

A hand is holding a silver mobile phone in the foreground. The background is a dark, blurred image of a barcode with some numbers (453120 and 0051) visible. A white circular shape is in the top left corner.

Mobile Commerce: opportunities and challenges

A GS1 Mobile Com White Paper



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February 2008 Edition



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1 Executive Summary

This White Paper seeks to demonstrate the reality of mobile commerce for businesses and consumers alike and the need for GS1 to contribute in a neutral way to establish relevant global standards for the benefit of all stakeholders. It ties together three basic trends:

SEE SECTION 3, p 3

Mobile Commerce Overview:

why mobile is changing the way

business happens

1 Consumers are changing their behaviour and expectations with regard to shopping and brand loyalty

- Mobile phones and the web are now allowing people to be more connected than ever - messages from other consumers are often more valued and trusted than messages from companies.
- Consumers respond positively to businesses that take the time to understand their needs and offer excellent customer service. Mobile technology allows businesses to become more service-oriented in what they do and to tailor what they provide to better meet the needs of individual consumers.

2 Businesses are changing the way they do business

- Businesses are looking for innovative ways to enter into a relationship with consumers. Technology is allowing a two-way dialogue between brand owners and consumers to be real.
- Businesses are also recognising the value of collaborating more closely with business partners and competitors. Sharing information about consumer behaviour and supply chain processes is of critical importance.
- Businesses are taking advantage of advances in technology to work faster, leaner and more intelligently. Small businesses are no longer at a disadvantage since complex business applications are available via the internet at low cost.

3 Mobile phones are enabling these changes to happen on a global scale

- There are over 3 billion mobile phones worldwide. This means that over 40% of the world's population carries a mobile phone, far more than use a computer or have access to the internet. In many developed countries, mobile phone penetration is above 90% and developing countries are catching up fast.
- Closer, more personalised relationships between businesses and consumers are possible via mobile phones.
- Emerging applications and services that add value to physical products and brands and go beyond limits previously imposed (such as extended packaging) already exist today on mobile phones.
- Existing business issues (such as inefficient couponing) can be resolved effectively using mobile technology.
- Convergence of different technologies on single devices that are available anywhere and anytime is allowing existing technologies (such as the internet) to evolve and extend their reach even further.

SEE SECTION 4, p 18

Business Applications:
what's possible with
GS1 standards and how?

Six business applications have been identified as particularly relevant in the supply and demand chain.

- **Extended packaging:** consumers access additional information about products through their mobile phone.
- **Content purchase and delivery:** digital products such as videos, games and music can be trialled and sold via mobile phones.
- **Mobile coupons:** mobile phones are used both to capture and redeem coupons and discounts.
- **Authentication:** mobile phones are used to check whether or not a product is genuine.
- **Re-ordering:** Mobile phones are used to reorder products with orders sent to the supplier in a standard format.
- **Mobile self-scanning:** consumers in supermarkets use their mobile phone (rather than a device supplied by the supermarket) to scan products as they do their shopping.

SEE SECTION 5, p 43

Technical environment:
building blocks
for mobile commerce

These opportunities and what mobile commerce will look like in the future depend on the creation of an open and neutral infrastructure trusted by both businesses and consumers to enable a fast and easy adoption of the technology, to reduce the cost of the initial investment for businesses and to facilitate innovation and to allow interoperability between all technology components across applications and geographical locations.

SEE SECTION 6, p 56

Recommendations

The following **recommendations** are considered as foundational to the growth of mobile commerce:

1. Use GS1 keys to identify objects
2. Encode GS1 keys in bar codes and RFID tags
3. Use existing bar codes on products as an entry point for product information
4. Mobile phones should be able to read GS1 standard 1D and 2D bar codes out of the box
5. Mobile phones should be able to read Electric Product Code RFID tags on products
6. When building systems to support mobile technologies, companies should use existing infrastructure to link to product information and added value services.
7. Focus on six business applications presented in this white paper
8. Ensure that consumers receive clear information
9. Ensure that legal aspects are well-researched

The GS1 Mobile Com group has brought together all relevant stakeholders to discuss how this can work. This White Paper is a research initiative produced by this group with the aim of:

- sharing knowledge about what is already possible and what could be possible in the future
- identifying potential issues and suggesting ways to remove barriers
- giving enough information so that stakeholders can make strategic decisions about how to prioritise mobile commerce in their businesses
- generating momentum amongst stakeholders around specific business applications that have most potential
- providing a neutral environment for stakeholders to discuss their needs
- creating an environment of transparency and responsible use as a driver for adoption

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2 Introduction

2.1 Objectives

This white paper aims to:

- understand different business needs relevant to mobile commerce.
- help businesses to define what benefits they could derive from mobile commerce.
- demonstrate how GS1 can support businesses and consumers in the adoption of mobile commerce.
- show where there are gaps and issues in technology that would create a barrier to adopting standards
- drive interoperable mobile commerce implementations based on a basic set of standards

2.2 Scope

This is a strategic and exploratory document that aims to:

- give guidance about the possibilities of using mobile devices to connect people with information about products.
- provoke thinking about how mobile devices can enhance the relationship between trading partners in the supply chain and between businesses and consumers.

Whilst there are many possible applications using mobile devices, this document focuses on exploring opportunities within the supply and demand chain. It does not seek to replicate work of other standards bodies active in the mobile sector.

This is not a technical or implementation document. It does not seek to define new standards nor to give detailed advice about the financial benefits of using mobile commerce. It also does not address how a future mobile commerce infrastructure might be funded.

2.3 GS1 - creating a favourable environment for mobile commerce

The GS1 System is the most widely used supply chain standards system in the world. For 30 years GS1 System has enabled products to be identified in the FMCG/Retail supply chain with enormous benefits for businesses and consumers.

GS1 also has a long experience bringing together partners in the supply chain to collaborate on building standards that enhance business processes and benefit all parties. GS1 has volunteered to play an active role in mobile commerce by building on existing standards used in the supply chain to identify and exchange information about products and business transactions.

GS1 wants to use this white paper to draw the attention of those who read it to the conditions needed for mobile commerce to succeed. We encourage readers to:

- be aware and pay attention to of commercial barriers that could result from certain technical solutions being deployed at local level. This is all the more critical given the emergent state of the market. An analysis of existing business models would make it possible to identify critical areas and to promote the relevant technical building blocks needed to create interoperable systems.

- Promote existing and interoperable technical building blocks described in section 5 of this document which will help share and reduce costs and facilitate and accelerate mobile commerce solutions.
- Build on existing local and global initiatives supported by GS1.
- Focus on deploying added-value applications described in section 4 of this document that.
- Contribute actively to the international GS1 Mobile Com working group

2.4 Target audience

This white paper should be read by:

- Manufacturers (Marketing, Customer Relationship Management, Business Intelligence, Customer Development, Packaging, Research & Development, Innovation, Quality Assurance)
- Retailers (Marketing, Store Operations, Logistics, Private Label Development, Research & Development)
- Mobile Phone Manufacturers
- Mobile Network Operators/Carriers
- Service Providers
- Marketing Agencies
- Government Agencies
- Consumer Organisations
- GS1 Member Organisations

2.5 Methodology

This White Paper is the result of a combination of:

- physical meetings and conference calls of the GS1 Mobile Com work group (comprised of members of the target audience above)
- interviews conducted amongst experts in the field of mobile commerce
- desk research

The goal has been to synthesise the wide variety of information available in a rapidly developing field into a format that inspires readers to look to the future and gives them the tools to start building that future within their organisation.

3 Mobile Commerce Overview: why mobile is changing the way business happens

3.1 How mobile phones have changed our lives

Over the past 10 years mobile phones have changed the way that we live and work. What is the nature of this change? On the one hand, it's a change in personal freedom. The mobile phone seems to give us more power as individuals to do what we want and be who we want to be. Many people consider mobile phones as extensions of themselves. This is shown by the wide variety of mobile phones available and the myriad ways of transforming each phone into a truly personal device.

It's more likely that you'll forget your keys than your mobile phone when you leave home in the morning.

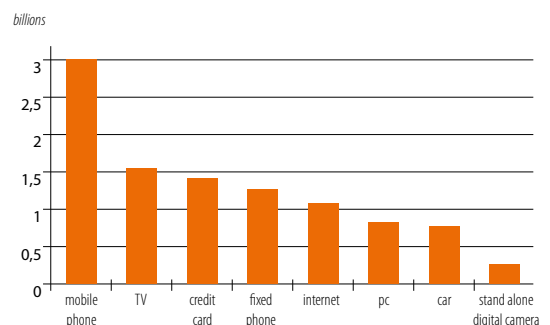
These days it's more likely that you'll forget your keys than your mobile phone when you leave home in the morning. As technology advances, mobile phones are able to be used to extend the reach of the person and delegate many functions that would previously have been more time consuming or would have to be carried out in person. As individuals, we expect to be able to do things whenever we want to and mobile phones are core devices enabling this expectation to be fulfilled. This means that there is a fundamental shift in our perception of space and time - of what is possible where and when.

On the other hand, mobile phones are connecting people more than ever before and becoming new glue holding together social interactions and relationships. A mobile phone makes us available to others, be they businesses or individuals, 24 hours a day, 7 days a week. This is an enormous break with the past, when we needed to know where a person was in order to contact them. It gives enormous opportunities for businesses to really connect with and understand consumers and for consumers to have more meaningful relationships with businesses.

3.2 The mobile industry in figures

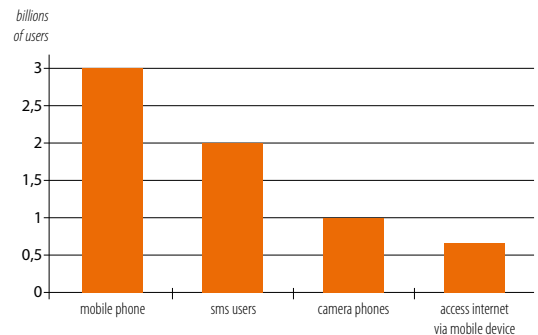
There are currently over 3 billion mobile phones worldwide (Informa, Nov 2007). How can we make sense of this huge figure? It means that approximately 40% of the world's population currently carries a mobile phone. The chart below puts this figure in the context of other major technologies. Mobile phone adoption continues to grow. By 2010, it is expected that there will be 4 billion mobile phones worldwide. In many developed countries mobile phone penetration is well above 90%, so saying "everyone has a mobile phone" is very close to reality.

Chart 1: Mobile phones in context
(Source: Informa, Tami Ahonen, Jan. 2007)



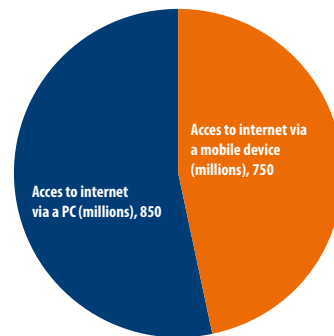
On average, mobile phones are replaced every 18 months (2006, Semiconductor Industry Association). In some markets, such as Japan and Korea, mobile phones are replaced as often as every 6 months amongst certain consumers. This means that new technology becomes adopted extremely quickly (normally within 2 replacement cycles). As of May 2007, already 1 billion camera phones had been sold, an incredible number given camera phones were only introduced in 2001.

Chart 2: Mobile Phone Functionality
(Source: TNS Mobile Trends Guide 2006, Computer Industry Almanac, Tomi Ahonen, Jan. 2007)



SMS has been another success story for the mobile industry. Text messaging is the most widely used data application worldwide. According to the TNS Mobile Trends Guide 2006, 72% of all mobile subscribers were active users of SMS. Adoption has been rapid, with mobile subscribers in some countries sending up to 10 text messages per day. The International Telecommunications Union (ITU) estimate that annual SMS revenue is close to \$100 billion.

Chart 3: Mobile access to the internet
(Source: Tomi Ahonen)



3.3 Mobile phones: revolutionary devices

Mobile phones are central to the lives of most people in developed countries and are growing in importance in less developed countries. Since their mainstream adoption in the 1990s, they have remained primarily communication devices. We use mobile phones to talk to other people and we carry mobile phones with us so that other people can talk to us.

However, the situation is changing. Mobile phone manufacturers have developed mobile devices that can serve many functions beyond voice communication such as taking photos and listening to music. Mobile network operators are offering services that give greater value to subscribers, such as portable email for business users. Mobile phones are now equipped with cameras with the potential to turn them into portable bar code scanners. Handset manufacturers are developing RFID chips that can turn mobile phones into mobile wallets able to carry and exchange electronic money securely and engage in other transactions with RFID readers in the physical world.

The combination of more powerful mobile devices, more innovative mobile operators and change in the mobile network infrastructure (such as 3G networks able to carry large amounts of data at high speed as broadband connections do for computers) is setting the stage for an enormous change in a already fast-moving sector. Mobile devices are fast becoming the place where numerous technologies meet and create applications that are useful for both consumers and businesses across the globe. The mobile phone of the future is a device that enables users to communicate, connect, transact and innovate. In most markets, phones with the characteristics below are already becoming available:

- **A communicative device**

The mobile phone will continue to be a device that is used to communicate with others. Although this may be extended beyond voice to instant messaging and email, it is important not to forget communication is a central strength of mobile devices. As it becomes easier and cheaper to transfer larger amounts of data, sharing photos and videos with others will further extend this role.

- **A connective device**

Mobile phones enable people to connect to other sources of data anytime, anywhere. This is what is happening with mobile email. As data on the web becomes more structured, mobile devices will become more and more powerful as entry points to tasks that have moved from offline to online but are currently still only available through fixed computers.

- **A transactional device**

Mobile phones are ideal devices to be used for payments and transactions. There are a wide range of applications that aim to transform the mobile phone into an electronic wallet that can be used as a payment device.

