GS1 MobileCom

Extended Packaging Pilot Handbook

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3	06-Nov-2008	Dipan Anarkat, Cameron Green	Second Draft
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The intent of this handbook is to assist GS1 Member Organisations and users of the GS1 System in understanding the potential ways of running Extended Packaging pilots.

GS1 strongly cautions that the **existing** standards be the primary basis for all piloting work.

The candidate recommendations in this document have been developed for exploratory and research purposes to be tested in the pilots. The learnings from the pilot phase will have to be eventually reviewed and go through the appropriate due process in the Global Standards Management Process (GSMP) in order to become GS1 standards. It is important to note that some of the candidate recommendations may be rejected based on pilot feedback and standardisation due process and that all candidate recommendations will have to be reviewed and scrutinized following due process in GSMP

This work will go into standards development within the next six months and if a valid business case or any of the requirements of the GSMP process are not met, GS1 will recommend that trials with these aspects stop immediately. GS1 only recommends components that are in alignment with the GS1 System.

GS1's role is to support the creation of an interoperable system for Extended Packaging and to support the creation of global standards. It is incumbent on pilot participants to assess the risks versus benefits of piloting any of the candidate recommendations in this document.

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1. Introduction

1.1. Objective

Extended Packaging is one of the applications of Mobile Commerce that has been identified as relevant for the Fast Moving Consumer Good (FMCG) supply and demand chains in the GS1 Mobile Commerce white paper [GS1MCOM]. Extended packaging means giving consumers access to additional information or services about products through their mobile phone. It is the ability to retrieve additional information about the product through mobile devices or in general to link a product with virtual information or services. Some examples are allergen information, language translations, recipes and usage instructions. Consumer needs are better met in this way since it is not feasible to print everything a consumer might want to know on a product's packaging or a store shelf.

The possibilities of an Extended Packaging solution have no limits. It provides a solution to:

- consumer demand for additional information

- limited space on packaging

- static nature of information printed on packaging

- track and trace

The purpose of this document is to provide a handbook to help all stakeholders (brands, retailers, mobile phone manufacturers, mobile network operators and solution providers) build Extended Packaging pilots based on existing GS1 global standards. Where standards do not exist, gaps (standards need) have been indentified. One of the goals of these pilots is to test whether the identified gaps are valid for subsequent standardization. Ultimately, our goal is to provide a simple way for consumers and businesses to interact based on an open infrastructure and open standards.

1.2. Pre-requisites

All readers of this document should have a working knowledge of:

- The GS1 MobileCom Opportunities and Challenges White Paper.
  http://www.gs1.org/docs/mobile/GS1_Mobile_Com_Whitepaper.pdf.

  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.

- GS1 Position Paper on Mobile Barcodes
 http://www.gs1.org/docs/mobile/GS1_Mobile_Com_Barcodes_Position_Paper.pdf

  This position paper aims to give manufacturers, retailers and other existing users of the GS1 system guidance on what barcodes they should consider for mobile phone applications. Since the distribution of the position paper, the Quick Response (QR) Code has been submitted for GS1 approval through the Global Standards Management Process, but is not yet a GS1 standard.

Additional background information on this initiative is available at: http://www.gs1.org/ mobile/.

1.3. Overview

In a typical Extended Packaging scenario, the following steps occur:

