Socio-economic benefits of SIM-based NFC

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Preface

Near Field Communication technology has been here for a few years now, and with several commercial applications of SIM-based NFC actively launched over the last year, and many more in the pipeline, the momentum for more NFC services is growing exponentially. One of the biggest challenges facing the adoption of NFC, as a day to day technology, is how to drive the scale of service rollout across all service industries. They key to success within those markets where SIM-based NFC has been successfully launched has been the collaboration between both mobile and service industries to make it happen and to ensure that those services put in place are fully interoperable leaving the door open for future growth.

The GSMA has commissioned this report to take an in depth view into the socio-economic benefits that the deployment of SIM-based NFC services will enable, and how collaboration between industries can help make this a reality.

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Table of Contents

Executive Summary: ............................................................................................................................................... 1
Introduction: ......................................................................................................................................................... 6
Approach & Methodology: .................................................................................................................................... 10
Socio-economic Benefits: ..................................................................................................................................... 13
Market Benefits: .................................................................................................................................................. 22
Consumer Benefits: ............................................................................................................................................. 39
Executive Summary

The following Study assesses the potential market impact of Near Field Communications (NFC). The purpose of this Study is to provide an independent perspective on the potential cost-benefits of NFC and determine the holistic impact of standardization across a range of stakeholders, as well as, the market as a whole.

The Study incorporates quantitative cost-benefit analysis and extrapolates a range of potential market impacts. These impacts are not limited to one country or region, but can extend across any market environment where the basic enabling conditions for NFC adoption are present. This Study provides an in-depth discussion of the quantitative and qualitative impact of NFC in ten markets and leverages this discussion to establish the broader socio-economic and commercial benefits of NFC.

The ten markets discussed in this Study include Australia, Brazil, Canada, France, Germany, Italy, Japan, South Korea, Spain, and the United Kingdom.

For purposes of analysis, some of these markets have been grouped in order to establish quantitative impact on a regional level. This aggregation was applied to the collective E5 model (including France, Germany, Italy, Spain, and the United Kingdom), as well as, Japan and South Korea.

These individual market analyses are designed to establish broader impact dimensions and provide context to the key messages discussed throughout the Study. These messages and impact dimensions focus on the specific benefits of NFC on six different groups of stakeholders:

1. Financial Institutions
2. Over-the-Top Players (OTT)
3. Mobile Network Operators (MNO)
4. Entertainment Ticketing
5. Transportation
6. Consumer Retail

The adoption of NFC in these different market sectors is a relatively new development. Two scenarios have been applied in order to quantify specific benefits and frame the analysis presented in the Study. The first scenario – Collaboration & Standardization – assumes market collaboration around a single NFC standard and the implementation of that standard across all stakeholders. The second scenario – Fragmented & Proprietary – assumes that NFC development will grow according to existing market trends and evolve in an opportunistic and ad hoc way.

While these scenarios incorporate different growth rates, the core driver for NFC expansion in Scenario One is centered on the standardization of Subscriber Identity Module (SIM) based NFC technology and processes. Currently, there are multiple NFC standards and processes being implemented in the market. At the core of these different approaches is the role of the Secure Element (SE) in facilitating NFC-enabled transactions. The Secure Element is a physical component that stores cryptographic keys needed to authenticate and authorize any NFC transaction.

This is critical because it ensures that any NFC transaction is protected from unauthorized data access. The threat of electronic pick pocketing, or hacking into someone’s NFC account from close proximity, becomes increasingly more prominent as NFC gains greater market traction. As a consequence, there is a growing emphasis on the ability to guarantee transaction security and provide dynamic control mechanisms through the Secure Element architecture.

This architecture can take multiple forms, with the Secure Element embedded in the handset, integrated with the SIM, or incorporated with an external digital card (microSD). In the case of embedded, the Secure Element is wired into the handset by the original equipment manufacturer (OEM). This model is preferred by OTT players such as Google and Apple because it enables any user with a NFC-
enabled handset to access NFC applications provisioned through the OTT player. MicroSD features the Secure Element on an external card that can be inserted into the handset. In this model, the transaction channel is largely maintained by the entity that operates and controls the microSD card. This approach has been primarily piloted by a number of banks and financial institutions.

In contrast to the embedded and microSD approaches, the SIM-based model features the Secure Element inherently integrated with the SIM chip. As illustrated in Figure 1, the three different models each feature a different set of processes and technology applications.

**Figure 1: Different Secure Element/ NFC Models**

![Diagram of different NFC models](image)

Source: Booz & Company NFC Scenario Model, 2011

Though assessing the specific benefits of each model is beyond the scope of the *Study*, the rationale for SIM-based Secure Element standardization is centered on a number of concrete advantages. Of these advantages, the most significant is the ability to provide a robust transaction environment by leveraging the Secure Element within the SIM card. This is not limited to the security of the SIM itself but extends to the Over-the-Air (OTA) platform, which can securely communicate with the SIM and dynamically provision applications on the handset.

Featuring secure management of personal data, SIM-based NFC leverages the OTA platform to actively and directly provide life-cycle management. This includes application downloads, software and security updates, as well as, the ability to dynamically delete data in real-time and preempt the unauthorized use of the handset. This is particularly relevant when considering that the projected increase in NFC transactions will warrant a greater need for enhanced security. This need is already demonstrated by the increased rate of attempted ‘digital pick-pocketing.’ Having the Secure Element incorporated into the SIM enables a significant level of security and the ability to dynamically provision and service NFC applications using OTA channels.

In addition to handset-oriented security, other benefits from the SIM-based approach are centered on portability, flexibility, configurability, and compliance with international standards (including transaction authentication and authorization requirements). Integrating NFC with the SIM enables individual users to change handsets without having their data tied to a specific device. This signifies an important user benefit, as individuals can replace their handset and change application providers without losing their personal data or jeopardizing transaction acceptance.

Additionally, via OTA functionality, individuals and service providers are able to securely download new applications onto the handset and provide software updates on an ongoing basis. These applications can capture real-time information and data streams that can be leveraged by consumers and service providers for a range of functionalities – including location-based promotions, product information, digital rewards, and account management.

While there are many scenarios that can be developed and assessed with regard to NFC implementation and growth, this *Study* assumes two degrees of NFC market evolution: one based on the existing market baseline and the other assuming complete SIM-based standardization across different sectors and stakeholders. Both scenarios assume that some degree of collaboration will occur around standards but neither presumes joint investment or other forms of asset structuring. Though these
commercial aspects are likely to shape the ultimate adoption and usage of NFC, the objective of the Study is to assess the impact of NFC irrespective of the specific behavior of individual firms.

The impacts discussed throughout the rest of this Study are based on a range of applications that leverage the Secure Element on the SIM. A broader range of applications that utilize NFC technology but do not necessarily require access to the Secure Element—such as building access and product tagging—are not directly addressed in the Study. While these applications help define the consumer value proposition and can drive broader ecosystem adoption, they do not substantively impact the core market benefits discussed in this Study.

Applying the scenario-based framework, these benefits are driven by the growth in the volume of NFC transactions across different sectors. As illustrated in Figure 2, the shift in transaction volume between the two scenarios underpins the broader impact derived from greater cross-sector NFC usage. Extending across the different market regions, the Study estimates that standardization will yield a cumulative average growth rate (CAGR) of 169% for the Collaborative Scenario over five years. This is 34% higher than the estimated CAGR for the Fragmented Scenario, yielding a 93% difference in total transaction volume in year five. The principal difference between these scenarios is driven by the increased adoption and usage of NFC services across the three sectors analyzed in the Study.

The Study identifies a number of key benefits that are realized through NFC and amplified by increased growth in the number of transactions. The first set of benefits is centered on the socio- and macro-economic impact of NFC. The most significant of these benefits are centered on:

- **Increased competition** through reduced cost and infrastructure barriers, creating a more conducive enabling environment for national, as well as, local market players.
- **Greater consumer value and choice** driven by increased competition and the need for greater product innovation, as well as, price differentiation.
- **Increased financial transparency** driven by the widespread adoption of NFC, which provides insight on financial transactions, including tax, customs and anti-money laundering/combating the financing of terrorism (AML/CFT).
- **Improved public sector servicing** realized through public sector adoption of NFC-enabled delivery and service products (e.g., identity, health, social security cards).

![Figure 2: Aggregate growth in NFC Transactions (across all markets and sectors)](image-url)
Reduced carbon footprint achieved through an increased growth in electronic payments; a general reduction in cash processing and card manufacturing; a reduction in the use of paper for tickets, coupons and receipts; and greater incentives for the adoption of digital products and services. The Study estimates that over the five year timeframe, standardization can drive as much as a 43% reduction in carbon emissions across the categories examined, with a 20% difference between the two scenarios.

In aggregate, these benefits illustrate that SIM-based NFC standardization can create market conditions that deliver indirect, non-financial value across a range of market stakeholders, including the end consumer. Centered on driving scale, standardization amplifies infrastructure development by creating a common framework for implementation and product interoperability.

This common framework can be realized through cross-industry collaboration and regulatory engagement on a shared set of standards. In addition to broader socio-economic benefits, collaboration on standards can yield specific commercial benefits for market stakeholders. These benefits are principally centered on cost offsets generated through NFC and the amplified impact realized through SIM-based standardization. While not limited to these, the Study identifies five core benefits that are realized across the six key ecosystem stakeholders:

- Reduced fraud driven through greater security enabled by SIM-based NFC. The Study estimates that standardization can yield a 14% reduction in the value of fraud over five years, with a 8% difference between the two scenarios.

- Economies of scale realized through improved operational efficiencies and reduced cost basis resulting from standardization.

- Reduced investment risk achieved through standardization by establishing common infrastructure and allocating ecosystem costs amongst multiple players.

- Dematerialization centered on the reduction in physical products and processes resulting from NFC adoption. The Study estimates that total dematerialization can generate a 17% cost reduction over five years, with a 7% difference between the two scenarios.

- Openness and transparency generated through a set of common standards that reduce barriers to entry by providing greater clarity around market business models.

While these market benefits cannot be applied in equal degrees to each stakeholder, their impact is seen across multiple sectors. In aggregate, these benefits constitute some of the core micro-economic impacts of NFC adoption and SIM-based standardization.

The Study is structured in three sections, with each section providing further analysis on the specific benefits and impacts to each stakeholder, as well as, to the market as a whole. Taken together, these macro- and micro economic benefits deliver direct value to the end consumer (see Figure 3, on page 5). Representing the third dimension discussed in this Study, these consumer benefits are centered on the ability of NFC to directly deliver utility and convenience. While the majority of the Study is focused on discussing the cost-side impacts of standardization, in the final analysis it is only through broad collaboration on ecosystem development that significant consumer-driven adoption and usage can be realized.
While the Study is largely focused on the business-to-consumer relationship (B2C), it should be noted that NFC can carry significant potential benefits for business-to-business (B2B) transactions. These potential benefits include greater processing efficiency and service delivery as well as enhanced information and data capture. For industries such as healthcare and aerospace, the ability to capture greater, real-time supply-chain and R&D data can be invaluable in product management. Components equipped with NFC chips can be quickly scanned, inventoried, processed, and integrated into overall product development. Though these benefits are outside the scope of the Study, they further illustrate that the potential impact of NFC is not limited to one dimension or set of use cases but extend along different aspects of the consumer experience and business lifecycle.

Looking across the markets covered in this Study, the maturity of existing NFC trials and initiatives sets a strong basis for potential growth. In analyzing the impact of standardization, the Study leverages these specific market examples to illustrate a set of concrete advantages that can be realized across stakeholders and market sectors. Combining these examples with a broader discussion on the core drivers, the Study focuses on establishing a set of key benefits that may be derived from NFC.