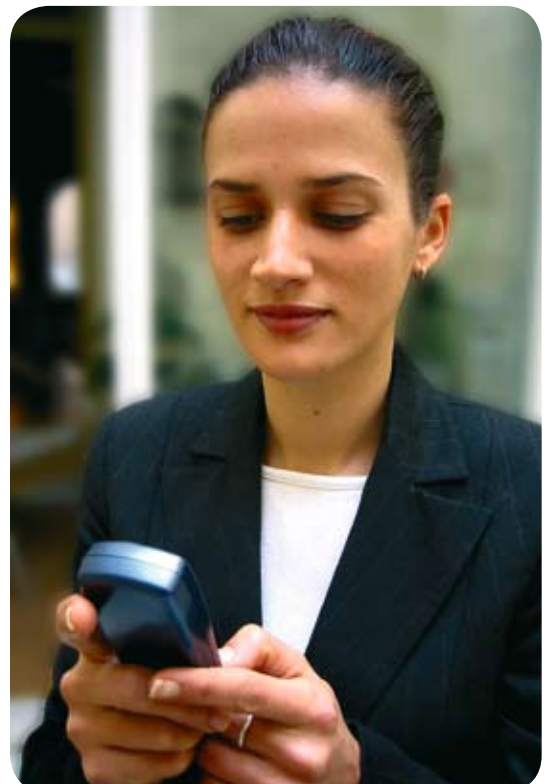
- **An intelligent device**

Mobile phones are a place where multiple applications can meet and fuse. Mobile devices that integrate a phone, a camera, a location finder (GPS) and a connection to the internet make it possible for a user to request context-dependent information such as finding out where a store selling a product they want to buy is located. As usage increases, mobile phones can become agents of change, tools that facilitate connecting things in the physical world to information about them in the digital world.

3.4 Mobile Commerce: beyond e-commerce

Throughout the 1990s the introduction of the internet and ecommerce reshaped the way that businesses do business and the way that consumers interact with businesses. Businesses took the opportunity to automate many processes that before would have been handled manually, from ordering to customer service. One clear example is the way that spending on advertising has begun to shift from traditional off-line media to online and digital media as advertisers have seen an opportunity to better connect with their target audience. IBM forecasts 22% growth in mobile, digital and interactive advertising formats between 2006 and 2010 against 4% growth in traditional advertising formats.

Mobile commerce, often referred to as m-commerce, builds on the advances made by ecommerce (such as automated, electronic processes) but makes interaction available to a wider audience in a more personalised way. Like any emerging market, there are many



propositions about how to use this technology. Some organisations adopt an aggressive policy and want to get something moving as fast as possible whilst others adopt a wait-and-see approach. As a result, proprietary solutions are developed that make integration with existing systems or by multiple partners complex and costly. At the same time, multiple solutions create a complex landscape for businesses and consumers alike - making it difficult to choose which solution to use.

The other difference between ecommerce and m-commerce is the opportunity to connect information with objects in a more direct way than has been possible until now. This is the world predicted by the *Internet of Things*, a report published by the International Telecommunications Union (ITU) in 2005, where objects have a life and history of their own that we can use to our advantage. The mobile phone can be the tool that connects the physical and virtual world. At the base of this vision is the ability to identify objects uniquely. GS1, with over 30 years experience developing identification standards for the supply chain that have been adopted globally, clearly has a role to play here. In this context, mobile phones are enablers of an *Internet of Things*. What is special about mobile phones is the fact that they have massive adoption globally. Many more people have access to a mobile phone than to a computers and this means that m-commerce has the opportunity to connect not just big businesses but also small business and consumers on a massive scale. In this sense, mobile phones have the potential to bridge the digital divide and allow organisations and individuals to reach out to one another more easily than ever before.

We're moving into a world where digital goods are becoming as important as physical goods. Due to the internet, value is created not just by goods themselves but by the exchanges of those goods. Organisations that can facilitate that exchange (for example by creating communities of users with similar interests) have a significant competitive advantage in this networked world. Furthermore, these communities can be leveraged to increase sales of physical goods through more engaged users. We know we can't predict the future. This document is a way to reflect on the future together and to stimulate ideas about how to shape it.

Key actors in mobile commerce

Actor	Stakeholders	Expected roles
Consumers		Interact with businesses through mobile phones
Companies	Manufacturers Distribution / Wholesalers Logistics / Transporters (3PL) Retailers	Relevant applications, provide content and transact with consumers
Mobile Industry & Service Providers	Mobile Phone Manufacturers Mobile Network Operators/Carriers Service Providers (IT companies) Marketing Agencies	Develop technology <ul style="list-style-type: none"> • Device • Data Source • Network
Enablers & Regulators	Government Agencies Standards Organisations Consumer / user associations	Provide regulations, standards and guidelines

3.5 Mobile marketing: towards personalisation

Mobile marketing has the potential to fundamentally change the way consumer marketing occurs. Instead of a campaign-based approach, there is a shift towards a dialogue where consumers are willing to share information and marketers are able to make use of that information in a more valuable way. Over time, businesses build up a relationship with consumers in which each considers the other as a trusted party. Four key factors distinguish mobile marketing from other more traditional forms of marketing:

- **permission-based:** unlike the interruption model that characterises television advertising, direct mail and other forms of mass marketing, consumers need to give their permission before being marketed to.
- **targeted:** by agreeing to share information about themselves and their buying habits, consumers allow businesses to improve the relevancy of the offers they send out.
- **“live”:** because of the nature of mobile phones, responses can be processed to give real-time visibility of reaction to specific offers.
- **two-way:** using mobile devices, consumers can not only respond to offers but also request specific types of information or interest (for example, offers related to a brand or a category) as well as sharing information with their peers.

Mobile has remained a much more trusted channel than email. Very strict rules have regulated marketing to mobile phones. As a result, unsolicited communication (spam) is not a problem in the same way that it is for email.

The main aspect that differentiates mobile marketing from other channels is the ability to send the right message to the right person at the right time and so trigger a better response rate. Even though other channels can reach highly targeted groups, there is little control over time. Mobile marketing can target a supermarket shopper as they are entering the supermarket or a person going out to a bar when they are likely to be thinking of buying a drink. This time dimension enhances the effectiveness of mobile campaigns compared to other channels. For these new approaches to be successful, consumer trust and confidence should be an integral part any campaign.

3.6 Success factors for mobile commerce

Mobile commerce is an emerging market. As with any emerging market there are significant opportunities and significant risks. The temptation at this stage is for key players to impose their own rules based on their own business models.

Although this can be beneficial for a few in the short-term and in some markets may be the only way to start doing mobile commerce, in the long-term this will have a negative impact on business because lack of interoperability and higher operating costs will create barriers to growth and adoption. However a dynamic market needs an environment that favours innovation and a diversity of stakeholders.

‘Brands and agencies are being forced to change their advertising strategies to engage with consumers and create a dialogue, rather than simply push messages to them’

*Chris Ward, Commercial Director,
Microsoft Digital Advertising Solutions*

Young consumers claim that authenticity comes not from a monologue, but through engagement in a dialogue.

IBM Global Innovation Outlook 3.0

It is for this reason that the GS1 Mobile Com group advocates an approach where building an interoperable standards-based eco-system for mobile commerce is central. This way, all players will be able to benefit from the system created, as they already do with the existing GS1 identification and communication standards.

This section defines four success factors which the GS1 Mobile Com group believes are key to making mass mobile commerce happen across the globe:

1. Innovative Business Models. Companies that want to take advantage of the opportunities presented by this new technology will have to understand how this technology fits with existing business models or provokes new ones.

- Retailers and manufacturers have to consider that they have the opportunity to become providers of services as well as providers of products. Providing services requires different resources, different internal organisation and different thinking to providing products, but there are many benefits to be gained from embracing a service-based approach that will strengthen core business.
- Mobile Network Operators need to consider how mobile commerce can be integrated with existing tools for revenue generation such as SMS, Premium SMS and MMS as well as the huge potential to drive data traffic (which in most markets is still priced highly and discourages increases usage). Additionally, the fact that mobile operators have an existing billing structure is of great advantage, particularly as far as payments for low amounts are concerned.
- Mobile Phone Manufacturers need to consider how to provide mobile devices that suit the needs of the market but also drive the market in new directions, with open architecture and tools allowing new applications to develop based on their devices and platforms.
- Solution Providers need to understand how to collaborate with different players, bearing in mind that in many mobile commerce applications they will only be one part of a solution.

2. Consumer adoption. Mobile phones are already starting to become a basic device available to everyone: anytime, anywhere. This means that the question is not so much “Will every consumer adopt his mobile phone as a universal interface to connect to any digital service?” as “When will consumers do this, under what circumstances, how much will they use it and how quickly will this adoption take place?”.

For mass adoption of this technology to take place quickly, consumers must:

- be able to access services as easily as possible (“just a few clicks and no more”).
- be convinced that the services are useful and make a difference to their lives.
- be confident about the costs of these services (for free, part of the monthly fee they already pay as a subscriber or a transparent one-off fee (such as SMS)).
- be confident about the source and reliability of the information delivered (for example bank, brand-owner, retailer, government organisation).
- be confident about respect of privacy and personal information.
- be confident that security measures protecting their devices (such as biometrics and pass codes) are effective.

For consumers to adopt any of these new services on their mobile phones confidently, they will need to be able to use these services whatever kind of mobile phone they buy, whatever kind of subscription contract they have signed and whatever mobile network operator they have chosen.

For service providers, this means that choices need to be made to support interoperability and openness, rather than to develop and use private or proprietary model. Business models need to be developed to make sure this is possible.

Once there is a global, interoperable platform available, service providers (bank, brand owners, retailers and many other stakeholders) will be able to focus their resources on creating and launching new services or on transferring existing services to mobile devices, all based on a system that is trusted by consumers.

3. Technology availability. Without certain technologies, mobile commerce is impossible.

The full potential of the mobile phone as an ubiquitous object is only released when local interaction technologies are embedded, such as the combination of camera and image recognition software (to read whether bar codes or recognise specific images) and ways of exchanging and communicating wireless information with products, point-of-sale and other devices. The integration of a secure element, such as a tamperproof chip card, inside the mobile phone will provide security and trust for handling valuable data (such as personal and payment information).

Support for high quality display of the information to the users, supporting state of art internet technologies are required to provide a satisfying and consistent user experience.

Mobile networks need to be able to deal with large amounts of traffic at high speed. Availability of technologies is vital to success of mobile commerce. As for internet and e-commerce, increased user comfort and reactivity provided by high speed connections encourage use of networks for data transfer. High speed mobile network technologies are now in place in many locations.

4. Interoperable Systems. Interoperable systems are essential to mass adoption of mobile commerce. Though proprietary systems may function well in limited situations, they are a barrier to any large-scale implementation.

- Can we imagine a world in which identification keys to access to mobile commerce applications are not unique and may cause conflicts when end consumers scan a bar code with their mobile phones?
- Can we imagine a world in which data carriers are different depending on the applications and need to download multiple bar code readers for the users? Significant additional costs are generated if applications providers are forced to adapt their bar code readers to each operating system in the mobile market.
- Can we imagine a world in which the communication layer is specific to a mobile device, a mobile operator or a local area? This means that whenever a consumer changes a geographic zone certain services will no longer be available. The access to the mobile service must be as simple as possible and the protocols used must be transparent for the users.
- Can we imagine a world in which data processing is built in a proprietary "logic" with no possibility of interoperability between the data pools used to store and exchange data with the services?

GS1's role is to help that businesses collaborate to make sure these success factors are on their side as they begin to use mobile commerce to enhance their business.

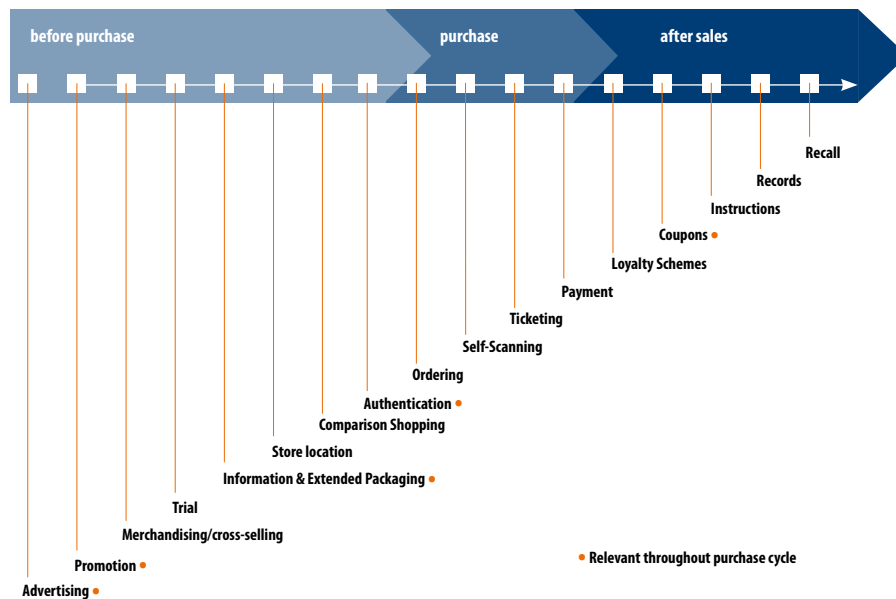
4 Business Applications: what's possible with GS1 standards and how

This section gives an overview of the current and potential applications of mobile commerce. Six of these applications are discussed in more detail with business cases, benefits and key challenges.

4.1 Business-to-Consumer Applications

These applications revolve around making life easier and richer for consumers and deepening the relationship between consumers and businesses, so that consumers feel they have more say in what they consume. One way to categorise these applications is to look at where they fit in the purchase cycle (as in the diagram below).

Business-to consumer applications and the purchase cycle



Advertising & Promotion

Key concept: advertising and promotional information is sent direct to mobile phones

A consumer is in a shop. She is interested in a new cosmetic product but hesitates to buy. She notices she can view an advertisement for the product by taking the picture of the bar code. She does this and views the advertisement.

A consumer notices a billboard advertising for a handbag while walking down the street. By moving closer and activating the Bluetooth function of its



Advertising on a Japanese mobile phone

phone, she is able to download a coupon to get 30% off the product in any shop today. She does this and receives the coupon in an electronic format on her mobile phone. This bar code will be read by a reader at the cash desk if she buys the product. She then uses her phone to find the location of the nearest shop. This application is discussed further in section 4.6 (Mobile Coupons).