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Figure 1-1 Extended Packaging overview
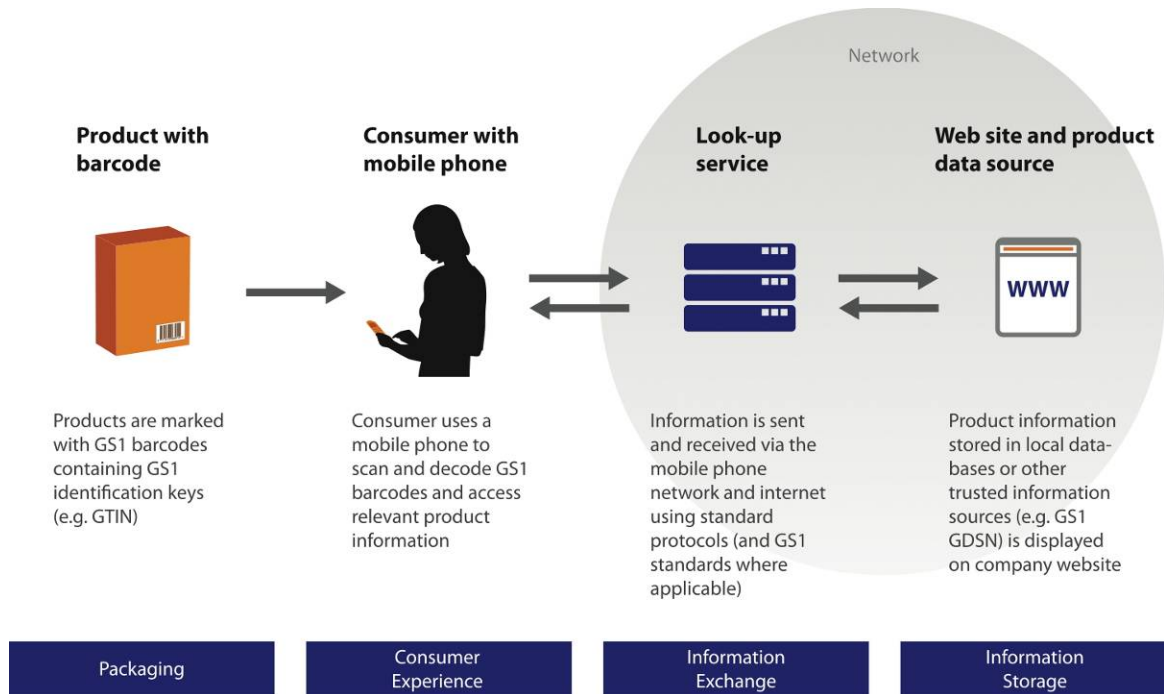
1. **Packaging**: The brand owner decides whether to use the existing linear (1D) barcode or to print an additional 2D barcode on the packaging. Also, the brand owner optionally applies a call-out /industry accepted service mark on the packaging to indicate that Extended Packaging information is available. The brand owner follows the candidate recommendations from this handbook for placement, size, shape and colour of the barcode as well as the optional service mark. Additionally, there may be human readable interpretation on the packaging as an alternative way to access the information in case the mobile scanning process does not work (e.g. GTIN, address of website).

2. **Consumer Experience:** The consumer scans the barcode on the product label using a mobile phone and receives information from a trusted source which is formatted and displayed on the mobile phone by a built-in application (e.g. web browser, SMS) or by the barcode reader software. The consumer receives the extended information he is interested in. Extended packaging information must be related to the product scanned so as to enable the consumer to make informed purchases (in store) or have use instructions (after store).

   The consumer should have the barcode scanner software easily installed, preferably pre-installed on the mobile phone. The consumer should be able to select the type of information he/she wants to receive. The format of the information that is relayed back to a consumer must be easily navigated and read via the mobile device. The mechanism to access product information should not require special phones or other hardware (i.e. it should work with the broad spectrum of mobile devices currently on the market including camera phones). Consumers should be able to have a good experience on reading barcodes under different ambient conditions (e.g. lighting, angle, distance). Access to additional information must be cost effective to the consumer.

3. **Information Exchange:** The consumer scans the barcode on the product label using a mobile phone. The reader application on the mobile phone then decodes/interprets the product identification and sends a query to the trusted source. The trusted source responds with information on the queried product.

   Information is exchanged using *direct* or *indirect* mode of access depending on the encoded content of the barcode scanned. In the direct mode the reader application connects directly to the

trusted source whereas in the indirect mode, the reader application uses a lookup service to find the trusted source based on the barcode scanned. Lookup services are used to inform the address of the trusted source when direct access using the barcode on the product label is not possible or not desired. Information can be exchanged using various mechanisms (e.g. mobile web access, structured query-response using GS1 standardized messaging, SMS etc.).

4. **Information Storage:** Brand owners will provide access to their own product data and/or populate trusted data sources with the product information consumers are interested in. Brand owner maintains control on the type of Extended Packaging information they are willing or able to share. If information is not available the consumer must receive a meaningful message. Information security/publishing policies should be set for mobile access. Consumers should be informed what data will be collected and stored.

1.4. Audience

In general the audience of this document are all entities looking to pilot Extended Packaging. More specifically:

■ *Brand Owners,* who want to provide additional information and services for their products.

■ *Retailers,* who want to provide additional information and services around products in their store.

■ *Mobile Operators & Handset Manufacturers,* looking to provide value added services to their customer base.