In this light, readers are urged to view the Study not as a definitive statement on the future market for NFC but rather as a benchmark for establishing the broader potential of NFC and defining a set of possible growth trajectories.

Realizing the benefits presented in this Study will be dependent on the ability of market stakeholders to drive increasing scale throughout the ecosystem. This ability will require collaboration across industry verticals and proactive engagement by different regulatory entities across traditional industry boundaries. In ensuring a balanced foundation for standardization and growth, individual regulators will need to incorporate perspectives beyond traditional industry silos and be willing to convene a diverse array of industry stakeholders on common standards.

Ultimately, SIM-based standardization amplifies the benefits of NFC by aligning disparate industry actors and interests on a common foundation for growth. This does not presume diminished competition – quite to the contrary – but rather assumes that regulatory authorities, industry stakeholders and the end consumer are linked in a virtuous circle where greater collaboration yields greater advantages across the market as a whole.

Source: Booz & Company NFC Scenario Model, 2011
Introduction: The mCommerce Market

Innovation in transaction and payment systems has been historically driven by the convergence of new technologies, a shift in consumer behavior, and the development of enabling infrastructure. In the first instance, the impact of this convergence has been centered on ecosystem stakeholders and their ability to collaborate and drive increased value across market sectors.

The history of payment form factors provides a useful benchmark by which to assess the potential impact of new technology on existing transaction channels. As illustrated in Figure 4, the evolution from magnetic strip payment cards to EMV chip represents one phase of payment evolution focused on enabling a common infrastructure for secure transactions. The shift towards EMV was marked by substantial collaboration along the payments value chain – involving equipment manufacturers, payment processors, financial institutions, merchants, and financial regulators. Without this collaboration, consensus on common standards would have been extremely difficult and it is likely that the impact of EMV would have been severely diminished.

Transitioning to mobile, the focus has been on developing new platforms that can enable a new range of products and services. Stemming from the transition from real to virtual payments, this shift towards mobile is indicative of broader trends. Historically, there have not been many disruptive models that have altered the long term trajectory of the industry. Only recently have the emergence of new players such as PayPal fundamentally challenged existing business models by disintermediating traditional players and creating new avenues for delivery, distribution and monetization. This disintermediation is driven by the ability of new actors to identify and capture critical unmet societal needs.

In the case of PayPal, this need focused on the ability to leverage the exponential increase in internet penetration for a new mode and channel of

Figure 4: Evolution of Payment Products

Source: Booz & Company NFC Scenario Model, 2011
consumer engagement. A critical mass of individuals was able to access the internet from home, transforming consumer behavior and driving greater trust in online transactions. Similar to PayPal, the recent growth in mobile commerce is driven by the exponential increase in smartphone penetration and the growing demand for third party applications.

Identifying and addressing these needs, private sector players can enable product innovation and structure new business models that take advantage of shifting market conditions. These new models oftentimes alter the nature of existing value chains, as well as, the roles of prevailing market actors. New payments initiatives, such as those announced by Google and Facebook, illustrate the degree to which the role and position of a specific market actor can be redefined to encompass a new set of behaviors and systems, thereby challenging the predominance of existing value chain players.

One of the principal drivers impacting market shifts and the position of private sector players is the emergence of new technologies and technology standards. Technology innovation in the payments space creates the foundation for new systems, services, products and user experiences. One technology that has emerged as a potential game changer in the payment and transaction space is Near Field Communication (NFC).

Initially introduced in the 1990s, primarily as a contactless transportation application in a limited number of markets such as Hong Kong and Japan, NFC has gained increasing prominence in recent years. Combined with increased security and significant growth in the penetration, as well as, sophistication of smartphones, NFC is seen as providing a potential alternative to current smart card schemes adopted in markets worldwide.

Despite the promise of NFC, commercial adoption is still in very nascent stages. While there have been a substantial number of trials globally, full scale market implementation has thus far been limited to high density urban environments in a select few countries – most notably Japan and South Korea. Challenges to adoption are centered on the difficulty in both implementing and effectively scaling NFC infrastructure across different market sectors.

At the heart of these challenges is the presence of multiple competing processes and technologies for provisioning the Secure Element required for secure NFC transactions. There are generally three models for securing NFC transactions on the handset. The first is focused on the embedding the Secure Element in the handset. This is done by original equipment manufacturers (OEM), and automatically provides NFC capability on the handset. This capability can then be leveraged by third party entities that provide applications which utilize NFC (e.g., Google Wallet).

The second approach leverages an external data card that can be inserted into the handset to enable NFC transactions. This approach has been historically favored by credit card companies and financial institutions. The final approach is centered on incorporating the Secure Element in the SIM chip. This approach leverages the over-the-air infrastructure of the mobile operator to provision security updates and download content.

These different technology approaches represent different business models and commercial value propositions associated with NFC. However, regardless of technology approach, the single biggest constraint facing handset-based NFC adoption is the inability to-date to effectively scale infrastructure and business models across consumer-oriented markets. Further inhibiting growth is the lack of common infrastructure, interoperable open platforms, and defined benefit for players across the value chain. Lacking clear commercial incentives, many relevant market players have simply foregone the necessary investment required to drive consumer adoption and usage. Despite positive indicators on consumer
demand, this lack of common market infrastructure is curtailing the widespread adoption of NFC across market sectors.

Despite these constraints, the disruptive potential of NFC is significant. Particularly when taken in the context of broader shifts in consumer behavior, this potential stands at the center of a mobile-oriented ecosystem. Buttressed by an exponential growth in mobile commerce (mCommerce), NFC represents not simply an extension of existing transaction channels but a new and intrinsic ability to connect online and offline commerce in a single form-factor: the mobile handset. Additionally, NFC carries the potential for unlocking substantial socio-economic benefits and lowering costs across market stakeholders. While many of these benefits are centered on private sector actors, some of the most powerful ones affect the market as a whole and deliver impact across industry and consumers.

The core of the consumer NFC experience is defined by an application-based mobile wallet (mWallet). The mWallet in this context refers not just to a payment application, but to a broader array of functionalities that are linked to a single wallet-based interface. As illustrated in Figure 5, the NFC-enabled mWallet is not a single application but rather a menu centered on a variable set of NFC-driven functionalities.

At the highest level, these functionalities focus on specific transaction environments – such as transportation, ticketing, and loyalty. At a more granular level, the mWallet application enables different tokens to be loaded onto the handset. These tokens can represent individual companies or products, such as different loyalty cards or payment mechanisms.

While the potential of NFC is significant, the ability to realize this potential is dependent on having adequate infrastructure required to drive scale and acceptance across multiple stakeholders. Consumers are likely to adopt NFC only when presented with a near frictionless experience that carries across multiple applications and can be used ubiquitously.

Seen as complementary to existing smart- and contactless cards, NFC will have to not simply recreate a transaction experience but provide additive value to the consumer.

Figure 5: Illustrative mWallet Set-up

Source: Booz & Company NFC Scenario Model, 2011
Today, we are entering a new period of innovation, driven by the near universal penetration of the mobile handset and its ability to become a focal point of daily interaction. NFC, in particular, is at the forefront of enabling an environment where the handset can replace plastic cards as a single, secure mechanism for transactions and interaction. In assessing the potential costs and benefits of NFC, the key question that arises is how different private and public sector entities can collaborate to accelerate the societal and economic benefits resulting from this innovation. At a fundamental level, broad-based NFC adoption will require cross industry collaboration and regulatory engagement in order to enable and incentivize service providers to innovate and create new NFC services.

This Study examines the specific costs and benefits of NFC and assesses the impact of standardization in driving adoption across market sectors. At a higher level, it provides a framework for the role collaboration can play not just in standardization but in reducing barriers to entry, increasing competition, and unlocking broader socio-economic benefits.

The Study uses quantitative and qualitative analysis to assess the impact of standardization and collaboration across a range of market enablers and industry verticals. Focused on determining the broader market externalities and socio-economic benefits of NFC, it identifies a set of key drivers that frame potential growth and impact across stakeholders and market sectors.

This Study assumes that collaboration and standardization will be necessary to accelerating core benefits and to setting the stage for a new era of innovation. While the SIM-based approach is only one of multiple models being tested in the market today, the Study assumes that collaboration around this standard carries significant benefit for all market stakeholders and sectors.
Approach & Methodology: Model Structure and Scenario Assumptions

This Study assesses the potential of NFC technology by examining a variety of quantitative and qualitative factors. The quantitative analysis incorporates market benchmarks, demographic statistics, and sector-specific data. The qualitative analysis examines market trends and establishes key drivers based on a comparative assessment of industry benchmarks. Together, they present a holistic basis for assessing the potential benefit of NFC and establishing the impact standardization can have on further accelerating these benefits across industry and consumer sectors.

At the highest level, the cost-benefit analysis examines two scenarios in order to understand the organic conditions for NFC uptake in the market, as well as, project the impact of standardization on growth trends. A number of core characteristics define the scenarios and frame how the cost-benefit analysis is structured:

Scenario One: Collaboration and Standardization
The key drivers in this scenario are centered on the broad standardization and uniform adoption of SIM-based NFC across a variety of verticals. Specifically, this scenario assumes the following underpinning conditions:

- Full standardization of SIM-based NFC, with all ecosystem players adopting common infrastructure and protocols.
- Collaboration is focused only on technology standards; it does not presume collaboration on go-to-market strategy, asset structures, or joint investment.
- MNO manages the Secure Element.

- Financial impact of collaboration and standardization is limited to economies of scale.
- Principal ecosystem impact driven by cost-reduction and network effects for key private sector stakeholders, as well as, externalities, particularly around lower barriers to entry.
- Consumer experience defined by cross-sector and cross-product interoperability.

As discussed further in the Study, the normalization of a single NFC standard does not presume a business model centered on a dominant player (e.g., MNO, bank). Rather, it assumes that the impact of standardization is carried across market stakeholders. As illustrated in Figure 6, this impact extends across enabler verticals – such as banks, operators and OTT players – to drive bottom line benefits to a range of verticals.

Figure 6: Scenario One Approach

The impact of standardization is modeled assuming an increase to the base transaction case. This case is established using trend projections based on market data and sector-specific benchmarks. The scenario model assumes that standardization is driven across all market sectors, leading to greater adoption of NFC-enabled infrastructure by all ecosystem stakeholders. Specifically, it assumes that the rate of infrastructure replacement will be higher across all provider verticals due to the commercial benefits derived from standardization. These benefits, discussed throughout the Study, extend to impact...
the implementation rate of NFC-enabled POS terminals, transport turnstiles, and ticketing counters. Moreover, the model assumes higher uptake and usage levels resulting in part from accelerated implementation of core ecosystem components by enabler verticals.

**Scenario Two – Fragmented Adoption:**
In contrast to Scenario One, the key assumptions underpinning this scenario are centered on defining the baseline environment for NFC and projecting potential growth based on individual market conditions. It inherently assumes the presence of multiple competing schemes, not just with regard to product competition but with respect to technology standards and business models. Opportunistic collaboration between stakeholders – based on current market partnerships – drives adoption in different sectors but fails to realize broader multiplier effects and accelerated adoption generated through a common technology framework. Adoption is further constrained by limited regulatory engagement, leading to the adoption of *ad hoc* standards and inhibiting full interoperability through open infrastructure.

As illustrated in Figure 7, in a fragmented scenario, different stakeholders are predisposed to use different Secure Element models depending on their position in the ecosystem. Individual enablers are compelled to use different models, based on their ability to define the user experience, capture the data, own the customer, control the technical architecture, and maximize the revenue stream. As a result, while the penetration of NFC-enabled handsets may increase with time, the usage levels will be negatively impacted by the inability of consumers to inherently use their handset across different verticals and product offerings.