Store Location

Key concept: a map is displayed on a mobile phone showing where consumers can buy a product

A consumer is visiting the website for a product he likes. He is intrigued by a bar code on the web page. Information next to the bar code explains that by scanning the bar code with his mobile phone he can save a link to a web page that will show a map of where that product is available in relation to where he and his mobile phone are. Next time he's in town, he uses his phone to consult the map and is presented with different options for finding the product.

In-store navigation

Key concept: consumers find products more easily when in a shop

A consumer comes into a store and scans an RFID tag to turn their phone into a shopping assistant. They can now search for any product in the store and know exactly where it is (aisle, shelf), how much it costs, and any other information necessary to make a purchasing decision.

Comparison Shopping

Key concept: consumers use their mobile phone to access information about product characteristics and price for related products

A consumer is in a shop. She uses her mobile phone to access a web-based comparison shopping application. By scanning a bar code on a product, she is able to see the price of this product in different shops in her area. Having seen that the product is reasonably priced, she decided to buy it. Using a similar set-up, consumers could also access test results from consumer organisations or customer reviews.

Information & Extended Packaging

Key concept: consumers access additional information about products through their mobile phone

A consumer is in a foreign country. He buys some medicine in a pharmacy, but wants to be sure he has understood the dosage instructions given by the pharmacist properly. He scans the bar code on the pack and finds he is able to read the dosage instructions in his own language.

A consumer is worried about allergens in a product she has just bought. By scanning the bar code on product packaging, she is able to access a full range of product information including information about which allergens the product contains.

The same concepts can be used to provide consumers with nutritional information (and so diet advice) as well as instructions related to product handling, warranty or recycling. A consumer could also check whether food was GM-free or Halal/Kosher certified.

This application is discussed further in section 4.4 (Extended Packaging).

“For cosmetics products, 72 % of the purchase decisions are made at the point of sales. Better information means better sales.”

Daniela Giachetti, L'Oréal



A consumer accessing additional information from a bar code printed on product packaging

Data-rich products

Key concept: consumers access information about products through their mobile phones

A consumer buys a television. Full access to product instructions and guarantee are available using a mobile phone to scan an RFID tag embedded inside the product throughout its lifecycle.

Self-Scanning

Key concept: consumers in supermarkets use their mobile phone (rather than a device supplied by the supermarket) to scan products as they do their shopping

A consumer is in a shop. He uses his mobile phone to scan RFID tags placed on the shelf each time he takes a product. When he has finished shopping, payment is automatically added to his mobile phone bill. By storing data from self-scanning, consumers could create a mobile shopping list which could then be shared with an online shopping application.

This application is discussed further in section 4.9 (Mobile Self-scanning).

Authentication

Key concept: mobile phones are used to check whether or not a product is genuine

A consumer is watching television. She sees a news report about a counterfeit pharmaceutical product. Using her mobile phone, she scans a bar code on the product packaging. She connects automatically to an anti-counterfeiting application that checks the product's authenticity and tells her that the product is genuine.

This application is discussed further in section 4.7 (Mobile Authentication).

Payment

Key concept: mobile phones are able to make payment anywhere, anytime.

A consumer walks into a small shop to buy a newspaper. By moving her mobile phone close to an RFID-enabled device on the cash desk, payment is deducted from a supply of electronic money stored on her mobile phone.

At a vending machine, a consumer can buy a canned drink by moving their phone close to an RFID-enabled phone reader. Payment is deducted from the person's mobile phone bill. A consumer pays his bills by simply scanning the barcode on the bill and using his mobile phone to process payment



Contactless payment using a mobile phone

Ticketing

Key concept: mobile phones are used to distribute and redeem tickets

A concert-goer buys concert tickets online. When she pays she gives her credit card number. A unique bar code is sent by SMS to her mobile phone. She gains entry to the concert by showing the bar code to a reader at the entrance.

A traveller needs to take a metro train. He has bought an electronic ticket that has automatically credited ten journeys to his mobile phone. At the ticket barrier, he moves his mobile phone close to an RFID-reader which deducts one journey from his account as the gate opens.



An example of mobile ticketing

Coupons

Key concept: mobile phones used both to capture and redeem coupons and discounts

A consumer sees an offer for a new product in a magazine. By scanning a bar code with her mobile phone, she is able to take the offer with her to the shop. At the cash-desk, she shows the bar code on mobile phone to the cashier. It is scanned at the same time as the rest of her shopping and the discount automatically calculated.

This application is discussed further in section 4.6 (Mobile Coupons).

Loyalty Schemes

Key concept: mobile phones are used to send targeted promotional coupons

A consumer sees an advertisement for a brand-loyalty scheme. She can accumulate points by scanning the bar codes on products that she has bought. When she has a certain number of points, she receives an SMS with discounts on further products.

This application is discussed further in section 4.6 (Mobile Coupons).

Loyalty Cards

Key concept: mobile phones replace physical loyalty cards

Having signed up for a supermarket loyalty scheme, a unique bar code is sent to a consumer's mobile phone. Whenever he shops at the same supermarket, he shows the bar code at the cash desk and accumulates points based on the total amount he has spent.

This application is discussed further in section 4.6 (Mobile Coupons).

Recall

Key concept: mobile phones are used to access information about product recall easily

A consumer is watching television. She sees a news report about a defective pharmaceutical product. Using her mobile phone, she scans the bar code on the product packaging. She connects automatically to an application that checks the products serial number and tells her that the product does not need to be recalled.

Interactive TV

Key concept: TV viewers can interact with what's happening on screen using their mobile phone

A consumer watches a dating programme on TV. Each of the potential dates is wearing a t-shirt with a bar code. Using her mobile phone to scan the bar code, she received extra information about the person and decides whether she is still interested.

A bar code runs under an TV advertisement for a product on TV. By scanning the bar code the consumer can purchase the product using their preferred shipping and billing information that is preconfigured.

Interactive Publications

Key concept: Publication readers can retrieve more information using their mobile phone

A bar code under each article and product advertisement allows readers of magazines, newspapers, and other publications to retrieve additional information necessary to increase comprehension and to make purchasing decisions.

Catalogue shopping

Key concept: mobile phones are used to place orders for products in a catalogue

A consumer receives a catalogue by mail from a catalogue shopping company. Each product on sale is accompanied by a unique bar code. By scanning the bar codes, the consumer can buy products directly from the catalogue in a similar way to Amazon's "1-Click" buying functionality. A consumer accesses a web-based catalogue on his mobile phone which he can browse and use to order products.

Trial of digital/non-digital media

Key concept: mobile phones are used to trial books, magazines, music and video

A consumer moves their mobile phone close to the shelf with an advertisement for a new magazine. Their mobile phone reads an RFID tag on the shelf and downloads a preview of an article from the magazine. Using rich media techniques, the consumer could also have the impression of turning the magazine's pages on their mobile phone as well as zooming into the article to read the text. This concept could be extended to other types of media. For example, a kiosk in a music store could allow consumers to download a song extract or an intelligent movie poster could allow consumers to download a film trailer.

Personal Safety

Key concept: mobile phones are used to alert current location

A person takes a taxi at night. By moving her RFID enabled phone close to a unique RFID tag placed in the taxi, she is able to automatically send her current location and her expected time of arrival to a friend by SMS.

Text to voice

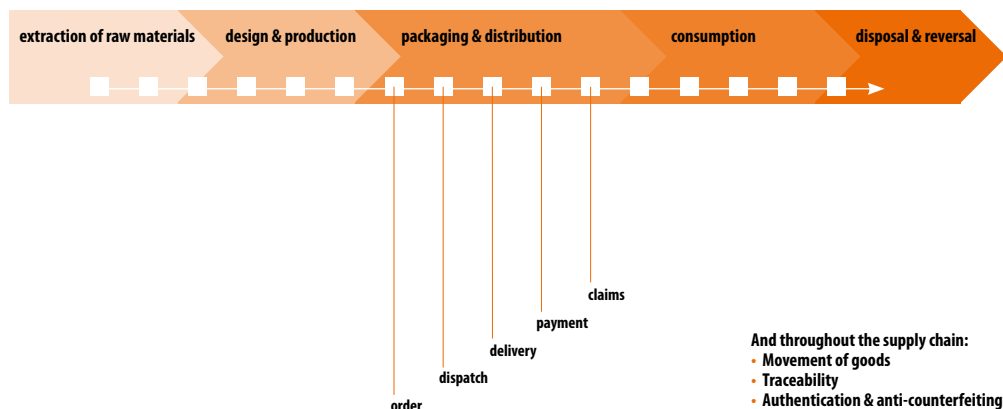
Key concept: mobile phones translate text to voice for elderly or visually-impaired consumers

By passing their mobile phone close to an RFID tag, an elderly or visually impaired consumer can hear information about a product or promotion.

4.2 Business-to-Business Applications

These applications centre on making businesses more efficient and enabling closer collaboration between business partners.

Business-to-business applications and product lifecycle



Ordering

Key concept: Mobile phones are used to reorder products with orders sent to the supplier in a standard format

By scanning a bar code on a product with a mobile phone and using a simple application to state quantity required, the owner of a small shop can automatically re-order goods.

This application is discussed further in section 4.8 (Re-ordering).

Delivery Confirmation

Key concept: Mobile phones are used to report or retrieve information about the status of orders during the transport and delivery process

By using a mobile phone to read a bar code on a case or pallet, a truck driver can confirm in real-time that an order has been delivered.

Stock control

Key concept: mobile phones can be used to keep track of stock and send updates to a central database

By using a mobile phone to scan bar codes or RFID tags on products, employees are able to supply the business with real-time stock updates to their business. Mobile phones (as opposed to dedicated mobile scanners already used in warehouses) are particularly attractive tools where stock is stored in many locations (such as stock control of apparel items directly in department stores).

Authentication

Key concept: mobile phones are used to check whether or not a product is genuine

By using a mobile phone to scan an RFID tag on a product, anyone in the supply chain can check if a product is genuine.

Supply Chain Information

Key concept: information about the supply chain processes is available via a mobile device

By scanning an RFID tag with a mobile phone, anyone in the supply chain can check information about a product's past and future states in the supply chain.

Traceability

Key concept: mobile phones are used to access traceability information about a product

By scanning a bar code on a product with a mobile phone, anyone in the supply chain can verify traceability information related to the product.

Distributed teams/collaboration

Key concept: mobile phones are used by teams to work together more effectively

By scanning an RFID tag at a location, members of distributed teams can communicate to others in a team that they have completed a task at a remote location.

A security company requires that its agents use their mobile phone to scan RFID tags at specific locations during their shift. They can use this to prove that they are providing an effective service to their customers.

4.3 Business Applications

The following section explores six business applications that have been chosen as being specifically relevant to the supply chain and to show diversity of different business needs and scenarios.

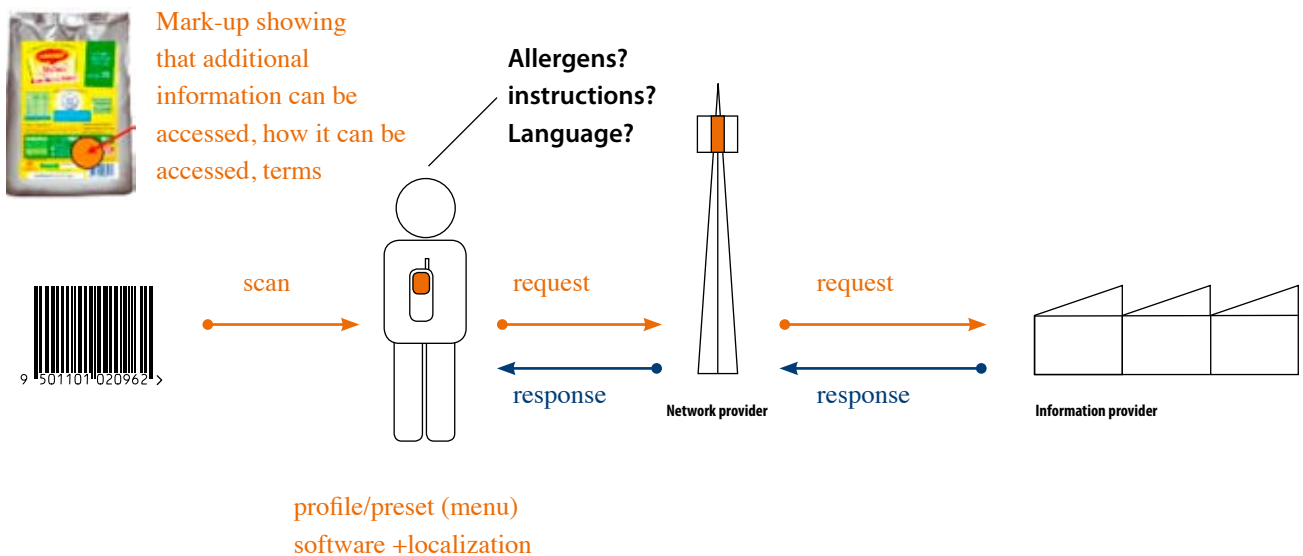
4.4 Business Application 1: Extended Packaging

4.4.1 Business Opportunity:

The possibilities of the “virtual” packaging have no limits. It provides a solution to:

- consumer demand for additional information
- limited space on packaging
- static nature of pack information

4.4.2 Basic Scenario



At its most basic extended packaging is simply about providing additional product information. A consumer scans a bar code on a product with their mobile phone. He connects to a network and retrieves additional information about the product.

However, when a person predefines what information they are interested in, this application can become extremely powerful for both business and consumers. Information that is shared with consumers becomes more valuable because it is personalised and relevant to consumer needs.

This vision of extended packaging gives businesses the opportunity to enter into a dialogue with their consumers where information is exchanged on both sides and where both sides benefit.