■ *Service and Solution providers* (e.g. reader application developers, information aggregators, etc)*,* looking for ways to connect brand information to consumers mobile devices and leverage open and interoperable networks.

1.5. Methodology

The information in this document has been gathered through discussion between members of the GS1 MobileCom and Extended Packaging workgroup from June 2008 – January 2009. Firstly, business requirements for Extended Packaging were gathered from participants (mainly brands, retailers, solution/service providers and some handset manufacturers and mobile operators) and validated by the group. Then existing GS1 standards were matched to each business requirement and standards gaps were noted. Additionally much work was done to develop scenarios for information exchange that can be piloted today. The mission of the Extended Packaging solution is:

■ To leverage existing GS1 Standards to build the foundation for the transmission of product information to consumers via mobile devices.

■ Focus on enabling a seamless consumer experience where valuable product information can be retrieved and well-organised on mobile devices.

A full list of business requirements is available in Appendix A.

GS1's role in this work effort is to help GS1 Member Organisations facilitate local pilots by:

■ Managing the interaction between various stake holders.

■ Maintaining the pilot specifications.

■ Compiling a report of pilot learnings.

■ Leveraging existing GS1 services:

  □ GEPIR

  □ GDSN

✓ **Note:** The use of these services does not imply they will be the de-facto solution for Extended Packaging. These are existing platforms that can be leveraged to start piloting and to better understand what is required for full implementation in the future. In parallel, GS1 seeks to understand the technical architecture required by the business users of the GS1 System for processes like Extended Packaging.

1.6. Scope

In Scope

- Consumers accessing additional information about consumer product goods using mobile devices.

- Interaction of mobile phone with information printed on the packaging (Linear or 2D barcodes).

- Accessing generic information about products.

Out of Scope

The following aspects of Extended Packaging have been deemed out of scope for this handbook but may be developed at a later phase:

- Radio Frequency Identification (RFID)/Near Field Communication (NFC) based interaction – not considered as there are few RFID-enabled phones and consumer items with RFID tags on the market today.

- Non-product related mobile interaction (e.g. locations, services).

- Non-Extended Packaging applications (e.g. payment, B2B).

- More complex applications (e.g. coupons, promotions, advertising).

Although the initial phase of this project identified three categories of Extended Packaging information (general, preferential, interactive) the decision was made by the workgroup to focus on the simplest of the three - General Information.

1.7. How to read this document

This document is divided into 5 main sections:

- **Section 1 "Introduction"** provides a high level overview on Extended Packaging and some information about the document itself.

- **Section 2 "Packaging"** proposes some recommendations on the various choices that affect the product packaging, including but not limited to use of service mark/logo for Extended Packaging, 2D barcodes, encoding of Application Identifiers (AI's) in 2D barcodes and the use of a URL as an AI.

- **Section 3 "Information Exchange"** explains the different business scenarios for Extended Packaging and lists three scenarios the working group have narrowed down onto for piloting.

- **Section 4 "Mobile Devices"** lists the various factors that affect scanning of barcodes using mobile phones and rationalizes on the importance of better optics in mobile phones and the use of existing linear barcodes for use in Extended Packaging.

- **Section 5 "Pilot Considerations"** provides some additional advice by stakeholder for successfully running Extended Packaging pilots.

Additionally, the terms 'Candidate Recommendation', 'Standard' and 'Standards Need' when used should be interpreted as follows:

Candidate Recommendation

A candidate recommendation is a rule or set of guidelines that, after extensive consensus building, has received the endorsement of the community and the working group members to be applicable for piloting. A candidate recommendation as used in the context of this document should be interpreted in a manner similar to a 'Candidate Recommendation' as outlined in the W3C standards track; the technical report is stable and appropriate for piloting. The technical report **MAY** still change based on pilot experience.

In this document candidate recommendations have been made to assist implementers with options that will allow for prototyping and initial development. These candidate recommendations may be entered as official GS1 standards if they prove to accomplish the associated Key Performance Indicators (KPI's).

Candidate Recommendations themselves are not standards and need to be validated through the standardisation process.

Standard

A standard is a GS1 approved standard, guideline, or specification. In some cases, GS1 standards have not been approved for mobile applications, however, they should be considered more stable than the 'Standards Need' which could change during the standardisation process.

Standards Need

A standards need is a missing functionality, feature, or specification, where standardisation is required to cover an existing gap.