**Figure 7: Scenario Two Approach**

Adoption in this scenario is likely to increase organically across different sectors and disproportionately affect different ecosystem stakeholders. For instance, without standardization, adoption in the transportation sector is likely to occur on an agency-level and trend along historical upgrade cycles and infrastructure investment parameters. As a result, the increased friction and inability of consumers to use the NFC functionality broadly across market sectors will impact NFC uptake and usage in the market.

Taking standardization of SIM-based NFC as the core differentiator between the two scenarios, the cost-benefit model is designed to test the hypotheses around adoption and impact. As illustrated in Figure 8, on page 12, the model structure applies these scenario-level assumptions to existing market baseline data. Driven in-part by the size of supporting NFC infrastructure and corresponding investment by different market stakeholders, the resulting growth rates are applied to estimate future transaction flows across the different scenarios.
The approach underpinning the quantitative outputs combines bottom-up and top-down analysis to determine the likely growth trend of NFC across different markets sectors (Figure 8). On a sector basis, this growth was estimated through statistical data such as the size and sophistication of existing transportation systems, the quantity of retail transactions, the estimated number of POS terminals, and the number of entertainment venues in the market.

This statistical data was then applied to the different assumptions underpinning the two core scenarios. These assumptions were centered on usage and uptake in each of the different sectors, and are based on two sets of data. The first set is internal data and analysis on comparable market models and specific uptake variables (e.g., adoption rates, platform cost). This data set was then further substantiated by applying a second data set which looked at specific market benchmarks for individual variables (e.g., redemption rate of digital couponing, cost of cash, throughput rate for turnstiles, and rate of replacement of transport infrastructure).

Together, the resulting projections were validated and sense-checked against publicly available third party sources, including Frost & Sullivan, Juniper, IE Market Research, and Data Monitor. These third party projections were applied to ensure that our results were in-line with other, independent trend analysis.

The scenarios that frame this Study present only two possible trajectories for how NFC can evolve in the market. Particularly in the Collaborative Scenario, growth estimates are predicated on an optimum environment for NFC adoption. As such, these estimates should be viewed as projections based on available on market data. While these projections present a high level of quantitative analysis, ultimately they are not intended to convey finality to the specific future market size of NFC. Rather, they should be viewed as a marker for validating the broader benefits and trend lines of NFC and SIM-based standardization.
Socio-economic Benefits:

Five Externalities Generated through NFC Standardization

To understand the potential socio-economic impact of NFC requires assessing the existing basis for market adoption and growth. Projecting uptake trends is dependent on evaluating the enabling conditions within the market and key to determining the potential volume of NFC transactions that drive aggregate benefits. In this light, the argument around collaboration and standardization is one predicated on an exponential growth in the existing, baseline trends evident in the market.

The following sections analyze baseline conditions for NFC adoption across the six core market regions: the E5 (including Spain, France, Germany, Italy, and the United Kingdom), Japan and Korea, Brazil, Canada, and Australia. Drawing on these individual cases, the Study extrapolates a set of broader socio-economic benefits that can be realized across different market environments. To this end, both the market analyses and the underpinning quantitative projections serve to validate the core hypotheses of the Study and should be viewed in the larger context of these overarching benefits.

Within the E5, this foundational basis for NFC uptake is maturing rapidly. As illustrated in Figure 9, NFC initiatives across Europe – involving multiple stakeholders – are testing both the consumer value proposition, as well as, the commercial structures that underpin go-to-market approaches.

While these trends illustrate that the foundations for NFC deployment are developing in the E5, adoption is likely to be relatively slow and fragmented. Though operators are collaborating on the introduction of NFC initiatives, this collaboration is largely done on a market-by-market basis and mostly limited to the intra-industry level. Broad inter-industry collaboration between operators, banks, card entities and OTT players continues to be minimal and largely limited to targeted pilot programs in specific market sectors.

Initiatives are led between different groups of entities advocating different technologies and different approaches to market adoption. Illustrative of this, some operators are viewing NFC as a consumer-branded, product-oriented value proposition whereas others view it predominantly as a channel play – focused on enabling broader back-end infrastructure. Beyond the Telco sector, different strategies pursued by different market stakeholders are fueling uncertainty with regard to which standards, processes, and business models will be adopted by the broader market.

These trends are not unique to the E5, but can be seen across other markets as well. In Australia, early NFC initiatives included both operators such as Telstra, as well as, banks such as National Australia Bank (NAB) and card networks like VISA.

Figure 9: Select European NFC Initiatives

Source: Booz & Company NFC Scenario Model, 2011
Despite these initial efforts, collaboration between different market stakeholders has proven difficult and these initiatives have not developed beyond the initial pilot phase. While both operators and banks enjoyed substantial market presence, insufficient infrastructure coupled with a lack of clarity around the basic business model resulted in an inability to effectively scale.

The emergence of competitive schemes by banks, card networks and OTT players in the Australian market has driven greater consumer and merchant awareness of the NFC value proposition. Additionally, these efforts underpin an expansion of NFC infrastructure in the market. However, obstacles remain and are centered on the ability to realize greater scale and clarity around the value of NFC to the consumer and smaller market players. Much as with Australia and the E5 markets, the implementation of NFC initiatives across Canada and Brazil reflects similarly constrained infrastructure conditions that are predicated on a relatively small number of market players.

The Canadian market has only recently begun to trial NFC services on a limited basis and reflects some of the strategies adopted by European market players. In contrast, the opportunity in Brazil is characterized less by the presence of existing initiatives or infrastructure but is centered on the limited penetration of electronic payment services and the exponential growth of mobile and digital products.

While these markets differ with regard to the state of NFC maturity, common themes centered on the importance of infrastructure development and the impact of collaboration can be applied equally across the board. NFC development across these markets has been largely led by small groups of leading industry stakeholders. In the case of Japan, this has been largely focused on the efforts of mobile operator NTT DoCoMo to develop and drive acceptance of its NFC-enabled products. Whereas this has necessitated substantial investment over the last seven years, efforts in Canada and Brazil are more nascent and at much smaller scale. Centered on the banking and telecom sectors, these efforts have been largely focused on testing the basic value proposition of NFC across different consumer segments.

These trends illustrate that even though the foundations for NFC deployment are developing across markets, adoption is directly linked to the prevalence of compatible infrastructure and the degree of product awareness in the market. Though different initiatives are being pursued in the market, this lack of broader infrastructure adoption is inhibiting the real utility of NFC products to
consumers and limiting the relative awareness of NFC in the market. These limitations are not just centered on scale but also on the inherent flexibility of that infrastructure to accept myriad transaction products through an open architecture.

Even in Japan, which has arguably the world’s most mature NFC ecosystem, infrastructure development has been largely led by DoCoMo. Instead of collaborating with retail entities and financial institutions, the early approach taken by DoCoMo was centered on investing substantial resources into acquiring ownership in existing financial institutions, card companies and retail chains. While this has resulted in comparatively high consumer adoption, actual market penetration remains more limited to the partnerships DoCoMo has been able to structure in largely high density, urban areas.

Though not nearly at the same scale, NFC initiatives launched in Canada and Brazil reflect similar trends around the impact of infrastructure development. In Brazil, recent NFC initiatives have been implemented by large market actors. Examples of this include limited pilots by Bradesco bank and VISA, as well as, the mobile operator Oi Paggo. While Brazil has substantial market potential, the limited development of infrastructure constrains short-term NFC adoption.

Canada has seen increasing collaboration between leading mobile operators to develop a joint NFC go-to-market strategy. Further reflecting the market potential of NFC, Canadian operator Rogers Wireless has applied for a banking license with the Canadian Ministry of Finance. Though unlikely to offer full service banking products, the move illustrates a broader desire by operators to enter the payments space. While adoption is still in nascent stages, these trends indicate both recognition of core infrastructure requirements and increasing pressure on other market players to enter the NFC space.

While large market stakeholders can drive initial acceptance and uptake of NFC products, ultimately the lack of ubiquitous scale inhibits the degree to which NFC will be adopted in the market. This is further constrained by the presence of multiple initiatives pushing different standards and models. One consequence of these disparate initiatives is that broader market adoption will be constrained by a limited trickle-down effect; though smaller market players may recognize the value of NFC, they are unlikely to actively adopt it without a broader acceptance framework in place.

The impact of this will be most significant in the consumer retail sector, where a lack of merchant adoption by high street retailers will directly yield much more limited uptake by average consumers. As a result, while NFC implementation is likely to continue, the growth rates associated with this implementation will be flatter and closely correlated to individual initiatives.

Even at flatter adoption rates, NFC transaction volume in the fragmented scenario will continue to grow at relatively exponential rates. The slope of the adoption curves differs depending on the market environment. Markets such as Korean and Japan will see flatter slopes and a smaller difference between the two scenarios due to the significant existing presence of contactless infrastructure. In contrast, markets such as Canada and the E5 will see more substantial growth rates driven by high propensity for consumer adoption and substantial room for infrastructure growth.
Across all markets, this growth is driven by a variety of factors, most notably:

- Widespread – and growing – penetration of NFC smartphones.
- Increasing penetration of contactless POS terminals.
- Growing familiarity and comfort with m-Commerce and e-Commerce products.
- Increasing visibility of NFC products – through multiple channels and across multiple sectors.
- Growing investments by a diverse array of private sector players in core NFC infrastructure development.

This increasing activity around NFC is not centered on any specific stakeholder but is being pushed across multiple sectors and markets. The efforts by mobile operators and financial institutions at a national level are indicative of this trend. At a broader level, however, interest in NFC by a diverse array of stakeholders and industries – such as transport, automotive, and government – underpin both growing critical market mass around the core value proposition and increased need for collaboration around standards.

Underpinning the trajectory of these trends, regulatory engagement can be seen as a principal driver in channeling collaboration towards a standardized framework on technology and processes. Influencing financial institutions, mobile operators, card networks, transportation authorities, retail entities, public sector authorities and – ultimately – the consumer, regulatory engagement can set the stage for widespread adoption and trigger broader socio-economic benefits.

As they evaluate how to engage with a broad array of private sector actors, regulatory authorities across multiple sectors have to balance the positions of different players and determine an approach that aligns different policy perspectives in order to most effectively shape market evolution. The resulting approach can set a broader stage for cross-industry development by aligning standards across industries and sectors.

The impact potential of regulatory engagement can be seen across different market environments. In Australia, the Reserve Bank (RBA) has taken a forward-leaning position with regard to defining the regulatory parameters for payments innovation. With a particular focus on understanding the broader possibility for mobile-enabled payments, the RBA has shown a willingness to consider not just the commercial potential of payments innovation but the structural and policy impact of direct regulatory engagement.

Similarly, regulatory authorities across the E5 are considering the impact of NFC on existing payment systems. Within the European Commission (EC), the implementation of the European Digital Agenda recognizes the potential impact of NFC across different constituent markets. In addition to activities at the national and EU level, the actions taken by the European Payments Council (EPC) further reinforce the impact of regulatory engagement on a European level. In May, the EPC issued guidelines for mobile contactless transactions in the Single Euro Payments Area (SEPA) with the stated intent of expediting the implementation and development of NFC products.

These efforts are not limited to regulators but extend to a broader range of national, regional and local
government authorities. Aligning government engagement along multiple levels can significantly aid the development of NFC. As shown in the case of France, direct government support of NFC development has led to greater adoption across ecosystem stakeholders. This support exists on multiple levels, incorporating over €20 million in financial incentives and awards with broad public sector backing to de-risk investment by private sector entities. The interplay of public-private engagement has proven to be a significant driver for potential adoption.

Initially focused on Nice, the support and engagement of government entities has led to the expansion of NFC pilots to numerous other cities in France. While financial support has been an important driver, of equal importance is the convening power and institutional weight that government entities can leverage to bring disparate players together in validating the value of NFC and raising awareness across market sectors as well as consumer segments. To this end, the French case illustrates that collaboration between government entities, regulatory authorities and private sector stakeholders can jump-start the creation of a holistic NFC ecosystem.