Business Benefits

- richer and more complete shopper behaviour data allows better decision-making and sharper campaigns

- better service to consumers
- differentiate from competitors
- increased trust in brand through transparency
- helps on-the-spot purchase decision (e.g. allergens, traceability, explanatory videos)
- wider audience
- up-to-date information
- easier internationalisation of products (e.g. different languages)
- cross-selling

Consumer Benefits

- control over information received
- right information at the right time in the right format (e.g. language)
- information available anywhere, anytime, on any product
- personalised information (profiling)
- easier to use for consumer (e.g. ability to change size of text, have abbreviations explained)

4.4.3 Key questions and challenge

- Need for mark-up/logo to tell consumers that additional information is available, how it can be accessed and relevant terms and conditions of use
- Is information related to individual products (such as traceability information) or to groups of the same product (such as information about the brand owner)? Is there therefore a need for a serialized product identification number or a generic product identification number?
- Make clear who owns/validates the content (manufacturer, producer, third-party service provider, government, etc.).
- Make sure applications are simple to access and easy to use.
- Consider relevance of text to audio services to share information with certain consumers
- Often information could be stored in multiple locations (for example, basic product information may be in a company's private database, but information about product certification may come from a government database. Full interoperability of data sources is essential.
- Does the consumer need to download a specific application onto their mobile phone?
- What response time is needed?
- Who will pay for these services?
- Make sure information is up-to-date (if dynamic information is required then there is also a need for a dynamic network to deliver this information)
- What happens if a bar code or RFID tag is damaged? Make sure that backup systems are in place (e.g. so that user can manually enter the bar code number into their phone).
- Be careful not to overload the consumer with information. If a large amount of information is available, the consumer could indicate what information they want to see displayed the first time they use the tool.
- How can we ensure information sent to and from consumers is relevant and secure. The m-commerce market will face many of the same challenges faced by the internet.
- Product information (master data in the supply chain) must be made available with common definitions and rules so that the consumer's mobile experience is consistent in any store or purchasing environment.

4.4.4 Case study

GS1 France worked with partners SERES and JET Multimedia to set up a live demonstrator capable of searching for information on a product in real-time that a consumer could access using their mobile phone. In this way, the product code will be linked to the information available and accessed anytime, anywhere by the consumer.

How does it work?

The prototype created follows the specifications recommended by GS1 France Mobile Commerce workgroup: read the GS1 bar code on products in order to facilitate access to information and go and search for the information in a GDSN (Global Data Synchronisation Network, see section 5.5.2 for further details) product catalogue. The consumer takes the following steps:

1. A consumer wants to be sure of certain information on food products such as the presence of allergens or genetically-modified ingredients or country of origin.
2. The consumer is informed of the existence of a mobile internet service called "Codeonline" that can provide the answers he needs every time he wants to purchase a product.
3. The consumer enters their name and sends it by SMS (free-of-charge) and is connected directly to the "Codeonline" website.
4. The consumer defines their "profile" from a list of criteria. Once the profile has been validated the software is automatically downloaded onto their mobile phone.
5. Every time the consumer wants to obtain the chosen information on a product they simply have to click on the "Codeonline" icon on their mobile phone and use the mobile phone camera to scan the product bar code. The whole request is made automatically and precise answers will appear directly on their mobile phone.

This scenario offers numerous advantages:

- Each consumer defines the questions that interest them beforehand once only (though their profile can later be modified if required)
- All products can be read by their mobile phone and the answers to the consumer's specific questions is provided without the need for any additional data input or selection
- A consumer can create several profiles (father, mother, child 1, child 2, etc.) depending on their specific problems with allergens or dietary needs
- Every profile is based on multiple criteria, with a potentially very wide range of criteria available
- Use of the industry-wide standards and open technology

Searching for information on a product in real-time



1. Before shopping:
The consumer downloads the GS1 CodeOnLine application and defines the information she is interested in

2. In-store 1:
The consumer opens the GS1 CodeOnLine application and takes a picture of the bar code on the product she is interested in

3. In-store:
A few seconds later, she receives the required information about the product on her mobile phone

4.4.1 Technology

Keys & Identifiers	GTIN (data carrier)
Data Carrier	1D bar codes, 2D bar codes or RFID tags could be used on product or shelf.
Mobile Device	Native barcode decoder software in mobile device. Camera. SMS functionality. internet access. Relevant software application.
Communication Layer	SMS, internet
Data Processing / Information Exchange	Data source (data pool, eCatalogue, proprietary database) Route to data source (e.g. GEPIR) containing product data and additional information

For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks and GS1 standards for mobile commerce.

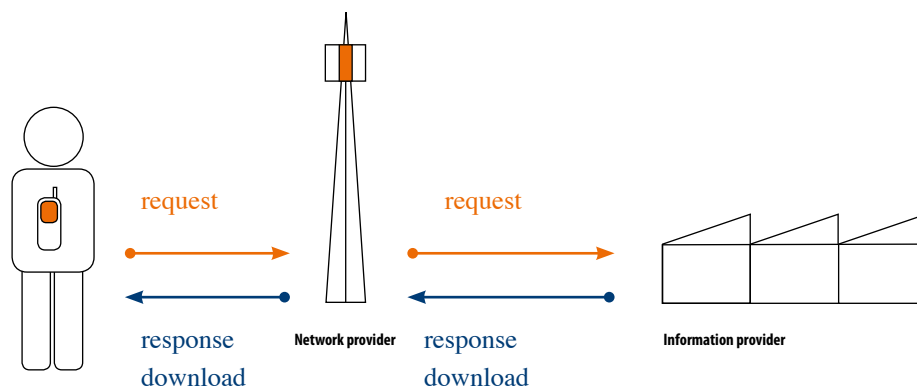
4.5 Business Application 2: Content Purchase & Delivery

4.5.1 Business Opportunity

The amount of digital content (from ringtones to songs to games to movies) is growing exponentially. Without a clear way to identify digital content, organisations have difficulty managing that content. Just as there is a need to identify physical object uniquely, so intangible products sold via mobile phones such as ringtones, wallpaper and music benefit from a comprehensive identification system.

4.5.2 Basic Scenario

A provider of digital music needs a system for uniquely identifying the tracks sold, so that they can manage them effectively in their internal systems. A consumer can use a service on their mobile phone to buy a song and download it directly to their mobile phone.



Business Benefits

- Single system for identifying digital content
- Global uniqueness
- Ease of integration of online and offline databases
- More digital content sold (thanks to mobile phones as additional channel)
- Digital good could be used as an additional promotional tool
- Unlike physical goods, digital products can be delivered direct to consumers to respond rapidly to consumer needs
- Products can be identified at different levels (album vs. song, part of book/magazine) allowing flexibility and the delivery of customised products on-demand

Consumer Benefits

- Ability to sell offline content such as books and CDs easily online using existing printing bar codes as key to populate product information screens
- User can pick and choose the individual content they like so customising content to meet their needs rather than buying pre-packaged content chosen by the business

4.5.3 Key questions and challenges

- What needs to be identified (e.g. songs, albums, games, ringtones)?
- Does the content need to align with offline content?
- What are rules for allocating Global Trade Item Numbers (GTINs) to digital content? In the same way that physical goods have clearly defined identifiers at pallet, case and item level, the relations between larger and smaller chunks of digital goods (for example albums vs. songs) need to be identified.
- How are links between different type of related content managed (for example a song might have associated lyrics, video, album? Parent/child relationships or additional attributes may need to be defined so that related content can be well managed and delivered to the consumer in an effective way whilst retaining the GS1 principle of non-significant identification keys.
- If there is cross promotion of physical and digital goods, retail systems need to understand how the two goods are related.

4.5.4 Case Study

Apple Japan needed a way to identify songs sold via their iTunes Music Store. Since physical albums were already identified used Global Trade Item Numbers (GTINs), it made sense to use this as a basis for identifying individual songs. Using GS1 identification keys simplified the process of identifying new content for Apple, with the additional benefit of facilitating import of data from existing sources.

4.5.5 Technology

Keys & Identifiers	GTIN
Data Carrier	Bar codes / RFID tags to connect to information about digital products from a physical object (such as a DVD)
Mobile Device	Internet access
Communication Layer	Internet (Wireless and Bluetooth should not be also be considered when downloading from kiosks, shelf etc.)
Data Processing / Information Exchange	Database containing digital content

For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks and GS1 standards for mobile commerce.

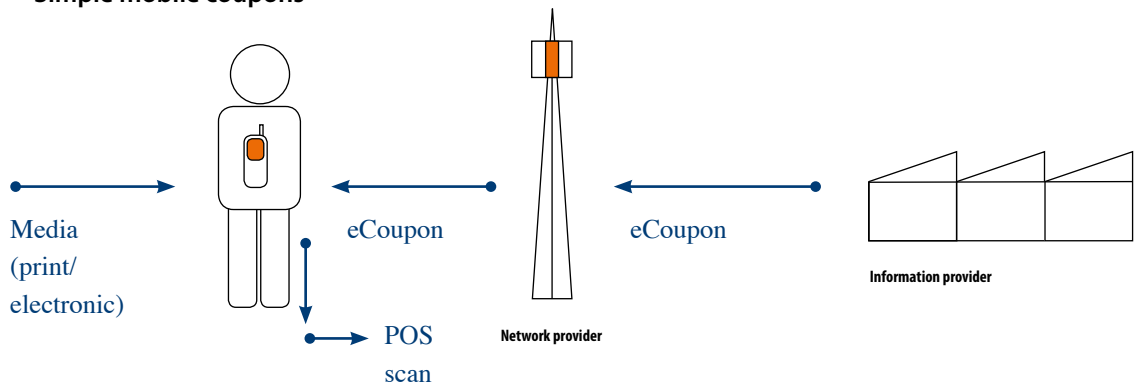
4.6 Business Application 3: Mobile Coupons

4.6.1 Business opportunity

Mobile coupons allow significant benefits to be derived from streamlining the coupon processing chain from consumer to coupon issuer including reduced costs, quicker campaign results and reduced error. In addition, mobile coupons create significant opportunities because consumers can be targeted with campaign tailored to suit their needs. Overall, mobile coupons represents an opportunity for a better return on promotional investments.

4.6.2 Basic Scenario

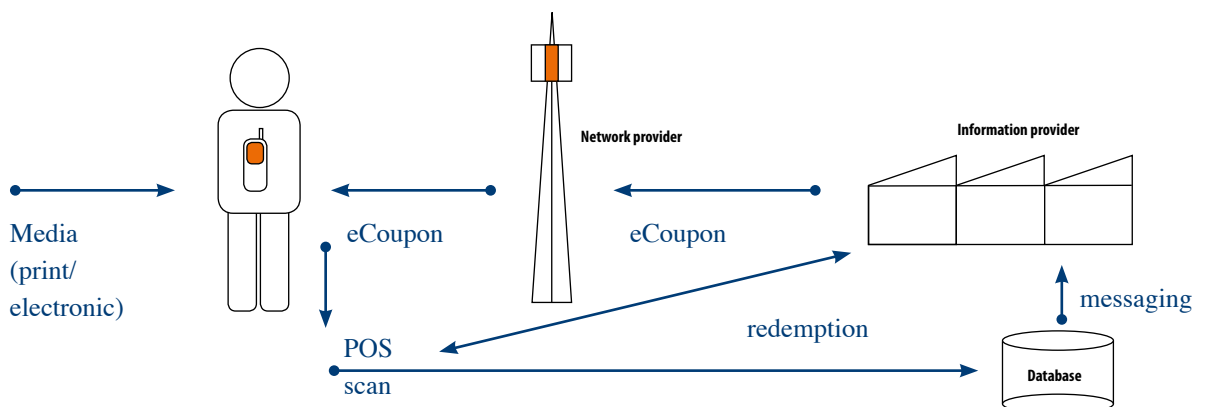
Simple mobile coupons



A brand owner advertises a new product in a magazine (or via any other printed or electronic media) with a mobile coupon in the format of a bar code. By scanning the bar code with their mobile phone, the consumer receives the mobile coupon. The consumer can then redeem the coupon by presenting their mobile phone which is read at point-of-sale (POS).

The POS system automatically communicates the reduction back to the brand owner who automatically reimburses the retailers.

Advanced mobile coupons (including profiling/loyalty scheme)



A brand owner or retailer advertises a loyalty program on their products, magazines/newspapers or other communication media using a 2d bar code containing a link to their website. The interested consumer scans the bar code, enters the website and signs up to the loyalty program.

Subsequently, the consumer receives coupons directly to their mobile phone which can be redeemed at the point of sale.

At the checkout the point of sales system collects the information about the coupon directly from mobile phone. Using the retailer's back office system the coupon information is communicated back to the brand owner who automatically processes reimbursement.

Information about coupon redemption is stored in the loyalty program database. Over time, the database builds a profile for the consumer, so that more targeted mobile coupons can be sent. Consumers can also request specific coupons by sending an SMS or mobile email to the loyalty program containing names of brands they like.

4.6.3 Benefits

Business Benefits

- Better engagement with consumers through enhanced couponing experience (more targeted, more fun)
- Faster, better and more reliable results from couponing campaigns
- Reduction of fraud (ability to authenticate a transaction to reduce incidence of malredemption)
- Cost reduction for total coupon chain (more efficient, reduced fees to third parties) so better use of and return on promotional investments
- Fast and streamlined redemption and settlement process with elimination of paper
- Real-time, richer information allows better consumer insight, better decision making and sharper, more targeted campaigns
- More tailored coupon campaigns: right consumers reached with tailored programs based on their real needs and consumption habits so leading to higher response rates
- Shorter time to market makes it possible to act quickly on live promotions
- Environmentally friendly – no paper to be handled
- Stronger relationships with business partners and consumers
- Opportunity for a 2-way communication and feedback (consumers can give additional information about why they have rejected a coupon so that next coupon can be improved)
- Increase use of coupons on impulse consumption and occasions
- Reduced time at checkout

Consumer Benefits

- More practical than cutting out paper coupons and keeping coupon wallets
- Receive more targeted offers
- Better couponing experience (more fun, quicker)
- Reduced coupon loss
- Coupon is available at any time in a convenient way, no need to plan in advance
- Consumers can benefit and be influenced by the coupons at the "moment of truth" in front of the shelf
- Reduce the time at the checkout

4.6.4 Key questions and challenges

Adoption

- How easily can consumers get and use their mobile coupons? Mobile coupons must be simple for consumers to use. Accessibility for elderly or disabled people should also be taken into consideration.
- Privacy should be carefully respected, in the sense that the customer should always know what personal data are being collected and have the possibility to decline this data collection.
- Due to the existence of several third parties, several applications may be required on the

- mobile to get the full service. They must be interoperable and stay simple for the user.
- Business models and cost structures should be discussed among the several actors in the couponing chain (including new actors such as mobile network operators and mobile phone manufacturers) so that a fair balance can be found. Any actor who would want to take advantage of a strategic position (for instance, due to a technically imposed restriction) would destroy value in the market, which would be bad for all actors in the long term.
 - Can existing processes for paper-based coupons can be adapted to mobile or do processes need to be modified?
 - Retailers may have technology and financial considerations to be able to participate (such as requiring a POS upgrade to read coupons from mobile phones)

Redemption

- How are coupons redeemed at point-of-sale (POS)? Can bar codes be displayed on mobile phones? If so, is the POS terminal equipped to read bar codes displayed in this way? If so, are consumers willing to hand over their mobile phone to the cashier?
- If coupons are not read directly from the mobile phone at point-of-sale (POS), kiosks could be used to print a 1d bar code on paper to aid scanning using current POS systems or the cashier could enter human readable information displayed on the mobile phone.
- What is the best way to redeem coupons if bar codes are not used – Bluetooth, NFC (Near Field Communication) or some other technology? What corresponding investment needs to be made by retailers to support these technologies?
- How would mobile coupons align with GS1 DataBar used for couponing?
- Should a unique code (with a serial number) or a generic code be used for coupons?
- How should multiple coupons be presented for redemption? Simplicity is needed both for consumer and for retailer.
- How do retailer point-of-sale (POS) systems communicate with third party and brand-owner systems?
- Can this be combined with Global Positioning System (GPS) or point-of-sale data to identify location and moment of consumption?
- How can RFID be used to distribute coupons?