In this document, potentially new standards necessary to enhance the Extended Packaging process have been identified as "standards needs". These are gaps that will be submitted as official change requests to GS1 GSMP upon publication of the document and subsequently based on pilot experience. A Candidate Recommendation has been made where a standards need has been identified. Pilot participants are free to interpret and prototype these innovations, as their experience will aid the standards development process.

1.8. Actors

The typical actors that engage in Extended Packaging are:

- **Consumer** – uses a mobile phone to scan a product and engage in Mobile Commerce. Consumer will typically use a barcode reader application to scan and query for information about products he/she is interested in.

- **Mobile Handset Manufacturer** – manufactures and sells the mobile phones to the consumer directly or via the Mobile Network Operator. In addition to their basic function as a portable phone with calling services, **Mobile Phones** also have good data processing and hardware capabilities that allow it to use the native hardware to read barcodes and access the mobile/wireless internet for information. Alternatively, mobile phones can also capture images using the built-in camera, which can be used by software on the phone to send it to a network service for decoding barcode information.

- **Mobile Software Provider** – provides specialised business applications for mobile devices. The application may be provided to the consumer for install on their mobile phones in a variety of ways:

  - ☐ Directly through their website.

  - ☐ Via the Mobile Network Operators website.

  - ☐ Preinstalled on the phone by the Mobile Handset Manufacturer.

☐ Preinstalled on the phone by the Mobile Network Operator.

The Mobile Network Operator can also become a Mobile Software Provider or may source the mobile application from external Mobile Software Providers. **Reader Applications are** - mobile applications provided by Mobile Software Provider and include barcode reader functionality to scan for Linear, 2D or both kinds of GS1 barcodes for Mobile Commerce applications. In addition to scanning of barcodes and decoding of the product identification and related data, reader applications will provide functionality for access and display of additional product related data.

■ **Mobile Service Provider** - provides a variety of mobile services related to products. Some of the services a Mobile Service Provider may provide are:

☐ Lookup service for resolution of GTIN to one or more of the following product related data

- Brand owner data

- Master data

- Information from third party service providers

☐ Custom mobile business solutions like

- Extended Packaging

- Traceability

- Language translation

- Price comparison

- Shopping assistant

☐ Data aggregation from trusted sources

☐ Mobile services like

- Mobile infrastructure management

- SMS

- Mobile software development

- Consulting and solutions development

The mobile service providers in many cases are also Mobile Software Providers.

■ **Information Provider** – is the trusted source for product information like

☐ Brand owner / Distributor / Retailer

☐ Regulatory agencies

☐ GDSN data pools (see section 3.8)

☐ Industry data sources

Mobile Service Providers can also be Information Providers if they aggregate data from multiple trusted sources.

■ **Mobile Network Operator (MNO**) – also known as wireless service provider, wireless carrier, mobile phone operator, or cellular company, is a telephone company that provides services for mobile phone subscribers. In many cases MNO's will also function as a Mobile Service Provider to provide value added services to its consumer base. MNO's are also known to market their own brand of handsets, effectively also functioning as a Mobile Handset Manufacturer.

■ **Brand Owner** – owns the product that the consumer is interested in. Brand owner makes product information available in its internal databases accessible to the consumers.

Information is made available via its mobile website for products or through trusted data sources like GDSN or other Mobile Service Providers.

2. Packaging

2.1. Service mark

One of the important requirements for enabling Extended Packaging is the ability for the consumer to know that additional information is available. Brand owners should add a call-out/call-to-action on their packaging informing consumers they can get additional information through their mobile phones. Typically, an industry-adopted service mark (logo/icon) is also used as an indicator. The brand owner applies the service mark on the product label during the label printing step of the product manufacturing process. The service mark is required to stimulate a user action to scan the barcode on the product. This is very important as retail stores often have thousands of products and without the visual indicator it would be impossible to know which products have additional information. Although, this may change; with ubiquitous barcode reading, consumers will generally expect all barcodes eventually to "plug" them in. However, the service mark if applied to the product label should meet the guidelines below.

Candidate Recommendation	1
Description	A service mark should be used on the product packaging.
Rationale	1. Business requirement - 1 [BR-1]. 2. A useful way to educate consumers that more information is available by scanning the product.