Adopting this systemic perspective, standardization of SIM-based NFC can exponentially drive the implementation of new transaction and payment services across a range of sectors and industries. At the core of the standardization argument is the premise that a single approach to NFC can be mutually reinforcing across all ecosystem actors. The case for regulatory intervention rests not on the benefits to any single industry player or vertical, but rather on the merits of aggregate socio-economic impact and externalities that can be realized through broad cross-industry support and open standards.

Overall, the cost-benefits driven through standardization can create an environment where supply-side gains are realized across the full range of market stakeholders. Ultimately, this impacts not just existing private sector players but carries the potential of generating a broader range of socio-economic benefits. These benefits are not distinct from the supply-side gains described above, but are externalities that emerge as a result of decreased systemic costs and increased competition due to lower barriers to entry. Five socio-economic impacts identified through the cost-benefit analysis include:

- Reduced carbon footprint
- Increased financial transparency
- Improved public sector servicing (e.g., health, social security agencies, etc.)
- Increased competition (both at a market and at a local level)
- Greater consumer choice and value

The case for carbon offsets is principally centered on the ability of NFC to reduce the need for physical cards, tickets, coupons and receipts. While NFC itself is not likely to substantially reduce emissions, it can reduce carbon costs associated with producing physical products.

Transcending any particular sector, this impact can be potentially significant and is directly correlative to increased transaction volume across individual groups of stakeholders. For instance, NFC enables transportation authorities to reduce the number of plastic contactless cards and allows retailers to shift from paper to digital couponing. These impacts could be particularly significant in the cases of transport and consumer couponing.

Cases such as the implementation of the Oyster Card in the United Kingdom and Octopus in Hong Kong suggest that the ability to compel systemic adoption of a particular form factor can have substantial impact. Demonstrating adoption rates of over 80%, both of these contactless card schemes illustrate that shifting from paper to contactless cards can be significant in the transportation sector.
Similar to transport, the adoption of electronic couponing in the consumer retail sector can help drive carbon offsets. This is particularly relevant in the case of NFC, as digital coupons enabled through NFC present merchants with both enhanced utility, as well as, reduced costs associated with paper coupons. The opt-in and redemption rates for digital coupons – and NFC in particular – tend to be substantially higher than paper-based couponing. As a result, merchants can not only be more sophisticated in how they target consumer segments but also be more strategic in how they allocate resources to marketing and promotions.

The aggregate value of this shift from physical to digital products increases as NFC-compatible infrastructure grows and consumer adoption increases. Standardization is at the core of amplifying these benefits by creating a common foundation for infrastructure development and interoperability of consumer products. As a result of standardization, markets can realize a potentially significant increase in carbon offsets (Figure 12).

Figure 12: Aggregate Projected NFC-driven Carbon Offsets

As a result, greater adoption and usages rates in later years drive an increased shift towards digital channels and yield significant potential reductions in carbon emissions. While this serves only as a projection, the larger take-away is centered on the potential impact NFC can have – provided there is scale in the market.

Another socio-economic benefit is centered on increased financial transparency. Evidenced in the broader adoption of electronic payment channels, NFC has the ability to provide greater granularity around individual transactions. This granularity can be used – both at a macro and micro level – to inform and capture data for a range of public sector objectives such as taxation, customs collection, and AML/CFT.

The ability to capture increased data around individual financial transactions enables the government to create more informed collection processes (e.g., taxation) while also ensuring a higher degree of protection against money laundering and other forms of fraud. Moreover, when applied to the broader NFC ecosystem, government entities can gain greater insights on the utilization and impact of tax payer resources. For instance, tracking spending on transport would provide public sector entities with invaluable data on usage trends and capacity planning.

Much as with carbon offsets, SIM-based standardization can augment the impact of NFC on financial transparency. This impact is directly related to the volume and diversity of transactions; the more people use NFC to make a wider range of transactions, the greater the level of financial transparency achieved. Standardization realizes this volume and diversification effect by enabling an interoperable infrastructure across multiple sectors.

The potential benefit of NFC to public sector agencies gains additional relevance when considering the impact it can have on increasing efficiencies of existing public sector services. For instance, transitioning patient access and data in the
national health system from physical cards to an NFC-enabled application on the handset could create substantial cost savings, as well as, significantly reduce latency associated with data access and processing. Additionally, it can create enhanced provider engagement with patients by enabling a richer data history and more informed care.

These benefits are not limited to the health sector but can extend to social welfare and social security, pensions, utilities, and a host of other potential applications. The benefit of SIM-based standardization is realized not only through increased transaction volume and greater infrastructure scale, but also in ensuring equal access across users and service providers in enabling NFC-driven products. Standards-based interoperability can drive greater private sector competition around developing innovative, data-driven applications that can be used by the wider population – rather than specific consumer segments.

One recent initiative in the United States, the Community Health Data Initiative (CHDI), illustrates the potential benefits derived from standardization and digitalization. Led by the White House and the Department of Health and Human Services, the CHDI is focused on digitalizing massive amounts of government data and providing access to developers through an open API. Through this effort, these public sector entities were able to incentivize the creation of new, commercialized applications using digital data sets. Mostly developed by third party developers, these applications leveraged both API access from the government, as well as, the open developer platforms on Android and iOS.

Though the CHDI did not directly incorporate NFC, the initiative illustrates both the potential of greater digitalization across public sector entities, as well as, the benefit of an open platform in delivering the benefits of individual applications. The success of the initiative was directly driven by the ability of developers to have access to the same data and to leverage that data for applications that could extend across multiple platforms and be used by the vast majority of smartphone users.

Extrapolating the CHDI case to NFC, the argument is not only centered on the ability to provide enhanced functionality but also on the impact that standardization can have on generating broader market externalities. The lessons learned from CHDI are that the government’s ability to effectively leverage technology can create trickle down benefits that ultimately impact consumers, service providers and the government. The second, implicit, lesson learned is that standardization and an open environment can create significant product development through increased competition between a greater array of market players.

While increased competition due to standardization has been discussed throughout the Study, it is worth discussing in greater detail how this impacts different market players. At one level, standardization increases competition by creating a common framework within which infrastructure is developed and augmented through economies of scale.

These cost reductions impact a range of ecosystem enablers and help drive scale across different infrastructure components. In contrast to the fragmented scenario, where OTT players such as Google, Apple, PayPal and Groupon become the principal winners, standardization enables a greater balance of benefits across all stakeholders.

While these benefits are most immediately obvious with market heavyweights, some of the most profound competitive advantages are driven at a local level. With technology standards guaranteed, local businesses – particularly in the consumer retail sector – can develop products that are aligned with substantial resources into infrastructure and technology development.
These actors are in many ways uniquely positioned to take advantage of the NFC value proposition, leveraging increasing penetration through standardization to develop products that incorporate features such as loyalty and couponing at a targeted, local level.

Providing a local alternative to the typical geography agnostic e-Commerce experience, these products can combine the proximity-based features of NFC with the ability to develop value propositions that leverage local content, physical points-of-sale, and aggregated digital data to effectively compete with national players. Examples of this, such as the e-Commerce start-ups Milo.com and Shopkick.com, suggest that the combination of local content with loyalty and physical points-of-sale could be a powerful driver for both developing local businesses and capturing new revenue streams.

In addition to the above externalities, one of the core benefits of standardization is centered on increased consumer choice and value. At the heart of these consumer-oriented benefits is the ability for standardization to amplify a cohesive set of NFC-driven use cases that define not just individual value propositions, but a holistic consumer experience. As illustrated in Figure 13, the core value derived from standardization is the ability for consumers to use an interoperable mobile wallet to enable a range of activities and applications, provided by multiple stakeholders across numerous industry verticals.

The most substantial impact of standardization in driving consumer choice and value is centered on this ability to create interoperable products between market sectors and to increase competition associated with new product development. Together, these two impacts ensure that more consumers can use NFC-enabled handsets to access a greater variety of products across multiple sectors.

One principal factor differentiating consumer behavior across markets is disparate societal attitudes and tendencies towards new technology and payments. In Canada and the E5, for example, the added convenience and novelty of mobile payments facilitated by NFC usage is less immediate because these markets already have a developed, widespread chip and pin (non-cash) payment system in addition to a high penetration of traditional credit card infrastructure.

Conversely, Japan and South Korea exhibit well developed NFC infrastructure that has been developed over the last decade. During this period it has been actively pushed by leading stakeholders. One reason for higher adoption rates amongst Japanese and Korean consumers is this exposure to the benefits of contactless technology.

This exposure has been crucial in building a positive consensus around the acceptance of NFC infrastructure such as NFC-enabled turnstiles and POS terminals. Additionally, the high rates of

Figure 13: NFC Consumer Experience

![Figure 13: NFC Consumer Experience](image-url)

Source: Booz & Company NFC Scenario Model, 2011
urbanization found in both Japan and Korea provide further incentive for adoption. This makes NFC technology, with its reduced transaction times and throughput rates, appealing in high queuing environments such as consumer retail and public transport.

High market potential for NFC adoption in Brazil is principally driven by its large population and underdeveloped banking services. For a large portion of the population, the ability to have cards stored on their phones for easy payment is a far more attractive option that having to travel long distances regularly to use bank branches and ATMs. Brazilian middle class consumers are also increasingly likely to adopt NFC due to its ability to integrate the core value proposition with other digital consumer products such as loyalty, social media, and location-based services (e.g., coupons).

The socio-economic benefits derived from standardization extend not just to the consumer experience but also to the function of that experience in amplifying usage and adoption. While different consumer segments may be skeptical about the advantage of NFC, it is likely that greater infrastructure development will play an important role in winning over consumers.

At the core of this argument is the assertion that the supply-side benefits realized through standardization lead to more innovative products which, buttressed by common technology infrastructure and architecture, see exponentially increased penetration and usage. This creates a reinforcing cycle, where increasing supply and utility (as a function of infrastructure acceptance), drive greater consumer adoption and usage. Greater adoption and usage, in turn, amplify and augment broader socio-economic benefits.

Figure 14: Core Socio-Economic Benefits Realized Through Standardization

<table>
<thead>
<tr>
<th>Key Messages</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase competition</td>
<td>Through reduced cost and infrastructure barriers, creating a more conducive enabling environment for national as well as local market players.</td>
</tr>
<tr>
<td>Greater consumer value and choice</td>
<td>Driven by increased competition and the need for greater product innovation as well as price differentiation.</td>
</tr>
<tr>
<td>Increased financial transparency</td>
<td>Driven by the widespread adoption of NFC, which provides insight on financial transactions, including tax, customs and anti-money laundering/ combating the financing of terrorism (AML/CFT).</td>
</tr>
<tr>
<td>Improved public sector servicing</td>
<td>Realized through public sector adoption of NFC-enabled delivery and service products (e.g., identity, health, social security cards).</td>
</tr>
<tr>
<td>Reduced carbon footprint</td>
<td>Achieved through an increased growth in electronic payments, a general reduction in cash processing and card manufacturing, a reduction in the use of paper for tickets, coupons and receipts, and greater incentives for the adoption of digital alternatives. The Study estimates that standardization can drive as much as a 43% reduction in carbon emissions across the categories examined over the five year timeframe, with a 20% difference between the two scenarios.</td>
</tr>
</tbody>
</table>

Source: Booz & Company NFC Scenario Model, 2011
Market Benefits:
Five Commercial Impacts Driven through NFC Standardization

In addition to socio-economic impacts, NFC can drive a number of key commercial benefits across ecosystem stakeholders. These benefits are principally centered on the cost reductions enabled through NFC and enhanced through standardization. While these cost benefits are realized across all stakeholders, the degree of impact differs depending on the position of the stakeholder in the market.