Couponing. In the day-by-day battle for consumer's attention and money, consumer goods companies, retailers and other industries make use of promotional paper coupons to increase consumer trial of their products, to increase product penetration and ultimately to increase sales. Coupons are also used to increase the number of consumers registered in the loyalty programs and the number of visitors to retail stores. The downside of paper coupons is that they are costly and complex to manage. There is no guarantee that they reach the intended consumers targeted and are very open to fraud. Though no precise studies are available, industry sources estimate that losses due to coupon fraud exceed \$500 million annually in the United States. In some countries up to 70% of coupons

are not properly redeemed. Coupons can be stolen or obtained from newspapers that carry coupon inserts; from magazine wholesalers; from newspaper vending machines and from recycling centres. They also are collected in other ways (for example, from members of organizations such as church groups and other charities that are paid to collect and cut the coupons). There are even companies that advertise that they purchase pre-cut coupons. There also have been cases of coupons being counterfeited. Paper coupons present several further challenges, such as:

- How to reach the right consumer and be relevant and timely to them (consumers need to cut, store, plan usage and carry coupons with them)

- How to make sure the coupon is used in the right way (according to the brand, product, size, quantity and location specified on the coupon)
- How to handle the additional workload created by paper coupons for brand manufacturers and retailers linked to processing the reimbursement and settlement.
- How to have access to timely information about which coupons have been successful (long feedback loop to know which coupons have been redeemed)
- How to set up a couponing campaign quickly and efficiently (currently operations take significant time to set up, third parties are involved to manage printing, distribution and often final redemption)

Fraud

- How is coupon fraud and malredemption addressed?
- If coupon is a reward for buying the product then what constitutes proof that the purchase has been made (authentication)? Currently bar codes cut out from the pack by consumers often serve this purpose.
- What system is in place to stop mobile coupons being fraudulently used (uniqueness)?
- How is the consumer identified as unique? Has the consumer's privacy been respected?
- Are proper systems in place to make sure that the coupon is redeemed properly? Most retailers have a system whereby a price reduction is made when two bar codes (the relevant product bar code and the coupon bar code) appear during the same transaction at point-of-sale. Can similar systems be used?
- How can secure elements (such as SIM card, mobile wallet, embedded secure chip) be leveraged for couponing applications to build on?

Technical

- Some mobile phones are able to store mobile coupon data and display bar codes through MMS (Multimedia Message Service), mobile e-mail or pre-loaded applications, but the diversity of characteristics and behaviours among mobile devices makes it difficult and expensive to have consistent applications working across a wide audience. In general, are current mobile phone operating systems robust enough to support a coupon application that will be quick to load and provide good user experience?
- The ability of common point-of-sale (POS) terminals to scan coupon bar code directly from mobile phone display should to be checked. Due to various factors such as depth, reflection and backlighting, the scanning capacity of these terminals may be greatly reduced or not operable at all.
- To exchange data with NFC-equipped mobile phones, point-of-sale (POS) terminals will obviously require the integration and deployment of contactless/NFC devices. Payment terminals will also integrate in the future the contactless/NFC technology, but it is unclear if they will be usable for mobile coupons data exchange, or if a second contactless device will be required at the POS.
- The infrastructure and interface requirements for a point-of-sale (POS) to interact with manufacturers to redeem mobile coupons must be light, so that they can be used even at small stores which do not have information technology departments.
- As more and more processes will rely on the mobile phone, battery autonomy will be an increasing issue.
- Open standards seem to be required to describe mobile coupons in a common and interoperable way and guarantee their uniqueness, traceability and redeemability.

Other

- When mobile coupons are sent what syntax do they have?
- How could this system be combined with an existing loyalty card (which could also identify the consumer)? If payment can be made by mobile phone, there is increased likelihood of loyalty card/coupon usage.
- Can the coupon be generated by the mobile phone on-the-spot based on dynamic information (e.g. location of consumer, products purchased, time of the day) or delivered to users via shelf displays?
- What happens when a consumer has to perform multiple actions on the phone simultaneously (such as taking an incoming call at the moment of the coupon transaction)?
- Mobile couponing involves an emotional consumer factor which may be difficult to measure and/or classify. Consumer research is necessary to understand how consumers will respond to mobile couponing.

4.6.5 Case Study

Mobile couponing pilot by Circle-K-Sunkus with Nestlé Japan (November 2007, Japan)

Circle-K-Sunkus (a convenience store chain in Japan with over 6000 stores) carried out a pilot of an mobile coupon promotional campaign for members of Nestlé Japan's "Together Nestlé" loyalty programme.

These members can shop using their mobile phones to pay for goods (using a mobile wallet called Edy available in Japan on the FeliCa chip, an RFID chip facilitating exchange of information between a mobile phone and a terminal).



This new mobile coupon service made it possible to:

- Define the maximum time of delivery and/or download of mobile coupon according to users attributes and/or usage
- Automatically discount the product price by moving the mobile phone when the eCoupons are stored close to reading device
- Automatically generate the usage reports of mobile coupon based on POS data, reducing processing time and workload for both Nestlé Japan and Circle-K-Sunkus.

The service works as follows:

1. The "Together Nestlé" member registers in store to join the Circle-K-Sunkus programme
2. The consumer installs application to manage different memberships on the FeliCa chip of their mobile phone
3. The consumer accesses the "Together Nestlé" mobile site and downloads the mobile coupons that interest them
4. The consumer pays for purchased goods by holding his/her mobile phone over the reader at Circle-K-Sunkus point-of-sale. Discounts are automatically applied for appropriate products (in this campaign, mobile coupons could be reused once they had been downloaded).



Coupon redemption and payment using a mobile phone with a mobile wallet

4.6.6 Technology

Keys & Identifiers	GTIN
Data Carrier	1D GS1 EAN/UPC (to be able to interface with POS), 2D bar code to be used when more information than Global Trade Item Number (GTIN) to be carried)
Mobile Device	Mobile phone should be capable in reading appropriate bar codes or otherwise receiving coupon information. If mobile phone is used as a mean to deliver mobile coupons to the point of sale mobile phone should appropriately display bar code on the screen so that the scanning at the POS can be performed.
Communication Layer	Depends on individual case
Data Processing / Information Exchange	Appropriate transactional systems (such as EPCIS)

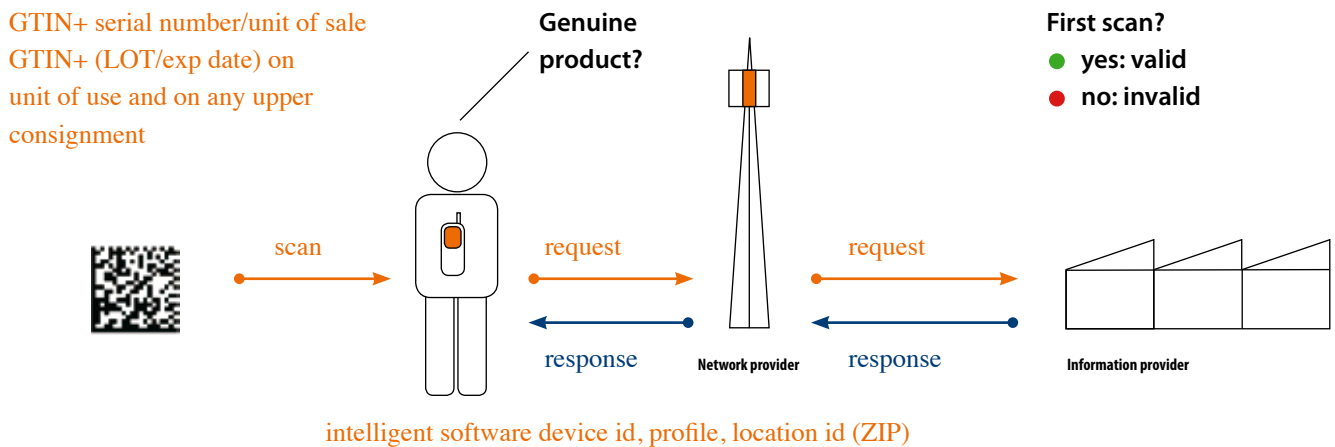
For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks and GS1 standards for mobile commerce.

4.7 Business Application 4: Authentication

4.7.1 Business Opportunity

Mobile technologies could be used by the consumers themselves to get a first level of product authentication and by companies to check if a product has been illegally introduced on a parallel markets.

7.7.2 Basic Scenario



By adding a serialised bar code to the trade item, manufacturers can ensure that the first-level authenticity of a product can be checked. Consumers, or other actors higher up the supply chain, can use a mobile phone to scan an item and check whether or not the product is genuine against a central database. This can become a tool to track and trace abnormalities on a large scale.

There are two types of actor interested in such a system. Firstly, consumers that could check if this particular product (for example a medicine bought from the internet) potentially has a problem of authenticity (the unique ID has already been seen in another context or location). Secondly, manufacturers, government organisations (such as customs) or associations (such as customer associations) could verify if certain products are sold in the wrong market. In order to achieve authentication at a unit level, it is necessary to use a GTIN plus a serial number. However, for checking market validity, a GTIN plus a lot number should be sufficient.

Counterfeiting is a global business issue. The World Customs Organization estimates that counterfeiting accounts for 5% to 7% of global merchandise trade, equivalent to lost sales of as much as US\$ 512 billion in 2006. An report published by the Organisation for Economic Co-operation and Development

(OECD) indicates that international trade in counterfeit and pirated products could have been up to US\$ 200 billion in 2005. This total does not include domestically produced and consumed counterfeit and pirated products and the significant volume of pirated digital products being distributed via the internet. If

these items were added, the total magnitude of counterfeiting and piracy worldwide could well be several hundred billion dollars more. Counterfeiting is particularly relevant in the healthcare sector and in any area where there are high-price items such as wine and spirits or luxury goods.

Business Benefits

- First-level mark of authenticity
- Tool to fight counterfeited goods
- Reduced losses in revenue from counterfeiting
- Brand protection
- Protecting sales by avoiding grey and parallel markets
- Organisations such as customs can focus on high risk items instead of counterfeit products

Consumer Benefits

- Increased trust
- More control over information

4.7.3 Key questions and challenges

- What information is given to the consumer on their mobile phone, a simple sign showing that the product is genuine or information related to the whole path a product has followed?
- What is the structure of the unique ID encoded on an RFID tag or bar code?
- What is the cost of printing a serialized bar code on each trade item versus the benefits?
- Which bar codes should be used?
- Which RFID tags should be used? If NFC tags are used, how should information on the tag be encoded?
- How is the information for the consumer structured?

4.7.4 Case Study

Counterfeiting is a common issue for well-known brands in China. During 2007, Inspiry China helped a major distillery in eastern China apply a bar code management system to its new products allowing both anti-counterfeiting and traceability. The system works as follows:

1. The system creates a unique bar code for each product. The bar code includes Global Trade Item Number (GTIN), a serial number and a random number (for anti-counterfeiting).
2. When a consumer wants to check the validity of a product, he downloads bar code recognition software to his camera phone and takes a picture of the bar code on the product.
3. The consumer can then choose to check either authentication or traceability:
 - If the user chooses authentication, the random number will be used to check whether or not the product is genuine.
 - If the user chooses traceability, the system will access to internet and trace to the product's information according to GTIN + serial number. The information will be shown on mobile screen including manufacturer, expiry date, raw material, operators, producing duration, etc.

The system thus enables consumers to use their mobile phone to immediately know whether a product is genuine. Additionally, the manufacturer is able to obtain real-time information (including location) about counterfeit products available on the market, as well as to analyse subsequent user actions.

4.7.5 Technology

Keys & Identifiers	GTIN + serial number or lot number.
Data Carrier	2D bar codes and/or RFID tags used on the unit of use and any upper unit.
Mobile Device	Mobile phone should be able to read and process DataMatrix bar codes. The application used in the conjunction with the mobile device should contain a configuration profile that indicates the device location (e.g. target market).
Communication Layer	Regular HTTP/HTTPS communication protocol (so that the end-user can fall back on regular web browser if needed).
Data Processing / Information Exchange	Need for master data, supported by data pools (possibly with GEPIR used as routing or resolution mechanism) Information-sharing component (connection to authentic products database or transactional database) is vital (EPCIS could be used)

For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks and GS1 standards for mobile commerce.

Identification means that a product will have a specific identification number representing it without being able to tell if this product is genuine or not. For example, a consumer could check the identification number encoded in the bar code on a bottle of water to know whether the product is produced by the brand on the label. However, the consumer cannot know whether the bottle is filled with tap water or whether the contents of the bottle have been modified in any way.

