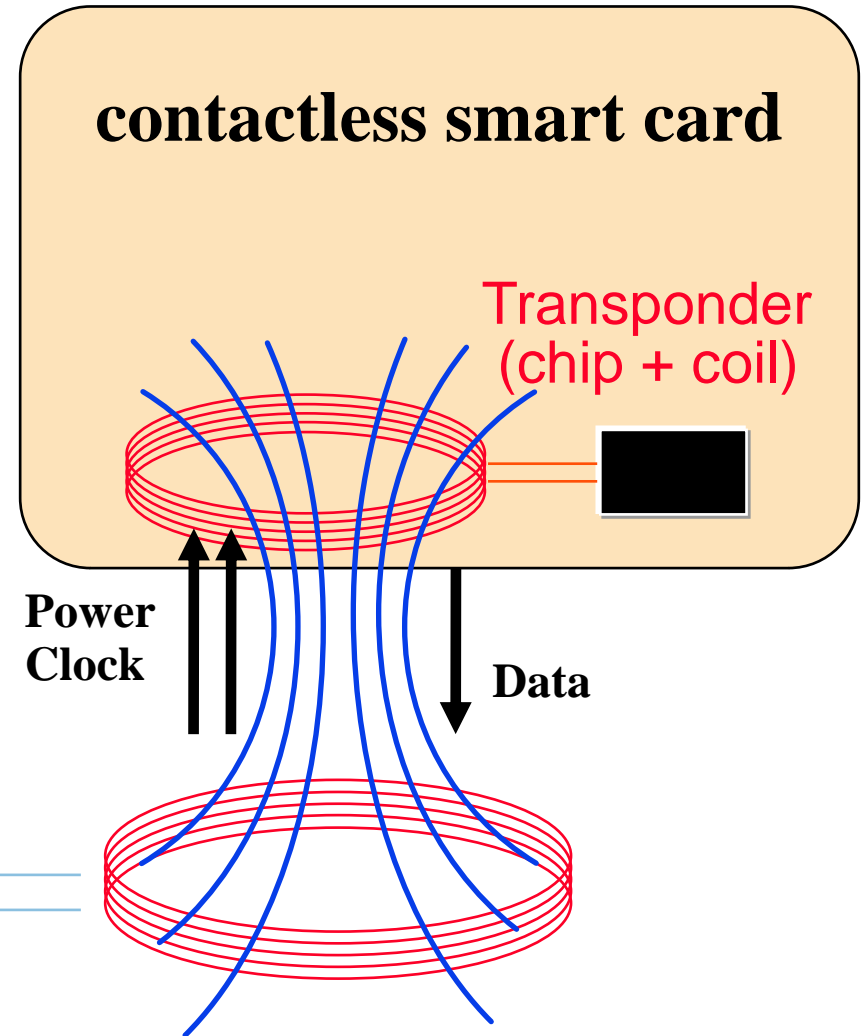


# Contactless Card Technology

- Smart card transfers data using radio frequency technology via a transmitter and receiver



**contactless  
smart card  
reader**



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# Contactless Card Types

	Memory	Microprocessor
Type A	Mifare <sup>®</sup> 1K Mifare UL	Mifare DESFire, SmartMX, micropass (Inside), Infineon
Type B		Micropass (Inside), Infineon
Other Types	Sony Felica  Cubic GO CARD <sup>®</sup>	



*ISO Standard*



*Not ISO Standard*



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# Benefits of Contactless Card Systems

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- **Vandalism proof bus or station equipment**
  - Less maintenance cost
  - More equipment availability
- **Same reader processes contactless cards and Limited Use tickets**
  - Less capital equipment cost
- **Convenient and easy to use**
  - **Customer satisfaction**
- **Secure**
  - More revenue
- **Modern Image**
- **Upgradable**