The Study assesses this degree of impact by differentiating between Provider Verticals and Enabler Verticals.

Provider verticals include stakeholders that are positioned to directly deliver NFC-enabled products to the end consumer. These principally include merchants (consumer retail), transport entities, entertainment ticketing enterprises, as well as, government entities (Figure 15).

While the strict distinction between provider and enabler verticals is somewhat artificial, it serves to illustrate how cost benefits realized through NFC carry different impacts depending on the stakeholder. For provider verticals, these impacts are largely centered on operational cost benefits, such as reduced cash processing and more effective consumer engagement. Conversely, for enabler verticals, these impacts are driven by implementation cost benefits, such as increased economies of scale and reduced investment risk.

Standardization enhances these impacts by both reducing the real costs associated with NFC implementation, as well as, amplifying the impact derived from NFC itself.

Figure 16: Cost Benefits for Verticals

Forming the basis for an exponentially increasing rate of NFC infrastructure development, SIM-based standardization mitigates operational risks, decreases investment requirements, and reduces product-oriented latency through three principal avenues:

1. Economies of scale
2. Assurance around technology standards and processes
3. Interoperable NFC handsets and contactless readers that are Single Wire Protocol (SWP) compliant

Source: Booz & Company NFC Scenario Model, 2011
Each of these avenues delivers real, as well as, marginal benefits across all stakeholders engaged in NFC ecosystem development. Standardization can help realize economies of scale by mandating common technology and process interfaces for NFC transactions. This would effectively create a common framework for implementation across a range of industry verticals, driving a marginal reduction in cost due to increased production volume of NFC infrastructure components.

In addition to economies of scale, standardization can establish assurance around technology standards and processes. This provides a common framework within which companies can make investment and operational decisions while mitigating the uncertainty around competing standards and processes. This substantially decreases real barriers to entry by providing a foundation upon which all products and services are built. It also has the potential for increasing the rate of innovation by lowering the risks associated with research and development. Reducing uncertainty around competing standards, new market entrants can be assured of a baseline standard that carries across different sectors and stakeholders.

One significant benefit realized through SIM-based standardization is the substantial increase in interoperable NFC handsets and contactless readers. Driven by mobile operators, standardization will lead not only to a greater number of handsets that are NFC-enabled but also to the ability to transact without being constrained to a specific set of channels. Additionally, the adoption of SIM-based standards will enable handsets to be used across markets, rather than being constrained to individual countries, further driving economies of scale across stakeholders and sectors.

Implicit in the growth of SIM-based handsets is the broader support network developed by mobile operators to secure and enable NFC transactions. Scaling this infrastructure across market players ensures that transactions can be initiated in any NFC-enabled environment, while maintaining security over the transaction and the ability of third party financial institutions to authorize, authenticate, and audit those transactions as required. As a result, the argument around handset penetration is not simply focused on the total number of NFC handsets but on the interoperability of those handsets and the broader network infrastructure enabled through standardization.

In aggregate, this means that standardization can incentivize infrastructure development and product innovation across market stakeholders by decreasing the fear that initial investments will fail due to the inability of a specific standard to be accepted by the broader market. Simply put, lack of standardization will force industry players to hedge positions and will likely lead to a situation where only the biggest market actors can effectively implement NFC. The absence of cross-industry support on regulatory standardization will force many players to adopt a ‘wait and see’ attitude, substantially reducing the potential infrastructure development of NFC and restricting the competitive environment to only the biggest entities.

The NFC experience is defined by the ability of individual market players to adapt the mWallet application on the handset to a core set of consumer interactions. For retail players, this set of interactions begins at a transition from online to in-store shopping, where the mWallet can enhance the shopping experience through the delivery of real-time, location-based couponing and promotional offers at the point-of-decision.

Transitioning from shopping to buying, the NFC mWallet enables consumers to instantly redeem coupons and pay at the retail point-of-sale (POS). Capturing transactions across a customer base, retailers can more effectively deliver incentives and create a richer, more individualized user interaction. There are five specific ways through which NFC can deliver benefits to retailers (Figure 17, on page 24).
These benefits are focused on how NFC can enhance the way individual retailers engage with consumers and more efficiently address current cost margins. Driving transaction volume through targeted couponing and improved data analytics, NFC can augment existing sales channels in the consumer retail sector through the following capabilities:

- Increased sales for individual merchants
- Improved ability to target consumers at the point-of-decision
- Seamless user experience
- Improved data around customer segmentation and sales analytics
- Targeted marketing tools, allowing optimized sales campaigns

In addition to driving transaction volume, NFC has the potential of offsetting current operating costs. Centered on costs associated with queuing, fraud and cash handling, NFC has the potential to create the following operating efficiencies:

- Faster queuing due to reduced check-out times
- Decreased operational costs driven by lower personnel requirements
- Decreased fraud driven by greater authentication and audit
- Greater consumer awareness around stolen handsets
- Reduced cash handling realized through a shift from physical to electronic payments

With core implementation costs centered on POS upgrades, the net benefit to retailers can be significant provided that there is substantial scale and infrastructure for NFC transactions in the market.

This scale and infrastructure is being steadily built across the E5 countries; both MasterCard and Visa have aggressively expanded their penetration of contactless devices and terminals. Their strategic partnerships for PayPass and PayWave with market-leading high street chains like Krispy Kreme, McDonalds and Subway have been a source of early success and form an important foundation for the expansion of NFC merchant acceptance.

In addition to E5 level initiatives, there are a number of market-specific initiatives. Of these, one of the most high-profile is the accelerated contactless POS adoption and infrastructure development in London ahead of the 2012 Olympic Games. This effort has seen close collaboration between multiple players. MasterCard’s sponsorship of London’s Underground Metro System, Visa’s sponsorship of the Games themselves and proactive engagement by the nation’s leading banks illustrate how cross-sector collaboration can set the stage for more rapid and widespread infrastructure development.

This has led to cooperation not just between banks and processors but between central and local government as well, combining their efforts to generate momentum across different sectors for contactless payments. While representing a local initiative, the efforts and visibility associate with the London Games carry the potential for validating different aspects of the value proposition and adding further weight to global go-to-market models.

Similar to trends in the E5, current initiatives in Australia, such as MasterCard’s PayPass, are driving new POS adoption and could serve as an important kick starter for NFC adoption. These initiatives suggest that the implementation rate could
accelerate, with MasterCard announcing that starting in October 2012 all of its cards issued in Australia will include PayPass contactless technology.

The growth of contactless POS infrastructure is important in assessing both the incremental cost to retailers, as well as, the broader enabling environment for retail-oriented NFC transactions. PayPass cards can currently be used at over 35,000 retail locations in Australia, including major merchant retailers such as McDonald’s, Bunnings and 7Eleven. In the case of MasterCard, it has mandated that by April 2014 all MasterCard merchants must have POS terminals that accept PayPass payments.

Contactless infrastructure in Japan has already developed to a significant degree. Here the approach of mobile operators such as NTT DoCoMo, KDDI and Softbank Mobile has been instrumental in driving growth. Through effective implementation of POS devices, high brand visibility, and collaboration with other market players, the company has been able to gain the backing of a majority of the Japanese mCommerce ecosystem. This has greatly helped in increasing the popularity of existing mobile wallet schemes, such as DoCoMo’s Osaifu-Ketai wallet product.

In addition to DoCoMo, a number of other retail-oriented initiatives are targeting further consumer adoption in Japan. The recent efforts by Google rank among the more prominent of these. Focused on Tokyo, Google is currently conducting NFC trials centered around gathering feedback on optimum locations for POS devices. Such trials will be crucial to effective infrastructure development, by ensuring that initial devices are fully utilized and gain maximum exposure to the public.

South Korea echoes the NFC growth trends visible in Japan, with substantial industry momentum directed towards developing further infrastructure and acceptance networks. In June 2011, the Korea Communications Commission (KCC) signed a landmark agreement between MNOs, credit card firms and government to collaborate in the promotion of NFC technology. The agreement calls for 300,000 NFC-enabled points of sale to be installed in South Korea by the end of 2011 and stipulates that all new smartphones must include NFC capabilities. The breadth of this potential collaboration suggests that NFC infrastructure development in South Korea is likely to accelerate in the intermediate future.

Current trends in Canada point to similar infrastructure development in the intermediate term. One indicator of NFC POS infrastructure development is the efforts of Visa and payment processor Payfirma. Visa’s Digital Wallet is being fully supported by Canada’s leading banks, expanding the scope of the technology to a broad base of different consumers. In addition to Visa, Payfirma’s move to support NFC payments on RIM handsets can be viewed as a significant market development – particularly given RIM’s substantial market share in Canada.

In addition to NFC POS developments, mobile operators are driving NFC infrastructure development across a range of markets. In France, Telecom/Orange is currently involved in a number of initiatives that could drive substantial growth in NFC infrastructure throughout France. The first of these initiatives is Cityzi, which has been launched in Nice and provides users with the ability to conduct a range of NFC transactions. Implemented in collaboration with other French operators Bouygues and SFR, the focus for Cityzi is to provide an open and interoperable platform that can be used by a range of service providers.

This reflects a broader strategy focused on enabling the wider NFC ecosystem through open standards that can be adopted by a variety of players in the market. Moving beyond Nice, Orange is positioning itself as a back-end system enabler for NFC transactions – leveraging its open platform to facilitate a greater transaction volume through an increased number of active stakeholders.
The Cityzi initiative reflects Orange’s wider NFC ambitions in the French market. Its publicly stated goal of selling half a million NFC-enabled handsets by the end of 2011 will be a strong driver in accelerating consumer demand for NFC services. Additionally, the introduction of new NFC-enabled devices is likely to lead to greater consumer awareness and an increased willingness to adopt new products and services.

While Orange’s broader strategy appears focused on facilitating NFC ecosystem development rather than individual-oriented and consumer branded products, the growth of consumer-facing infrastructure will prove significant in driving overall adoption and usage rates. This is particularly the case as increased collaboration between multiple operators, financial institutions, and third parties such as retailers help drive acceptance of a common NFC infrastructure. In Germany, Deutsche Telekom introduced NFC services this year, adding to its existing presence in Western Europe. Further, it has stated that initial NFC services will be on a common platform, suggesting collaboration between European MNOs in developing the NFC market Infrastructure. This trend is further reinforced by operator-led initiatives in Spain and the UK.

In the case of the UK, collaboration between Everything Everywhere/ Vodafone/ O2 has generated significant interest in nascent NFC growth. This builds on previous attempts in the UK to launch NFC services, particularly the joined effort between Barclays and Orange to implement a consumer-oriented NFC-card. In addition to the UK, Spain is seeing increased NFC momentum, with three leading mobile operators (Orange, Telefónica Movistar and Vodafone) having signed a NFC collaboration agreement earlier this year.

These trends illustrate a tendency by operators to collaborate in order to reduce market fragmentation, maximize uniformity and leverage market investment.

There are also instances of competition, as well as, collaboration spurring infrastructure developments outside of the E5. One example of a rapidly maturing NFC market is Turkey. Last year, the Turkish operator Avea collaborated with Garanti Bank to roll out a NFC add-on for handsets, facilitating wireless payment in stores and enabling distribution of digital coupons. These efforts build on existing contactless initiatives developed by Garanti. Of these, the Bonus Trink program gained

Figure 18: European NFC Initiatives (non-exhaustive)

<table>
<thead>
<tr>
<th>Description</th>
<th>Status</th>
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<tbody>
<tr>
<td><strong>O₂</strong></td>
<td>Mobile Commerce Joint Venture between the UK’s three largest MNOs, with an estimated joint base of 66m SHMs</td>
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<tr>
<td></td>
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<tr>
<td><strong>ING</strong></td>
<td>NFC mobile payment JV consisting of three MNOs (KPN, Vodafone and T-Mobile) and three largest retail banks (Rabobank, ING and ABN Amro)</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td><strong>Garanti</strong></td>
<td>Commercial partnership between Avea, Garanti Bank and Mastercard</td>
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<tr>
<td><strong>TELU</strong></td>
<td>Mobile Commerce Joint Venture comprising all four Danish MNOs</td>
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<tr>
<td><strong>O₂</strong></td>
<td>“mPacs” scheme: expanded to include Deutsche Telekom, and expand online transactions system to enable NFC payments in-store</td>
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<tr>
<td><strong>France</strong></td>
<td>Joint venture between France’s three largest telco’s and IT consulting firm ATOS Origin</td>
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Source: Booz & Company NFC Scenario Model, 2011
significant traction with over one million customers having signed up to use contactless cards and stickers in order to collect bonus points at different merchant locations. These efforts demonstrate nascent consumer demand for mobile contactless solutions and form the foundation for a broader NFC value proposition.