Sidebar: Authentication. Authentication is the process of proving that something is genuine. It is important not to confuse identification and authentication, since the later includes identifying a product plus a process of making sure the product is genuine. There are several levels of authentication can be distinguished:

- No authentication (only identification)
- First-level authentication
- Advanced-level authentication

First-level authentication includes techniques that are easy and inexpensive to implement but with a low or medium level of security, giving counterfeiters more opportunities to find ways to cheat the system. These techniques include the following: a unique ID plus additional data coming from specific databases (such as events/transactions databases), double unique ID on product, unique ID plus encrypted security code or contextual data like date and location information. It should be possible for anyone with a mobile phone to get first-level authentication information.

Advanced-level authentication includes techniques that are more expensive to implement as they would need some advanced processing material but with a higher security level and therefore a lower risk for counterfeiters to find a way to cheat the system. Those techniques include watermarking, DNA analysis, spraying with chemical dots and physical surface fingerprinting.

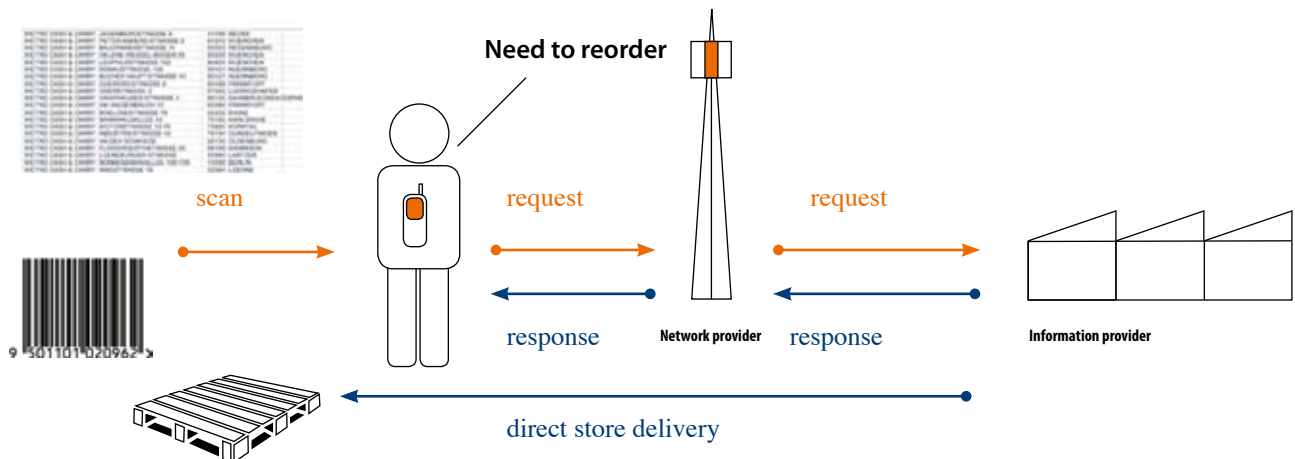
Among these three levels, first-level authentication is the most suited solution for mobile commerce use since identification alone does not provide any level of authentication and advanced-level authentication require costly verification equipment beyond the capabilities of mobile phones.

4.8. Business Application 5: Re-ordering (Mobile EDI)

4.8.1. Business Opportunity

Suppliers receive large numbers of orders from different retailers in a non-automated way (frequently by phone and fax). All businesses in the supply chain spend significant time in the ordering process and there are significant efficiencies to be gained.

7.8.2. Basic Scenario



The owner of a small shop uses his mobile phone to reorder products by scanning the bar code on the product packaging (or case or pallet) and using a simple application to choose quantity required. The supplier receives an electronic message that is automatically processed by his reordering system. The same principle could be used to inform customers of dispatch or delivery of goods. Just as Web EDI (Electronic Data Interchange) represents a subset of enterprise EDI messages, so Mobile EDI could be built from a set of basic EDI messages needed for simple operations.

Business Benefits (supplier)

- Saves time because orders are placed electronically
- Fewer errors
- Potentially higher sales because of easier ordering process
- Automation of ordering process (even for smaller customers, so full benefit of EDI)
- Leaner and faster supply chain
- Enables Collaborative Planning Forecasting and Replenishment (CPFR) as well as Just In Time (JIT) manufacturing techniques

Business Benefits (receiver)

- Saves time
- Fewer errors
- Ease of use
- No need for advanced technology

4.8.3 Key questions and challenges

- Usability of application on mobile phone is paramount, so that increased complexity of technology (moving from phone call or fax to mobile order) is not a barrier.
- Ensure that user of mobile phone has clear feedback that their order has being received correctly.
- Evaluate cultural value of a phone call as being more trusted than an order placed using a mobile phone.
- Mobile phones equipped to scan linear barcodes would enable systems to built that use existing barcodes on products, cases or pallets as a base.

4.8.4 Case study

A German food wholesaler currently delivers food products to hospitals, residential homes, restaurants, pubs and staff canteens. These customers are rarely equipped with electronic or automatic identification systems. For this reason, the wholesaler decided to start a pilot project with ten of his customers with the aim of increasing automation of the ordering process.

The customer receives a mobile phone with a built-in camera from the wholesaler. When the customer needs to order products he takes a picture of the GS1 bar code on the product package with the mobile phone, adds the quantity he needs and presses the "Send" button. An SMS message is automatically send to the wholesaler who identifies the sender by his mobile phone number.

This initiative both makes ordering new products easier for the customer and means that the wholesaler receives the customer's orders in a electronic format, enabling him to automate processing further.

4.8.5 Technology

Keys & Identifiers	GTIN
Data Carrier	1D bar codes can be used in the conjunction with the application that is downloaded onto the mobile device. 2D bar codes could also be used if additional information needs to be carried.
Mobile Device	Mobile device should be able to scan interpret and communicate an electronic order to the remote server. The mobile device should be able to reliably display the server's response.
Communication Layer	Internet or network operator
Data Processing / Information Exchange	Should be assured by supplier

For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks and GS1 standards for mobile commerce.

4.9 Business Application 6: Mobile Self-scanning

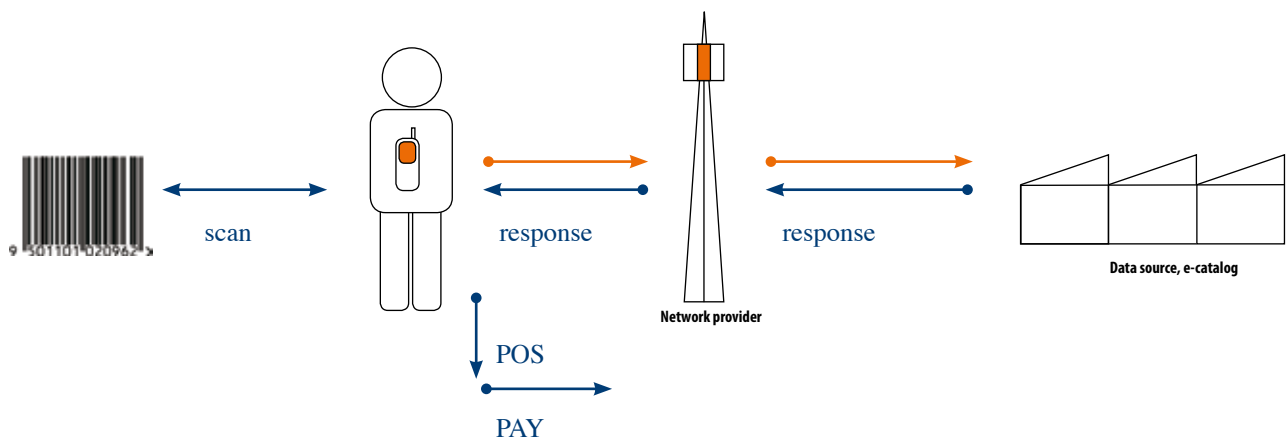
4.9.1 Business Opportunity

Consumers want to have a better and quicker shopping experience. The time spent at check out is very limiting. Problems at check out (such as discovering that the price is not correct) create a loss than optimal shopping experience for affecting the whole queue.

Self-scanning in retail stores can enhance customer experience by increasing speed and convenience. Retailers also save time in check out operations. Providing self-scanning equipment to the consumers involves significant investment (purchase and maintenance) that could be avoided through the use of personal mobile phones by the consumers.

This application could represent the first step towards a complete self check out process including mobile payment.

7.9.2. Basic Scenario



Using a simple application downloaded onto his mobile phone, a consumer scans the bar codes on products as they add them to their shopping trolley. All the details of the shopping basket (list of items, descriptions, single item price, total amount..) are automatically updated by the scanning operation.

At the checkout the application will be able to send all the shopping basket details from the mobile phone to the cashier system (if the scan is offline) or an identification with a link to details of the contents of the shopping basket (if the scan is online with the store database).

This application could be the central part of mobile supermarket shopping:

- Before shopping: to prepare the purchase by making a shopping list based on previous purchases but also on store planned promotion.
- During shopping: to locate goods and optimise the shopping experience.
- After shopping: to manage stock of goods at home by scanning products when they are used and adding them automatically to the next shopping list.

Consumer Benefits

- Uses own device: more personal and no need to learn how to use an external device
- Feel of greater control and trust
- Improve convenience at the check out (less queues)
- Increase customer loyalty (happier customers)

Business Benefits

- Cash desk personnel more available to improve consumer shopping experience
- Save money (compared to retail-owned self-scanning devices)
- Wider adoption of self-scanning because consumers more willing to use their own device (could be combined with other application to deliver promotional information direct to the consumer at the appropriate time)
- Increase consumer traffic
- Increase average basket amount

4.9.3 Key questions and challenges

- What application is on the mobile device of the consumer?
- Is the product catalogue downloaded onto the device (need for enough memory and security) and when (in order to be up to date)? Or is it an "on-line request" application, querying an external database for product information (need to fast system)?
- Can this application use only Wi-Fi or Bluetooth in order to avoid telecom charges?
- How does this work together with extended packaging so that the consumer does not have to switch between two different applications on his device whilst shopping?
- How is payment done to maintain this quick and convenience experience? Mobile payment could be an extension of this service to make it even easier
- How to manage efficient fraud control? This problem is highly variable depending on different markets. In markets where self-scanning is currently successful, random checks (with a person being checked more often if they have attempted to defraud once) seem to work well.

4.9.4 Case study

A major international retailer has worked on a number of self-scanning pilots using mobile phones to replace dedicated self-scanning devices and old-fashioned check-outs.

Consumers found that the concept led to a satisfying shopping experience. Further pilots are planned, in particular combining mobile self-scanning with mobile payment at point-of-sale.

4.9.5 Technology

Keys & Identifiers	Global Trade Item Number (GTIN)
Data Carrier	1D (GS1 EAN/UPC) bar codes or RFID tags could be used on product (or shelf)
Mobile Device	Native decoder software in mobile device. Self-scanning application.
Communication Layer	Internet (if data is out-store), Wi-Fi or Bluetooth (if data is in in-store)
Data Processing / Information Exchange	Data Source (data pool, e-catalogue) containing product data

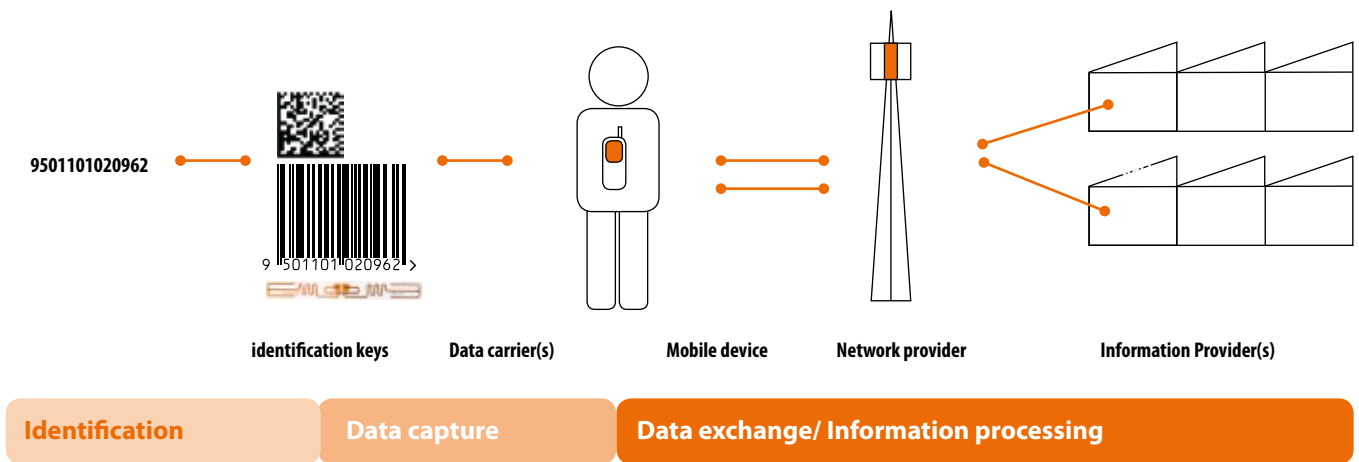
For a more detailed discussion of technologies and standards, see the Section 5: Technical environment: building blocks for mobile commerce.

5 Technical environment: building blocks for mobile commerce

This section explores the individual components that can be put together to satisfy a particular business need or process. The diagram below shows how these components can be separated into:

- **identification keys** are numeric codes that are used to identify objects
- **data carriers** are physical representation that carries the numeric codes (such as a bar code or RFID tag)
- **mobile devices** are able to capture data from the data carrier
- **network providers and technologies** make it possible to exchange data across a network
- **information providers** provide information processing and transactional functionality

A generic scenario could be described as follows and is represented in the diagram below. Numeric identification codes are used to uniquely identify traded items, locations or services. Bar codes or RFID tags are used to represent these identifiers so that the mobile devices can capture them. An owner of a mobile device scans the bar code or tag and captures the identification code. A particular request is then issued by the mobile device and sent through a network to an information provider. Information processing takes place and the desired response is sent back to the mobile device.



The following sections explore each part of this generic scenario in more detail. For specific examples of business applications based on these technical components see section 4 of this document.

5.1 Identification Keys

Identification keys are needed to uniquely identify traded items, locations or consignments used in the supply chain. Further identification might be needed for actors, mobile devices, mobile device components (such as SIM cards or secure chips) or other parts of the generic scenario described above.