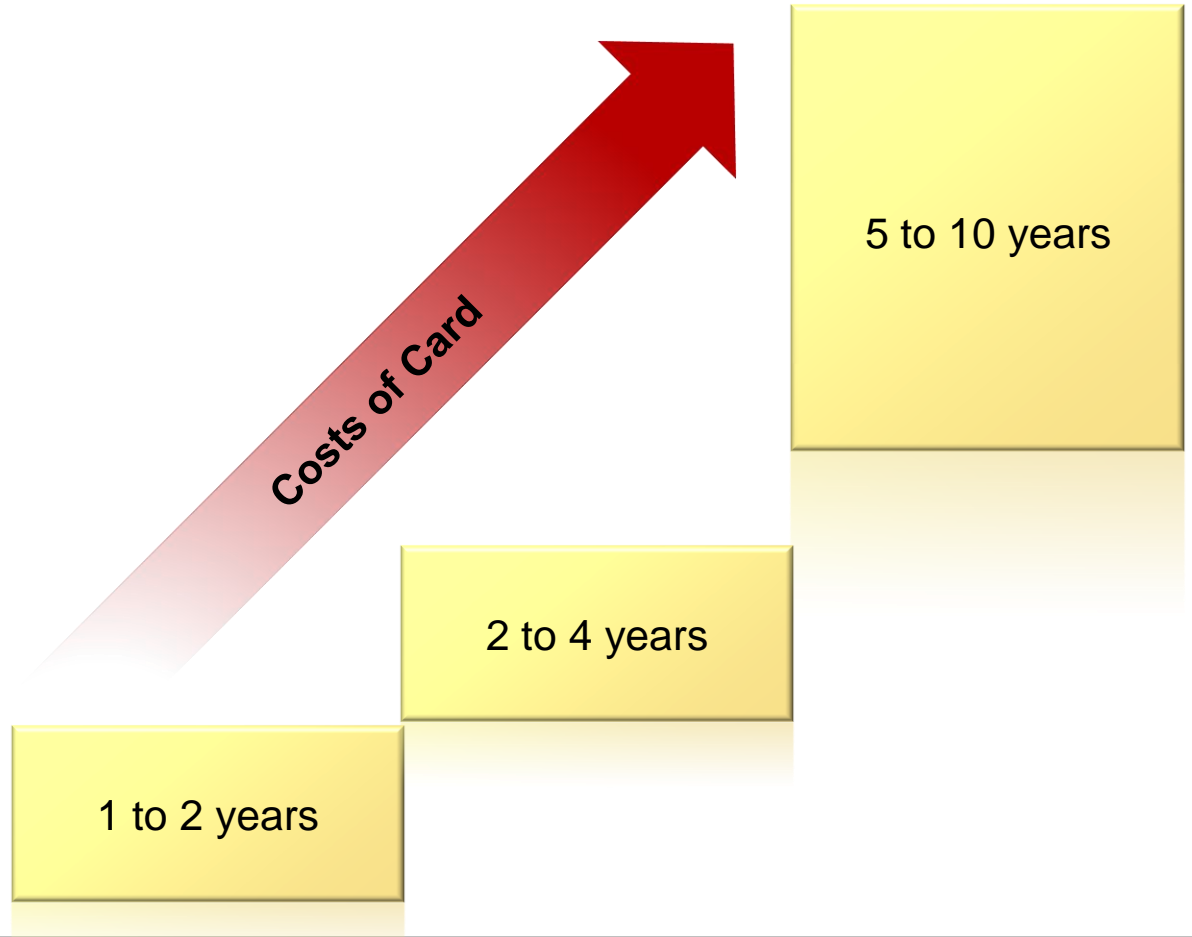


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# Cost vs. Complexity and Durability

COMPLEXITY

- National eID  
eDriving License  
eHealth
- Financial Cards  
Chip & PIN
- GSM SIM  
Pay TV
- ID Badging  
Access Control
- Transport Cards
- Loyalty Cards  
Gift Cards



DURABILITY



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# Cost vs. Technology

	Contact-based	Contact-less	Dual Interface	Hybrid (2 chips)
Cost	A = 100%	A x 130 – 150 %	A x 150 – 170 %	A x 180 – 220 %

Cost of a smart card depends on various factors as the microprocessor, operating system, inlay and manufacturing costs vary case by case.



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# Standards & Interoperability

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- ISO 7810/11 → *Standard for ID cards and features*
  - ISO 7816 → *Standard for contact based smart cards*
  - ISO 14443 → *Standard for Type A & Type B contactless smart cards*
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- Universal Transit Farecard Standards (UTFS)
  - Contactless Fare Media Standard (CFMS)



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# Emerging Technologies and Trends

- Near Field Communications (NFC)
  - Phone is both card and terminal
- microSD with integrated antenna
  - Can change any mobile phone to an NFC phone
- Mobile phone sticker
  - Allows to use mobile devices for payment
- Open Payment
  - Bank cards can be used to pay transit fare
- Open Standard for Public Transport (OSTP)
  - Alternative transit contactless card technology



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# Thank You



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