In response to these efforts, rival operator Turkcell launched a new mobile wallet service called Cep-T Cüzdan. With over 33 million subscribers, Turkcell leveraged its position as Turkey’s largest operator to quickly drive visibility and market traction. Cep-T Cüzdan runs on the world’s first UICC NFC-SWP Android device, featuring full integration of the Secure Element with internal NFC components. In a move that echoes the market strategy of France Telecom, Turkcell has made its platform available to a range of banks and third party service providers in an effort to drive adoption volume. In establishing a competing product to Garanti, this case shows how competition between two rival industry players can drive further adoption of NFC across different market sectors.

The consequence of these efforts is the development of robust NFC infrastructure in Turkey. The application of NFC to the retail sector has been particularly significant, with over 400,000 NFC-enabled POS estimated to be implemented in the market by the end of 2011. The aggregate impact of these trends is centered on increasing accessibility and utility of NFC for consumers. While much of these efforts are concentrated on urban environments, they form an important foundation for expanding NFC services across other market segments.

Other initiatives within Europe further reinforce the trend towards NFC adoption in the retail sector. The Netherlands has seen the expansion of the MiniTix virtual wallet into schools, cafes and sports venues through a partnership of Multicard and financial services firm Rabobank. Additionally, a recent pilot in the Netherlands by Rabobank and grocery chain Albert Heijn is testing the benefit of NFC payments for retail purchases. While this pilot is initially small in scale, the significance lies in the ability for large retailers like Albert Heijn to push new payment products to consumers. Particularly when combined with integrated incentives, such as digital couponing and loyalty, these initiatives can raise visibility and acceptance of NFC amongst mass market consumers.

At a more collaborative level, the ‘six pack’ agreement between the three mobile network operators (KPN, Vodafone and T-Mobile) and the three largest retail banks (Rabobank, ING and ABN Amro) in the Netherlands calls for the development of a joint venture to deliver a NFC mobile payments. While specific product offerings have not yet been announced, the initial focus is on enabling contactless payment supporting Visa payWave or MasterCard PayPass on NFC handsets. Despite these efforts, contactless payment infrastructure is still very nascent in the Netherlands, positing a business model challenge to ‘six pack’ efforts. Overcoming this challenge will require collaboration across industry players and combined infrastructure development to ensure availability and acceptance of core technology.

In the Nordic region, Telenor and the Norwegian bank DnB NOR have teamed up with Giesecke & Devrient and MasterCard to trial NFC payments at select Oslo merchant locations. Similarly in Denmark, four mobile network operators are collaborating to develop a shared transaction platform for SIM-based NFC transactions. The operators, including TDC, Telenor, TeliaSonera, and Three, have established a joint venture dedicated to developing necessary infrastructure for broad-based NFC acceptance. While initially focused on payments, the operators have indicated a desire to move into additional services – particularly as consumer adoption increases with time.

In other countries, third party NFC applications are rising. One example of this is the recent pilot at the
Clarion Hotel in Stockholm, where select hotel guests were given an NFC-enabled handset through which they were able to book a room and remotely download a key using the OTA channel. The trial involved collaboration between multiple actors, including TeliaSonera, Choice Hotels Scandinavia, and Giesecke & Devrient. The eight month trial demonstrated high satisfaction rates with the NFC product and indicated that consumer acceptance will be driven in part by the ability of NFC to make every day processes more efficient.

While this is only a small pilot, it serves to illustrate the broader potential of NFC to facilitate a range of transaction use cases. Other examples, such as the Finnish start-up 6Starz, leverage NFC-enabled tagging to access a range of location-specific benefits, such as social data and digital coupons. These examples all underscore the argument that infrastructure maturity and ecosystem adoption will be driven by collaboration across multiple sectors and stakeholders.

Outside of Europe, similar trials and initiatives are driving market adoption of NFC. In Japan, the social network Mixi has recently introduced NFC functionalities, providing the site’s 21 million members with the ability to check-in and use location-based features enabled through NFC. This signals an important development for two reasons. First, increasing the number of use cases for NFC, particularly across different consumer bases, leads to increased uptake and usage of the technology. Second, social media creates additional layers of value to the end consumer by dynamically integrating content across multiple modes of interaction. The long-term importance of integrating social media with NFC lies in creating a broader acceptance network and ecosystem within which NFC assumes multiple purposes for the individual consumer.

In addition to these initiatives, recent collaboration between mobile operators in Japan and South Korea point to further infrastructure development. This collaboration is centered on two sets of agreements. The first of these, between DoCoMo and South Korean operator KT, is focused on creating an interoperable mobile wallet that can be used by consumers in Japan, as well as, in South Korea. Anticipated to be commercially launched in 2012, this service will provide a range of products, including payments, ticketing and couponing.

The second agreement, between Korean operator SK Telecom and Japanese operators KDDI and Softbank Mobile, is focused on providing cross-market NFC services. Extending to payments, public transport and ticketing applications, this NFC initiative has the potential of increasing the existing rate of infrastructure development in the market. Moreover, leveraging cross-market trends, both agreements reinforce the importance of collaboration in driving uptake and usage across multiple market sectors.

Collaboration has been and will continue to be integral to NFC adoption in the Korean retail sector. The collaboration agreement signed in mid-June 2011 will drive significant NFC infrastructure development in the next sixteen to twenty four months. The deal also included retail-targeted initiatives such as discounts to customers using the technology.

Additionally, VISA and MasterCard are moving ahead with implementing NFC-capable terminals across different merchant segments – such as retail and fast food. Examples of this include the Korean coffee shop chain Caffé Bene, which leverages NFC to provide customers with a loyalty token that delivers coupons and other offers. Efforts by SK Telecom further reflect these trends, with the latest initiative centered on enabling a ‘NFC zone’ in Seoul this year that provides consumers with an integrated NFC retail experience across a range of merchants.

Much as in South Korea, Japanese efforts to drive NFC uptake in the retail sector have focused on developing partnerships with different market
stakeholders. In the case of DoCoMo, these efforts have been centered on developing partnerships with leading retail entities such as McDonalds. These efforts have sought to incorporate broader NFC-enabled functionalities, such as integrated loyalty and couponing.

The current retail initiatives in Japan and South Korea suggest that retail adoption will continue to gain momentum in coming years. In contrast to these markets, NFC retail adoption in Canada and Brazil has thus far been much more limited.

In Canada, a number of retail-oriented trials are beginning to drive momentum around NFC merchant adoption. One of the earliest initiatives in the Canadian market is EnStream, the joint venture between Canada’s three leading mobile operators. Leveraging an interoperable mobile wallet called Zoompass, subscribers can send, request and receive money via their mobile phones. While initial consumer responses to Zoompass have been positive, further commercial development has proven difficult and reflects broader trends around NFC adoption in the Canadian market.

These trends are centered on three principal constraints. The first is that NFC-enabled infrastructure is less developed. Secondly, ambivalence on the part of Canadian consumers and merchants has meant that NFC trials in retail have tended to be smaller-scale. The third is centered on the lack of partnership scale, something that proved critical with other national payment initiatives implemented in the Canadian market, such as the Interac payment consortium. Despite these constraints, the opportunity for growth exists and is centered on the ability of different stakeholders to collaborate on developing a common infrastructure that extends across different consumer-oriented services.

NFC use in the Brazilian retail sector is forecast to grow at a slower pace than in other market regions. Slow infrastructure development outside of the country’s major cities will be an obstacle – as will Brazil’s large number of smaller, independent retail stores. The cost of implementation for these independent stores will likely be higher since they cannot benefit from the same economies of scale and cost benefits that are captured by larger retail chains. These chains can benefit from NFC adoption by capturing increased loyalty, reduced processing costs, and greater efficiencies. Additionally, these retail segments tend to be concentrated in large, urban environments that will naturally witness higher and more immediate adoption levels of NFC infrastructure.

These current developments will determine the intermediate future of NFC adoption across these markets. Such trials will showcase both the strengths of the new technology and its limitations. A key factor under consideration will also be safety and convenience, particularly for risk-averse consumers. Current studies show that attitudes towards risk vary across markets, with different consumer groups showing greater proclivity and willingness to use mobile payments.

The growth of contactless POS infrastructure is important in assessing both the incremental cost to retailers, as well as, the broader enabling environment for retail-oriented NFC transactions.

The trends above illustrate two important points:

1. Individual enablers are moving forward pushing merchants to adopt particular technologies and standards for new payment channels. The costs associated with this are fixed and do not in and of themselves present a new burden to the retailer. Put differently, in many of the markets discussed in the Study, being a MasterCard merchant requires PayPass compatibility so upgrading to contactless POS is not a cost specific to NFC but an assumed cost as part of being a MasterCard merchant. While MasterCard is only one example of one set of enablers, it underscores how standardization
can both drive penetration, as well as, change
the investment calculus around infrastructure
upgrades.

2. The increasing penetration of NFC POS
infrastructure helps create critical mass. Starting
with large retailers and consumer brands, the
rate of adoption increases exponentially as
infrastructure standardization is adopted across
smaller categories of retailers. Underpinning
greater rates of acceptance and usage, the
expansion of POS-based infrastructure
development is critical to driving consumer
usage and realizing broader network effects.

While these initiatives point to the growth potential
of NFC, the implementation of infrastructure must
be reinforced through active participation from
merchants and clear demand from consumers. Scale,
in this sense, cannot be driven by a single player
alone but is reinforced through the participation of
many market actors in creating critical mass around
consumer transactions and utility.

Achieving this scale through infrastructure
development requires substantial investment and
collaboration on interface standards and
interoperable functionalities. Though usage and
adoption in the retail sector can be realized through
different NFC technologies and processes, the
growth rate is substantially increased through the
presence of universal standards. This difference
between standardization and fragmentation drives
an increasing delta in the usage of NFC-enabled
mWallets for consumer retail transactions. As
illustrated in Figure 19, usage between the two
scenarios is driven by the rate of adoption and the
growth of underlying infrastructure across different
market environments.

Figure 19: Aggregate NFC Retail Usage

![Figure 19](image.png)

Source: Juniper, ComScore, Frost & Sullivan, IE Market Research,
Booz & Company analysis

In addition to usage, standardization and
collaboration have an impact on the volume and
benefit derived from digital couponing. As
illustrated in Figure 20, the number of digital
coupons redeemed under the Collaborative
Scenarios substantially greater than under the
Fragmented Scenario. This is driven by the increased
number of NFC-enabled mWallets, as well as, the
net benefit of having an exponentially greater
number of NFC-enabled POS devices where the
consumer can transact. This interoperability impact
is particularly significant from a retail perspective,
as individual consumers are not restricted to
transacting with a set number of retailers
participating in a particular scheme but can use their
handset across the entire retail sector.