Many business applications begin with using correct identification numbers to identify products. It is important to keep in mind the investment that already has been made in existing ways of identifying products as well as any interoperability considerations so that seamless integration with other applications in the supply chain is possible.

Choosing the right identification keys to use for mobile commerce can be easy if goods are already identified. This is the case for the companies already using GS1 identification, where Global Trade Item Number (GTIN) is used to identify trade items, Global Location Number (GLN) to identify business location and so on.

This task is more difficult in areas where common industry-wide identification schemes are not yet established such as identification of consumers, devices and geographical locations. Businesses should choose a method that remains open and extensible across industry or geographical boundaries.

The following areas might require further research and need for standards:

- How can a consumer or household be uniquely identified, taking in consideration privacy aspects?
- How can a particular purchase be uniquely identified so that information can be shared between trading partners (manufacturer, retailer, marketing companies). How to identify several purchases that are processed in one transaction?
- Do items or units of use need to be identified individually or is generic identification of a class of products sufficient?

5.2 Data Carriers

5.2.1 Bar codes

An identification key can be represented physically in the form of the bar code. Both one-dimensional (1D) and two-dimensional (2D) bar codes exist.

1D bar codes (also called linear bar codes) are one of the most widespread and well-known global identification applications and can be seen anywhere in the world. Standards for 1D bar codes have been developed and adopted since the early 1970's. 1D bar codes are read by laser-based scanners (currently at point-of-sale and throughout the supply chain) and camera-based readers (by mobile phones and in specific environments).

1D bar codes require that the size and printing quality match certain criteria in order to be compliant with the standards.

2D bar codes are more novel and have become commonplace in countries with faster adoption of more advanced mobile phones and networks, such as Japan and Korea. There is still relatively little standardisation and many divergent implementations and varieties exist. Several vendors are trying to use this situation to their advantage creating private or patented solutions.

2D bar codes are more advanced than 1D bar codes and have built-in error-correction mechanisms



A typical EAN-13 bar code



A typical Data Matrix bar code

that accept some considerable tolerances in the quality of the printed image without any reduced performance in scanning and recognition of the symbol. 2D bar codes require camera-based scanners to be read. 2D bar codes found in Asia are standardised but proprietary (with non-claimed royalty rights) and allow a URL (web address) to be encoded.

GS1 DataMatrix is a 2D bar code developed by GS1 and based on the ECC200 ISO Standard. While providing all the advantages of other 2D bar codes GS1 DataMatrix is widely supported by important industry stakeholders and is becoming more and more popular within different sectors (such as healthcare). Mobile devices present a very good technical opportunity to act as bar code scanners to capture information stored in 1D or 2D bar codes printed on the product packaging and in other locations. More detailed requirements for mobile devices are listed further on in this section.

The following questions are intended to guide whether a business application should use 1D or 2D bar codes:

- How much information needs to be captured for the application to work? As a rule, 1D bar codes carry less information than 2D bar codes. However, emerging standards such as GS1 DataBar make it possible to have extended data set comparable with two-dimensional bar codes.
- Does the object already carry identification information? If so, can that information be used to power mobile applications? People often think that mobile applications need 2D bar codes to function. In many cases, there is no reason why 1D bar codes cannot be used. In the case of consumer products, there are good reasons for using existing 1D bar codes such as limited space on the pack or clarity for the consumer.
- Does transactional data need to be in the data carrier and human readable on the object (such as delivery dates and serial information)? Take into consideration different amount of data that can be stored in different data carriers.
- Is there a need for the product to be scanned by the conventional technologies present at current POS? Again interoperability is very important here. It makes sense to use already existing data carriers if this can fulfil the business need.
- How generic should the application be? As a rule 1D bar codes are generic and require more complex applications to request forwarding to related information whereas 2D bar codes can potentially encode a URL (web address) that points directly to the information provider. However, having a URL hardcoded in the bar code might make the application less robust and less flexible. The following cases can be observed:
 1. 1D bar code scanning requires generic framework for the URL resolution. This is also referred to as indirect or managed encoding.
 2. 2D bar code scanning with no specific URL encoded requires a generic framework for the URL resolution. This is also referred to as indirect or managed encoding.
 3. 2D bar code scanning with a specific URL encoded does not require any additional processing. This is also referred to as direct or unmanaged encoding.

Each of these cases has its advantages and disadvantages. The first two cases require a more evolved infrastructure but are also more robust and can be customised to future needs more easily.

- Should a “patented” solution be chosen? There are many “proprietary” 2D bar codes currently available on the market. The GS1 Mobile Com group suggests that widely-implemented, open standards be used wherever possible.
- What happens if the mobile device is unable to capture information from the bar code? Users should have access to a fallback mechanism such as manual entry of human readable data.

As always it is important to keep in mind that the data carrier chosen should serve a particular business purpose. Some applications can be perfectly served by 1D bar codes while others would not be able to succeed with this conventional technology. Readers are advised to read the business applications described in section 4 for guidance.

The following table summarises characteristics of 1D and 2D bar codes:

1D (EAN/UPC, Data Bar)	2D (DataMatrix EC200, etc)
<ul style="list-style-type: none"> • 100% present at POS • Robust, proven, understood Implemented worldwide • EAN/UPC has a limited dataset GS1 DataBar allows for more data • Additional processing is needed. Can encode URL to point directly to information provider • Read by laser-based or camera-based scanner 	<ul style="list-style-type: none"> • Not many adequately equipped POS terminals exist • Many divergent standards exist • Rich Data (can be used for the serialised data) • Easier to capture in terms of contrast, printing quality, light margins and error correction • Requires camera-based scanner to be read

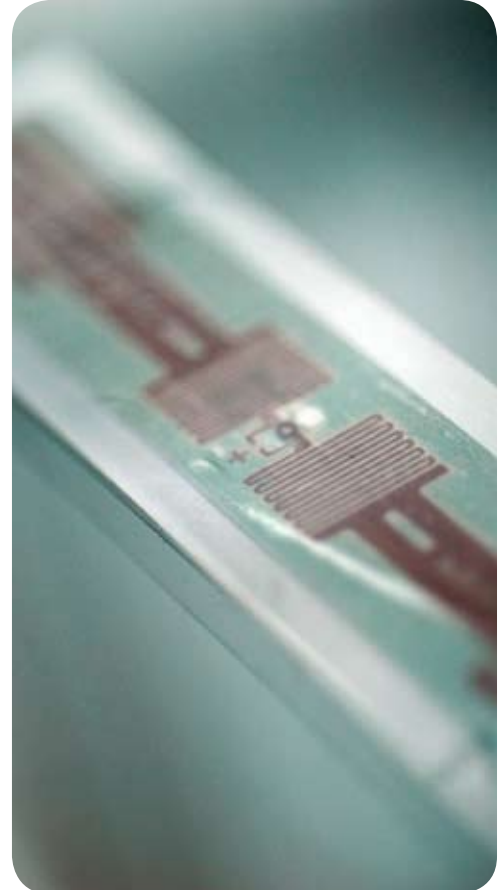
5.2.1 Radio Frequency Identification (RFID) Tags

Electronic Product Codes (EPC) are assigned to physical objects, loads, locations, assets and other entities embedded in a Radio Frequency Identification (RFID) tag attached to each object. With an RFID reader, an EPC-compliant RFID tag and a distributed EPC network, a business can look up detailed information about a product or package, such as its date of manufacture or expiration.

5.2.1.1 EPC-compliant RFID Tags

The Electronic Product Code (EPC) is a family of coding schemes to be used with RFID tags. The EPC was created as a low-cost method of tracking goods in the supply chain using RFID technology. It is designed to meet the needs of various industries, while guaranteeing uniqueness for all EPC-compliant tags. EPC tags have been designed to identify individual items as opposed to just the manufacturer and class of products, as most bar codes do today. The EPC accommodates existing coding schemes and defines new schemes where necessary.

If mobile devices should read RFID tags, they should work according to the specifications of EPCglobal. Several standards are available such as the tag data standard,



A typical EPC tag

ISO standards and other technical requirements and specifications. EPCglobal developments in the future will show which kind of technology will be standard in retail environments. Currently pallets and cases are identified and tagged with ultra high frequency (UHF) transponders using the EPC tag data standard. On consumer items high frequency (HF) technology is expected, but this difference in technology does not change the content of the tags. Information on a tag always has to follow the tag data standard.

5.2.1.2 Near Field Communication (NFC) Tags

Near Field Communication (NFC), is a short-range high frequency (HF) wireless communication technology, which enables the exchange of data between devices over distances of about 10cm. NFC is based on open standards by the NFC Forum (www.nfcforum.com), an organisation with over 100 members from handset, IT and other device manufacturers, plus payment organisations and application developers.

The technology is an extension of the ISO 14443 proximity-card standard (contactless card, RFID) that combines the interface of a smartcard and a reader into a single device. NFC is primarily aimed to be used in conjunction with mobile phones.

NFC has three main use cases in consumer markets:

- Service initiation and information fetching. For example, downloading of timetable information can be triggered by touching a tag at a bus stop.
- Ticketing and payment. An NFC device can communicate with both existing ISO 14443 smartcards and readers, as well as with other NFC devices, and is thereby compatible with existing contactless infrastructures already in use for public transportation and payment. In this use case, the handset is emulating a contactless card or a payment card. This kind of ticketing is already being done in Europe in the Frankfurt area.
- Handset-to-handset information transfer. For example, two NFC handsets touching exchange business cards.

In B2B markets, NFC is already being used for anti-counterfeiting, asset management, security guarding and time and attendance management.

For NFC to be used in mobile commerce the ISO 14443 standard must be followed. This standard has to be used when NFC tag in a mobile device is used to authenticate the transaction process with another device or with a stand-alone NFC tag.

5.3 Mobile Devices

Hundreds of different mobile devices are available to the end consumers and the range of devices available changes frequently. In 2006, Nokia alone released 39 new mobile phone models. It would be a very complicated task to effectively list all of all the mobile devices that could be used for the mobile commerce purposes.

More and more devices available on the market today bring new and exciting functions that can be used by different business applications. Two examples are location-based functionality (based on Global Positioning System (GPS) or other technologies) and payment functionality. Both extend the reach of mobile devices and increase their integration with relevant business applications and processes.

To enable mobile commerce to happen widely, what defines a mobile device?

- Ubiquitous (present in the mass market and available to the consumers on the day-to-day basis)
- Reasonably-priced
- Provides internet connectivity
- Able to display rich content such as images
- Portable
- Customisable
- Able to save data
- Autonomous
- Has a good quality camera with autofocus
- Screen can display barcodes
- Ability to read RFID tags

In addition mobile devices should be able to read barcodes and RFID tags to be able to interact with physical objects as described below. As mobile phones begin to be to emulate credit cards security is an important issue. Measures such as PIN (Personal Identification Number) codes and biometrics are necessary to make sure the device can only be used by its owner.

5.3.1 Bar code Scanning

Mobile devices should be capable of reading both 1D and 2D bar codes. Ideally bar code reading should be assured by the underlying operating system of the device thus enabling robust and speedy reading and decoding of the bar codes. A camera with auto-focus is needed to effectively read the bar code. A simpler variant would be a macro lens, but this limits usability by making it more difficult to take normal (non-macro) pictures. Latest developments in the software should also be taken into account to ensure quick and effective decoding of barcodes read by the mobile device.



Scanning an EAN-13 bar code using the BATOO application developed by ETH Z, rich

5.3.2 Bar code Display

In several business applications it might be desirable that a bar code is displayed on the screen of the mobile device so that the conventional methods of Automatic Identification and Data Capture (AIDC) could be deployed such as laser scanning at point-of-sale. Experience with the scanning of the mobile phone screens is however mixed (see section 5.3.3 below).

5.3.3 Point-of-sale (POS) interaction with Mobile Devices

Point-of-sale (POS) usually means a checkout counter in a shop or supermarket. More specifically, the point-of-sale often refers to the hardware and software used for checkouts - the equivalent of an electronic cash register. Point-of-sale systems are used in almost every type of retail store.

Integration of the mobile technologies with point-of-sale systems brings numerous benefits such as:

- automated identification of the customer and access to his or her customer profile if such interaction is desired.
- payment at POS using a mobile device as a digital wallet.
- transmission of pre-scanned data if a mobile device is used for the self-scanning purposes.

Challenges are obviously related to robustness and effectiveness of the communication between the mobile device and POS interfaces. Several trials have shown that existing point-of-sale equipment has difficulty reading bar codes displayed on mobile phone screens. Either more specialised equipment is needed (that corrects errors caused by distortion and scratching) or RFID protocols (such as NFC) could be used to exchange data between the mobile phone and the point-of-sale. Additionally, consumer tests have shown that consumers may be reluctant to give their phones to a cashier for scanning.

5.4 Network providers and technologies

There are several standards that govern communication between mobile device and the supporting network. The following is a non-exhaustive listing of the most influential standards and technologies:

5.4.1 GSM

Global System for Mobile communications is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 82% of the global mobile market uses the standard. Over 2 billion people use GSM phones across more than 200 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signalling and speech channels are digital quality, and so is considered a second generation (2G) mobile phone system. Data communication has been built on top of the 2G system thanks to the work of the 3rd Generation Partnership Project (3GPP).

The key advantages of GSM systems to consumers have been better voice quality and low-cost alternatives to making calls, such as the Short Message Service (SMS, also called "text messaging"). The advantage for network operators has been the ease of deploying equipment from any vendor that implements the standard.

GPRS (General Packet Data Service) is a mobile data service available to GSM users. It is important because it allows end users without access to 3G networks to have access to a mobile internet and related data services." If there are space issues here, you can add at end of final paragraph (without creating new paragraph) and you could reduce the space after the bulleted list further up the page.

5.4.2 3G

3G is the third generation of mobile phone standards and technology, after 2G. It is based on the International Telecommunication Union (ITU) family of standards under the International Mobile Telecommunications IMT-2000 programme. 3G technologies enable network operators to offer users a wider range of advanced services while achieving greater network capacity through improved spectral efficiency. Services include wide-area wireless voice telephony and broadband wireless data transmission. Typically, they provide a 5-10 Mb per second service.