Figure 20: Aggregate Number of Transactions
Attributable to NFC Couponing

![Figure 20](image.png)

Source: eMarketer, Booz & Company analysis
While collaboration and standardization can have a significant consumer transaction benefit, it can also generate increased cost efficiencies for providers associated with retail transactions. Particularly with respect to fraud, standardization can reduce the net liability of merchants in the retail sector. There are three ways through which NFC can reduce fraud:

1. Consumers are statistically more aware of a lost or stolen mobile than they are of lost or stolen cards – accelerating the reporting time associated with missing devices

2. Transactions conducted on the mobile are more secure than card due to multi-factor authentication (provided the mWallet has these protections in place)

3. Should the mWallet account be compromised, the core NFC platform provides greater visibility into unauthorized transactions and an improved ability to wipe secure information from the handset

As a function of usage and adoption, the total monetary benefit derived from fraud reduction is split between merchants, who have to pay less in disputed transactions and issuing banks, which have reduced accountability for refunded transactions.

**Figure 21: Aggregate Cost of Fraud**

![Graph showing cost of fraud over time](image)

Source: Frost & Sullivan, Visa, Booz & Company analysis

Shifting from retail to transport and entertainment ticketing, the impact potential of NFC-enabled mWallets is principally centered on higher throughput rates for turnstiles, more effective data capturing, cross-sell of other products through digital offers and promotions, and increased transaction efficiency. While different with respect to implementation, the benefits of NFC on ticketing apply both to the transportation and consumer entertainment sectors.

In transportation, the mWallet can function as a single application that the individual utilizes across distinct transportation modes (e.g., train, subway, bus), as well as, in adjacent retail environments. As seen in the case of the Octopus in Hong Kong, the shift in the application of smart cards from purely transportation ticketing to third party payments led to an exponential increase in adoption and usage. There were two drivers at the core of this growth:

- The ability of Octopus to attain a deposit-taking license from the Hong Kong Monetary Authority, removing restrictions that prohibited Octopus from generating more than 15% of turnover from non-transit functions.
- Widespread acceptance of the Octopus card by merchants, driven through innovative loyalty programs like Octopus Rewards.

These drivers enabled Octopus to exponentially increase both uptake and usage, with over 95% of individuals between 16 and 65 holding a card. Additionally, Octopus processes over 11 million transactions per day, with more than 9,000 retail outlets from over 3,000 service providers accepting the card. Leveraging an enhanced ability to capture and provide digital incentives, over 2.4 million users have joined the Octopus Rewards Programme.

While this growth did not occur overnight, it provides a useful benchmark for assessing the potential impact of NFC. Delivering benefits similar to existing smart card schemes, but with enhanced functionality and scale, NFC can leverage a single wallet application through which individuals can buy tickets, scan entry at turnstiles, and receive incentives and rewards.
Unlike retail, the key constraints facing NFC adoption in the transportation sector are not centered as much on defining the benefit to consumers and merchants, as they are driven by the sophistication of existing systems and historical infrastructure replacement rates within the sector.

In the E5, urban transportation infrastructure is well developed, with the London, Paris, Rome and Madrid metro systems all featuring contactless systems. However, outside of major urban areas, many transportation systems in Europe continue to operate using closed-loop access channels. Large cities and metropolitan areas are pushing for their own smart card systems, with individual transportation authorities adopting different upgrade timeframes, depending on geography and investment required.

There are notable examples of NFC trials being conducted within the E5. In London, successful NFC trials have involved replacing Oyster cards with trial handsets. Additionally, NFC transport trials in Milan, Madrid, and Paris have illustrated the potential value of NFC in facilitating transport ticketing. These studies reported convenience, ease of use and improved satisfaction across consumer segments. Additionally, a German study for transport in Berlin, Cologne, Dusseldorf and Frankfurt piloted the feasibility of NFC payment for long distance travelers, with similar results.

In the absence of widespread infrastructure change, the growth of NFC in the transport sector will be relatively minimal and centered on individual transport authorities. Due to the sheer quantity and pace of implementing new contactless ticketing outside of the large cities in the E5, the potential impact of NFC appears initially limited. This trend is also seen in Australia, where the majority of mass transportation systems are currently going through the process of implementing new contactless ticketing systems. Transportation authorities may be unwilling to quickly accept and integrate NFC, given existing investment in procuring and implementing new technology channels. Public ownership of transportation systems in the E5 may also be a barrier to progress, with governments reluctant to implement costly overhauls in a period of continued economic uncertainty and budget cuts.

In the Nordic countries there have been few larger-scale NFC trials focused on transport. Despite the relatively limited scale of these trials, there are a number of initiatives that are incorporating NFC in innovative ways. One example of this is the Scandinavian Airlines' NFC initiative announced in September 2011. This initiative, focused on NFC-enabled SAS Smart Pass stickers, will provide benefits to certain frequent fliers. The contactless mechanism will be utilized during the check-in and boarding process, as well as, enable transactions at self-service machines, airport lounges and Duty Free shopping.

While still in its beginning stages, the SAS initiative has the potential of examining the practical realities of implementing NFC in the aviation sector. Unlike traditional public transport systems, this application of NFC signifies a new value proposition for consumers and service providers alike. At a broader level, the adoption of NFC in this sector points to broader infrastructure development and expansion of consumer-oriented product utility.

The likely uptake of NFC in transportation sectors differs widely depending on market environment. The first transit and retail contactless payment system in Latin America was implemented in Fortaleza, Brazil. The collaboration between Libercard, ViVOtech and Inteligensa enables consumers in Fortaleza, the country’s fifth largest city, to use a contactless card in local transit and make retail purchases at participating merchant locations.
According to ViVOtech, the initiative demonstrated high initial success rates, with more than $2.5 million in purchases within the first three months of launch. The initiative, first launched in late 2008 has already shown the potential for NFC adoption in the Brazilian transport sector. Despite facing substantial infrastructure constraints and high investment requirements, the case of Libercard illustrates the potential impact that NFC can have on public transport systems in Brazil.

Despite having implemented contactless systems only recently, the Canadian market has shown substantial adoption potential – with over nine of the country’s largest cities having implemented similar schemes. Many of these systems, such as Montreal’s public transport network, leverage technology that could be easily adapted to support NFC transactions. Moving towards NFC acceptance in the transport sector will depend on the benefits Canadian authorities see in shifting from existing contactless systems and the degree to which those benefits can be realized more quickly and at reduced cost through collaboration.

In Japan and South Korea, contactless card infrastructure is well established and NFC enjoys high penetration throughout urban transport systems. In Japan, early adoption of contactless systems was specifically focused on reducing friction typically associated with turnstile throughput in high traffic areas. Today, a variety of NFC-enabled transport products are available throughout Japan and can be used on both local transport systems, as well as, commuter rail. Further expanding the adoption and usage of NFC in these market environments will be dependent on the ability to derive enhanced consumer value through the core product, as well as, greater acceptance of the mobile wallet across a higher number of locations.

Under a fragmented scenario, adoption of NFC readers is likely to be opportunistic and implemented on a system-by-system basis. Additionally, without strong incentives – such as price reduction and added convenience – it appears unlikely that consumers will drive substantial increases in usage. While the investment associated with upgrading existing contactless turnstiles to NFC compatibility is relatively small – representing a fraction of the total turnstile investment – the key question is centered on the business case for transport authorities.

Standardization can drive adoption of NFC by transport authorities for four main reasons:

1. Mandated NFC standard for technology channel and processes
2. Cost offsets through tax benefits and subsidization
3. Cross-product functionality through leveraged open-loop networks
4. MNO subsidized handset implementation driving consumer uptake

While NFC applications will likely continue to compete with contactless cards until they are phased out, the basis for accelerated infrastructure replacement and consumer adoption can be achieved through standardization. As illustrated in Figure 22, standardization increases the number of NFC-enabled transactions across the transportation sector.

**Figure 22: Aggregate NFC Transaction Volume in Transport (% of Total)**

Source: Juniper, ComScore, Frost & Sullivan, IE Market Research, Booz & Company analysis
It is likely that NFC upgrades will be done on a system-wide basis, due to the nature of infrastructure investment and the need to have functionality across all access points. As a result, investment in turnstile upgrades will be done at an aggregate level – incurring capital outlays at specific points in order to achieve increasing standardization within the system.

Similar to transportation, ticketing in the entertainment sector can benefit from NFC by enabling increased efficiency around ticket issuance and admission, more effective data capturing, and increased impact of cross-sell of other products through digital offers and promotions. Core use cases are centered on the ability of entertainment entities to effectively leverage NFC infrastructure to more effectively land, deliver, and engage individuals in a particular recreational activity. For instance, individuals can buy movie tickets using the mWallet application, instantly enter a movie theatre without queuing to get the physical ticket, and receive a real-time coupon for 10% off popcorn.

While large scale adoption of entertainment-centered NFC ticketing has thus far proven elusive, the adoption of mobile technology for event reviews, digital offers and purchasing is growing substantially. Illustrative of this, in the United States movie ticket provider Fandango introduced a new mobile application in the spring of 2011. Generating over twenty percent of its summer ticket sales, the application has proven successful in capturing latent demand for consumer mobile applications.

The potential for NFC to tap into these trends will depend largely on three factors: the first being the penetration of NFC activated mWallets, the second being the ability to use the handset at a diverse array of access points and points-of-sale, and the third being the incentivization of consumer behavior.

In many ways, this reflects the same structural constraints facing adoption in the consumer retail sector. Unlike consumer retail, the entertainment ticketing sector across most markets is highly consolidated, with a small number of corporate entities controlling the majority of venues. This creates an ability to achieve scale and drive usage through market leverage. However, in a fragmented NFC market, the business case for entertainment entities is not immediately clear as the penetration and interoperability of NFC-activated handsets is much smaller than under standardization. While NFC implementation in the entertainment sector can be done on an incremental basis, this fails to capture these potential scaling benefits and limits the value proposition to the entertainment entity.

The value of standardization is, therefore, centered on the ability to create a more substantial and mature ecosystem, wherein the number of NFC-handsets and baseline usage across a range of use cases is higher than in a fragmented scenario. Within entertainment ticketing, this means that the addressable market in terms of the number of individuals that have NFC-enabled mWallets is significantly higher.

With a higher baseline of NFC-activated mWallets, entertainment ticketing entities can structure infrastructure investment on a more secure basis, knowing that interoperability with existing handsets is built into the NFC framework.

As a result, standardization is likely to lead to more significant investment by entertainment ticketing entities into NFC-enabled venues, as well as, increased consumer usage in the entertainment venues.

As illustrated in Figure 23, on page 35, standardization and corresponding infrastructure investment by entertainment entities leads to an exponential increase in the transaction benefit of NFC. Comparing the fragmented and collaborative scenarios, there are a number of core differences in how standardization drives uptake and the likely behavior of market actors. Transportation and entertainment ticketing entities enjoy a relatively
consolidated market position, with substantial control over infrastructure, value proposition, and product offering. Conversely, consumer retail is a fragmented sector with thousands of individual merchants, offering different products are faced with constant competitive pressures.

Figure 23: Aggregate NFC Transaction Volume in Entertainment Ticketing (% of Total)

Source: Juniper, ComScore, Frost & Sullivan, IE Market Research, Booz & Company analysis

Without standardization and collaboration, the incentive for NFC adoption in the transportation and entertainment sectors will likely remain elusive. This is not to say that there is no benefit, but that the aggregate benefit to the sector as a whole is likely to be substantially greater in a market environment characterized by standardized technology and processes. Transportation authorities that have already upgraded their infrastructure to be contactless are unlikely to independently push for NFC adoption. Similarly, entertainment ticketing venues are unlikely to implement NFC infrastructure without some level of certainty around the addressable market and the penetration of active mWallets.

In contrast to the transportation and entertainment sectors, consumer retail will see steadier NFC growth, driven by existing efforts by multiple market players to implement new contactless infrastructure. However, in order to drive adoption and usage beyond just the largest retailers, there needs to be mutually reinforcing dynamics centered on active merchant adoption, customer demand and product innovation. These dynamics can be substantially enhanced through standardization of underlying infrastructure.

The benefits generated through standardization are not limited to provider verticals but extend to enablers such as banks, mobile operators, trusted service managers (TSMs), and card networks. Creating both sector-specific benefits, as well as, reducing costs associated with the implementation of NFC itself, these enablers provide the infrastructure necessary to process and guarantee all aspects of the transaction process. For enablers at the core of the NFC ecosystem, there are a number of specific benefits that can be realized, including:

- Enhanced distribution and supply networks
- Greater product penetration through exponential brand visibility
- Reduced investment requirements
- More rapid realization of key business case drivers

While the business case is unique to individual players, these benefits extend across enablers to affect the overall market potential for NFC and shape the commercial value proposition. Since individual enablers possess comparative advantages particular to that sector, the benefit of collaboration on standards can be seen in realizing infrastructure synergies across the broader market. For instance, the impact of individual marketing campaigns is greatly enhanced when the underlying products are based on a set of common standards.

Rather than competing on standards, these campaigns would compete on products and raise overall awareness and uptake in the market. This network effect would apply across all enablers, with all players benefiting from a general increase in understanding and adoption. For instance, a mobile operator could launch a campaign for a NFC-enabled mobile wallet and, inherently, reinforce product visibility of a bank seeking to drive adoption amongst its customer base.
In addition to marketing, standardization can drive enhanced distribution and supply networks by leveraging different supply channels. Rather than competing on a specific technology model, SIM-based NFC can connect different distribution elements to increase overall acceptance. Illustrative of this, mobile operators can leverage significant physical assets—such as shops, franchises, and resellers—to directly reach a wide spectrum of consumers.

Conversely, banks and card networks can drive provider adoption by facilitating SIM-based NFC implementation. Similar to marketing, the ability to leverage the comparative advantage of different players in distribution can create a network effect through which the overall ecosystem for NFC becomes more robust and developed.

This network effect aids all enabler verticals by enhancing the baseline conditions for NFC adoption, as well as, offsetting investment requirements. Rather than investing in distinct systems with different underlying interfaces, SIM-based standardization amplifies the impact of individual investments by realizing returns across the enabler ecosystem.

Illustrative of this, investment made by banks into NFC transaction capabilities mitigates the need for other players to do the same while more effectively scaling institutional capabilities within existing banking structures. Conversely, investments made by mobile operators into network processing and SIM handset deployment can lead to banks and card networks avoiding redundant investments.

The broader argument around investment benefits is centered on the ability for standardization to create a common infrastructure that achieves scale much more rapidly through the participation of all enabler verticals. This does not presume joint investment, either within or between enablers, but rather supposes that while individual players will invest on a self-interested basis, the net outcome is one that creates efficiencies, reduces costs, and drives scale across all players.

Within the investment dimension, standardization drives home the notion that for NFC to truly succeed, it cannot be a zero-sum game. The infrastructure investments made by one entity or group of entities cannot inherently come at the expense of another group of entities. Doing so would likely create structural constraints where the financial barrier to entry is set so high that only a small number of players can effectively participate. Moreover, it inhibits ecosystem development for it presupposes that there will continue to be multiple competing standards that consumers have to choose between.

In the final analysis, standardization reinforces the adage that the whole is greater than the sum of its parts. Going at it alone, few, if any, of the enablers are likely to capture the degree of benefits that can be realized through standardization. Individual enablers can realize core benefits in the business case more rapidly and to a greater degree if there is a common foundation that incentivizes market players to participate. In this sense, collaboration on standardization is necessary in order to fully realize the commercial, as well as, socio-economic potential of NFC.

Driving this impact is the overall uptake and usage of NFC in the market. As illustrated in Figure 24, aggregate handset adoption increases substantially.

**Figure 24: Aggregate NFC Handset Adoption**

Source: Juniper, ComScore, Frost & Sullivan, IE Market Research, Booz & Company analysis
through standardized NFC technology and processes. One of the principal drivers for the exponential increase in uptake is the network effect generated through broad enabler engagement on infrastructure development.

Another business case driver impacted through standardization is the reduction in cash handling costs. NFC adoption will accelerate the downward trend in cash as a percentage of total transactions. In the long run, processing cash is more than twice as expensive for the bank as processing an electronic transaction. In the Consolidated Scenario, a significant number of cash transactions move to NFC yielding significant savings. In addition to this, the reduction in cash and the increase in electronic transactions yield a net benefit on fraud reduction.

**Figure 25: Total Cash Processing & Plastic Card Savings**

![Graph showing total cash processing and plastic card savings](image)

Source: Visa, Booz & Company analysis

As discussed in the provider section, the rate of fraud decreases substantially through standardization, with the percentage of fraudulent transactions falling proportional to the volume of NFC transactions.

Without collaboration on standards, there exists a high likelihood that NFC development would occur in a fragmented manner, lacking widespread adoption and usage across provider and enabler verticals. For enablers, fragmentation results in slower realization of the core business case, as well as, diminished margins on volume.

NFC standardization can address many of these concerns around scale and revenue benefit. The increased number of NFC-enabled transactions through standardization and collaboration leads to reduced costs and substantially increased revenue to different stakeholders. Reinforcing one of the key conclusions from the provider vertical analysis, this creates a virtuous circle where individual stakeholders capture greater benefits through the collective efforts of all players. Generating increased usage and adoption, standardization drives amplified benefits derived through NFC.

In aggregate, the benefits to different verticals can only be realized through the active engagement of multiple stakeholders. SIM-based standardization amplifies these benefits by increasing the scale of NFC implementation and extending its impact across a wider array of market actors (Figure 26). While these benefits affect individual stakeholders in different degrees, the net impact of standardization can be applied to the economy as a whole.

The market dynamics of SIM-based NFC standardization are highly dependent on both supply- and demand-side drivers. Increasing development of core NFC infrastructure across

**Figure 26: Key Market Impacts**

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<tr>
<th>Key Impacts</th>
<th>Low degree of impact</th>
<th>High degree of impact</th>
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<td>Economies of Scale</td>
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Source: Booz & Company NFC Scenario Model, 2011
verticals, combined with interoperability across all handsets, is at the core of the exponential increase in uptake and usage seen in the collaborative scenario.

Requiring coordination on technology standards and processes across provider and enabler verticals, one of the core assumptions in the collaborative scenario is that market players leverage their natural strengths to enable a broader transaction ecosystem.

Increasing infrastructure and handset penetration is critical to driving consumer demand and ensuring a virtuous circle centered on product utility, consumer benefit, and financial value to commercial entities. In this virtuous circle, the benefit to consumers is inherently linked to increasing value captured by private sector players throughout the economy.
Consumer Benefits:
Realizing Utility and Convenience through NFC Standardization

*NFC can enable a number of significant consumer-oriented benefits.* These benefits transcend any particular sector and are focused on the ability of NFC to deliver a range of functionalities that realize greater utility and convenience. The true power of NFC does not lie in any specific functionality, but in the ability to fluidly combine different products across different sectors into a single, handset-based application.

While this application is often construed as the mobile wallet or mWallet, in actuality the *mWallet* is not limited to payments or constrained to a particular service provider. Rather, the mWallet application refers to the ability to dynamically integrate and enable a range of discrete functionalities provided by a range of service providers.

As illustrated in Figure 28, NFC-driven functionalities can be realized in each of the sectors discussed throughout the *Study*. Moreover, the impact of NFC in these sectors is directly linked to the benefits derived to the consumer from standardization and multi-stakeholder adoption. The greater the range of functionalities, the more the consumer is likely to use NFC – yielding increasing impact to the end service providers.

However, the ability of consumers to access multiple functionalities is likewise linked directly to the scale of NFC infrastructure in the market. Much as with stakeholder benefits, standardization drives both increased ability for consumers to transact and enhances the range of functionalities available.

Figure 28: Functionalities on the mWallet

Source: Booz & Company NFC Scenario Model, 2011

While NFC-driven benefits have been discussed throughout the *Study* in the context of market stakeholders, these benefits can be equally applied to consumers as well. Specifically, the carry-over impact of these industry-oriented benefits can drive substantial consequences for the individual consumer. Assessing the benefits discussed in sections three and four, a number of tangible consumer benefits can be defined:

1. **Convenience for consumers**: The NFC enabled handset could be used for transport ticketing across markets, ensuring ease of use for the consumer. For example, a consumer swipes the NFC enabled phone to pay for a ticket to use public transport for the journey to a London airport. At the airport the consumer uses the phone again to board the plane. Once landed in Madrid, the consumer swipes the phone again to buy a subway ticket in Madrid. Throughout the journey the consumer experience is exactly the same reducing the need to queue, handle different ticket types and cash.

2. **Increased competition leading to consumer benefits**: mobile NFC services reduce the entry barrier for smaller service providers lacking economies of scale compared to large, existing
players in the market. This leads to increased competition, more choice for consumers and reduced prices – all consumer benefits.

3. **Service portability**: a SIM-based solution enables the deployment of multiple services via application download and ensures complete service portability – the user can take their services with them when they change handsets or operators.

4. **Increased security**: SIM-based mobile NFC enabled phones provide strong security features, such as PIN numbers to access services, strong authentication techniques to protect the mobile wallet (such as digital signature, OTP), as well as, the operators’ ability to and activate and de-activate services ‘over the air’ if the phone is lost or stolen and re-install services OTA once a new phone is provisioned. The SIM also has the benefit of complying with international security standards and is tamper resistant.

Focused on both the quantity and quality of the NFC experience, consumer benefits are driven principally by this combination of utility and convenience. The key to adoption lies in increasing consumer stickiness by incentivizing and increasing ease of usage. While the first is centered on the integration of multiple products, for instance loyalty and payments, the second is based on the ability to use NFC easily, without having to find acceptance points.

Together, the incentivization and availability arguments stand at the heart of defining the core user experience. SIM-based standardization can substantially impact and enhance this experience by inherently creating a more robust incentivization ecosystem. Incentivization through standardization is driven by the ability for many different market actors to create and iterate products through common acceptance frameworks, as well as, the ability to structure incentives across multiple market sectors. The availability argument builds on this latter impact, providing consumers with a significantly greater acceptance network that leverages NFC-enabled transaction channels across different verticals to drive aggregate adoption and usage.

In the final analysis, ubiquitous adoption of NFC services can only be achieved upon reaching an inflection point where the barriers to market entry are lower, the aggregate net benefits to all market players are higher, and the universal benefit for consumers is clearly articulated in a core value proposition. This case study has demonstrated that standardization can lead to a significant increase in the number of transactions and a corresponding financial benefit to all actors involved. Additionally, it has shown that the core value proposition to consumers shifts and gains cohesion as NFC adoption becomes more widespread. Across markets, the adoption is driven by multiple stakeholders and across multiple sectors. While NFC development carries benefits, as well as, costs, the potential advantages to market players are significant and real. Fully realizing these advantages will take time and will require collaboration across stakeholders in order to ensure the broadest possible platform for growth.

As illustrated in Figure 29, on page 41, collaboration around standards can create a network effect that positively impacts all players and generates exponentially greater benefits. Without standardization, NFC is likely to grow at current market rates but always be inhibited by the lack of a cohesive consumer experience that links different core ecosystem components into a single value proposition.
Ultimately, it is this value proposition – linking consumers and industry stakeholders – that drives the network effect realized through standardization. NFC, at its very core, is not a technology designed for one stakeholder or one industry. Rather, it is a tool that can be leveraged by a potentially infinite number of actors to create greater value, utility and convenience for consumers. Without common standards and processes, both the benefit to consumers and the impact to stakeholders will always be constrained by the presence of competing schemes and the inability to attain critical scale across market verticals.
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