5.4.2.1 EDGE

Enhanced Data rates for GSM Evolution (EDGE) or Enhanced GPRS (EGPRS), is a digital mobile phone technology that allows increased data transmission rates and improved data transmission reliability. Although technically a 3G-network technology, it is generally classified as the unofficial standard 2.75G, due to its slower network speed. EDGE has been introduced into GSM networks around the world since 2003, initially in North America.

EDGE can be used for any packet switched application, such as an internet connection. High-speed data applications such as video services and other multimedia benefit from increased data capacity of EGPRS.

5.4.2.2 UMTS

Universal Mobile Telecommunications System (UMTS) is one of the third-generation (3G) mobile phone technologies. Currently, the most common form uses W-CDMA as the underlying air interface, is standardized by the 3GPP, and is the European answer to the ITU IMT-2000 requirements for 3G cellular radio systems.

5.4.2.3 HSPA

High-Speed Packet Access (HSPA) is a collection of mobile telephony protocols that extend and improve the performance of existing UMTS protocols. Two standards (HSDPA and HSUPA) have been established and a further standard HSOPA is being proposed.

5.4.3 Wireless Networks (Bluetooth / Wi-Fi)

More and more mobile phones support several technologies at once, not only in the respect to the communication between the handset and the carrier network but also wireless networking such as Bluetooth (short-range) or Wi-Fi (medium-range).

Several pilots have been established in the retail area where consumer's handset can receive promotional info or download music files via Bluetooth connection (in-store promotions, etc ...). In France, L'Oréal and Carrefour have collaborated on one such Bluetooth pilot.

5.4.4 SMS

SMS (Short Message Service) is the most commonly used protocol for text messaging between mobile phones. Already a multi-billion dollar industry, SMS is available on a wide range of networks and performs very well. It would be relatively easy to establish SMS as an additional data carrier for GS1 Identification Keys. All that would be needed would be guidelines on how to structure GS1-compliant SMS messages.

5.4.5. MMS

MMS (Multimedia Message Service) is a standard for sending messages with multimedia content (such as images, audio and video). Marketing messages sent via MMS are generally more effective (leading for example to higher brand recall) than SMS text messages. However, not all phones and networks support MMS consistently, leading to patchy adoption.

5.5 Information Providers

Network providers and technologies are used to send and receive data. There are many different ways to process and enrich these requests by providing the application-tailored responses back to the consumer.

The GS1 System provides GS1 identification keys which can be stored in bar codes and RFID tags and used to create a link to an information provider. The mobile device must have a mechanism to retrieve additional information from the right information provider. Some ways to access the right information provider are GEPIR, GDSN and EPCIS which are described further below.

5.5.1 Global Electronic Party Information Register

The Global Electronic Party Information Register (GEPIR) is a distributed database that contains basic information on over 1,000,000 companies in over 100 countries that could be extended through cascading to further information providers (see the extended packaging business case).

Users can search by GTIN (including UPC and EAN-13), SSCC and GLN numbers or by company name in some countries. Results can be returned in HTML (or XML for some countries). The service is provided jointly by different GS1 Member Organisations. For further information, visit <http://www.gepir.org/>. GEPIR is a neutral bridge to the several information providers making it very flexible and unique for mobile commerce.



5.5.2 Global Data Synchronisation Network

GS1 GDSN™ (Global Data Synchronisation Network) is an automated, standards-based global environment that enables secure and continuous data synchronisation, allowing trading partners in the supply chain to have consistent item data in their systems at the same time.



While GEPIR (see section 5.5.1 above) provides a simple query mechanism to retrieve company details and validate identification keys, GDSN provides infrastructure to publish and subscribe for trading item details such as core item attributes, industry-specific extensions and information on prices and promotions (if available).

5.5.3. EPCglobal Network

EPCglobal network is a composition of services provided by EPCIS and ONS infrastructure. EPC Information Services (EPCIS) is a repository of RFID events (such as reads of RFID tags) based on standards from EPCglobal.

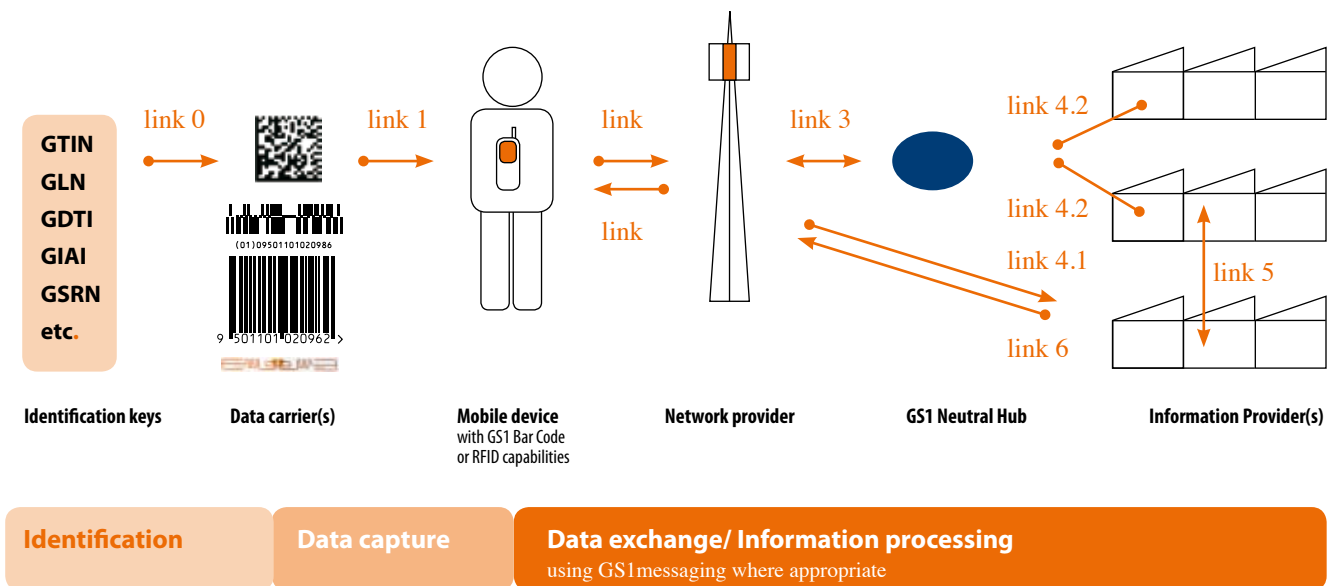


Object Naming Service (ONS) is a mechanism that leverages Domain Name System (DNS) to discover information about a product and related services from the Electronic Product Code (EPC). It is a component of the EPCglobal Network.



This infrastructure might become more important to mobile commerce in the future especially when the access to transactional data is needed and item-level tagging becomes used on a larger scale.

5.6 The possible GS1 framework for mobile commerce

The diagram below shows a possible framework for mobile commerce based on GS1 standards with the parts of the mobile commerce ecosystem which need to be interoperable. Some parts of the ecosystem are already in place and work well, some work on a proprietary basis and need to be standardised and some are missing. For further explanation see the table below.



COMPONENT		Possibility today	Responsibility
Identification GS1 identification keys provide a proven and robust identification system 	GTIN - global unique number for trade items and services	ü	GS1
	GLN - global unique number for locations	ü	
	GDTI - global identifier for documents	ü	
	GIAI - global identifier for assets	ü	
	GSRN – global unique service relation number	ü	
Data Carriers GS1 data carriers are designed to carry GS1 identification keys 	GS1 1D barcodes: GS1 EAN/UPC	ü	GS1
	GS1 1D barcodes: GS1 DataBar symbols	(ü 2010)	
	GS1 2D codes: GS1 DataMatrix ECC 200.	ü	
	EPC tags: UHF (ultra high frequency)	ü	
	EPC tags: HF (high frequency)	(ü NFC Forum)	
 Data Carrier – Mobile Device	Camera system with autofocus, macro lens or software to read barcodes without one of these two.	ü	OEMs
	Reader protocol according to EPCglobal standards.	ü	- GS1 (EPCglobal) - OEMs
 Mobile Device	- Built in software engine (OEM) to decode all data carriers specified above. - Software to encode GS1 ID keys in at least GS1 DataMatrix and display them.	- (ü on a proprietary basis)	OEMs
 Link 2 Mobile Device - Network Provider	The link from the device to the Network Provider is standardized, but there may be a need for review.	ü	Network Provider
	GS1 SMS: use SMS as a data carrier using the GS1 application identified concept unchanged	-	- GS1 - Network Provider
 Network Provider	As long as the links to and from the network provider are in the right format, this is not mobile commerce specific.	-	
 Link 3 Network Provider – Neutral Hub/ Registry/ Resolution Service	Every authorized request from a mobile device needs to be completed by resolution data which is available from the neutral hub to fulfil the request. This step is always the first .	-	
 Neutral Hub/ Registry/ Resolution Service	As identification keys themselves carry no information about where to link to, a “registry” is needed to know where relevant information is stored. GEPIR, GDSN Global Registry and EPCIS are examples of systems that could be used to perform this function.	ü	GS1

COMPONENT		Possibility today	Responsibility
Link 4.1 and 4.2 Neutral Hub/ Registry/ Resolution Service or Network Provider – Information Provider/ Content Service	These links will be implementation-specific. Having the data from the data carrier completed by the resolution data the request can be fulfilled by the right information provider. The link can be established either via the Network Provider (4.1) or via the neutral hub (4.2).	ü(http protocol, ...) - (content)	
Link 5 between Information Providers/ Content Service Data Exchange	As identification keys themselves carry no information about where to link to, a “registry” is needed to know where relevant information is stored. GEPIR and EPCIS are examples of systems that could be used to perform this function.	ü (http protocol, ...)	- Information Provider
Information Provider/ Content Service 	The Information/ content can be located at the: <ul style="list-style-type: none"> - Brand Owner - Third-party Information Provider - Retailer - Market Research Institution - Network Provider 	ü	<ul style="list-style-type: none"> - Brand Owner - Third-party Information Provider - Retailer - Market Research Institution - Network Provider
Link 6 back to the Network Provider	The answer to the request sent by the right Information Provider is provided to the Network Provider in a standardised way.	ü (http protocol, ...)	<ul style="list-style-type: none"> - Information Provider - Network Provider
Link 7 Network Provider – Mobile Device	The link from the Network Provider to the device is standardised, but there may be a need for review.	ü	Network Provider
	GS1 SMS: use SMS as a data carrier using the GS1 application identified concept unchanged.	-	<ul style="list-style-type: none"> - GS1 - Network Provider
Mobile Device 	Browser or software application to show the answer to the request sent independent of how the content is received.	ü	OEMs

6 Recommendations

The GS1 Mobile Com group is proposing these recommendations to make the adoption and use of mobile commerce technology as fast and as easy for consumers and businesses alike.

The following **principles** should to be adhered to:

- Create and use open, global and multi-sectorial standards
- Re-use existing standards and infrastructure where possible
- Fully respect consumer rights and privacy
- Create standards that are proven to solve business problems or create business opportunities

Generally speaking, it is strongly recommended to use existing systems and ensure the convergence of the technologies related to identification and information exchange. The following **recommendations about identification and technical infrastructure** should be followed:

1. Use GS1 keys to identify objects

Since GS1 keys are a proven method of uniquely identifying items, service relationships, assets, consignments and locations, this method identification should continue to be used for mobile commerce applications.

2. Encode GS1 keys in bar codes and RFID tags

It is preferable to encode GS1 keys in bar codes rather than URLs because of the resulting flexibility that this gives to mobile commerce systems. GS1 also sees an opportunity for a "GS1 SMS" to encode relevant GS1 Identification Keys using the SMS (Short Message Service) format.

3. Use existing bar codes on products as an entry point for product information

If a bar code already exists on a product, then it should be used as a first choice to support mobile applications. If additional data are required and are not contained in the existing bar code then GS1 DataMatrix, GS1 DataBar or EPC-compliant RFID tags should be used. In most cases this means that a 1D bar code that already exists on a product is preferable to a new 2D bar code (provided the 1D bar code carries enough data to support the associated business application).

4. Mobile phones should be able to read GS1 standard 1D and 2D bar codes out of the box

By creating mobile phones that are natively able to scan GS1 standard 1D and 2D bar codes, mobile phone manufacturers will remove one of the main existing barriers for the application described in this white paper to be adopted by large numbers of consumers globally. As a minimum requirement, mobile phones should be able to read EAN/UPC, GS1 DataBar and GS1 DataMatrix (ECC 200) bar codes.

5. Mobile phones should be able to read EPC RFID tags on products

As products begin to be tagged with EPC RFID tags to improve supply chain efficiency, businesses should be able to use these tags as a basis for their consumer-facing and business-to-business applications and mobile phones should be able to read these tags.

6. When building systems to support mobile technologies, companies should use existing infrastructure to link to product information and added value services. Specifically:

- GDSN compliant data pools or EPCIS for product information
- GEPIR for information about brand ownership
- GS1 Traceability standards-compliant information systems for dynamic information
- GS1 XML messages to communicate product related information between information providers

The following **recommendations concerning priorities and legal aspects** should be followed:

7. Focus on six business applications presented in this white paper

The six business application presented in this white paper (Extended Packaging, Digital Content Purchase and Delivery, Mobile Coupons, Mobile Authentication, Mobile Re-ordering, Mobile Self-Scanning) are clear examples of applications that bring benefits to businesses and consumers. Case studies show that these applications are possible today. By focusing on these applications to provide standards-compliant solutions, companies have an opportunity to generate real value without taking a huge investment risk. They will also create a solid foundation making it easier to integrate existing and future applications and to scale up within an organisation.

8. Ensure that consumers receive clear clear information

Where existing bar codes are used to link to further information via a mobile device, there should be clear marking on the pack to show to the consumer that additional information is available, what type of information is available, how the information can be accessed and whether there is any charge for the service.

9. Ensure that legal aspects are well-researched

Storage and transfer of personal data is protected by strict data protection laws. For mobile commerce to be successful, consumer trust needs to be achieved. Additionally, many of the business applications described here require product information generated from more than one source which requires different data owners agreeing to share information.

7 Sources

For a better understanding of any technical terms or acronyms mentioned in this White Paper, visit www.gs1.org/glossary/.

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All bar codes in this document have been produced using BarTender.

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