Figure 2-1 Three versions of a service mark meeting the requirements in Candidate Recommendation 2
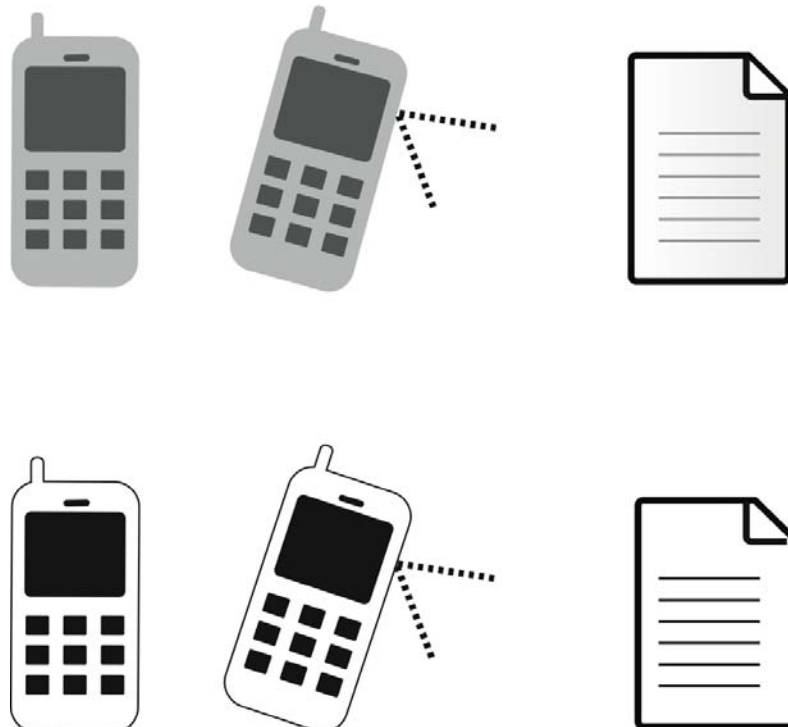
Note: The physical image files for the icons in figure 2-1 can be found at the following link: http://www.gs1.org/docs/mobile/GS1_EP_call_to_action_icons.zip

Candidate Recommendation	2
Description	The Service Mark to be used on the product label for the piloting should be one of the three possible options as shown in Figure 2-1 above. Usage guidelines: The service mark should be located on the product label as near as possible to the barcode so that it is easier and more intuitive for consumers to initiate a barcode scan. The placement of the service mark on the product packaging depends on various factors and it is up to the packaging designers to decide the actual location. Some of these considerations are: ■ Dimensions of the product and available real estate on product label. ■ Aesthetic appeal of the product. Additionally, service marks should be graphically related to the barcode that needs to be scanned possibly using a thin line to surround the barcode while respecting the quiet zone needed for correct scanning.
Rationale	■ Business requirement - 1 [BR-1]. ■ It should be a globally recognizable (not culturally dependent) and a unique service mark. ■ The shape and colour should have minimum impact on existing packaging. ■ The shape should convey Mobile Commerce Extended Packaging to consumers. ■ These options for service marks were developed following consultation with the Extended Packaging workgroup, work done by GS1 France, work done towards the GS1 Mobile Commerce white paper and research on design approaches to icon development. Three approaches were taken: 1. Show tool needed to engage in Extended Packaging (a mobile phone) 2. Show action needed to engage in Extended Packaging (taking a picture of a barcode with a camera phone) 3. Show result of engaging in Extended Packaging (information) ■ Pilots, and in particular consumer response, will decide which of these approaches are most effective. Each service mark is downloadable in vector format at the URL specified above to be used in the pilots.

Candidate Recommendation	2
Standards Need	Need a standard service mark that identifies Extended Packaging information availability, the guidelines for usage, and the public policy/meaning. Additionally, guidelines for Extended Packaging service mark use and public policy are needed to provide reasonable basis for use of Extended Packaging technology for consumer items. The objective of service mark definition will be to promote consumer notice, education, and choice about the technology and include consumer privacy protections. Some considerations for the service mark definition would be: 1. Consumer Notice Consumers will be given clear notice of the availability of additional information through the use of Extended Packaging technology. This notice will be given through the use of an Extended Packaging service mark or identifier on the products or packaging. 2. Consumer Choice Consumers will be informed of the choices that are available for the mechanism to access Extended Packaging information. For e.g. Recommend a sentence in local language such as "Network charges may apply". 3. Consumer Education Consumers will have the opportunity to easily obtain accurate information about Extended Packaging and its applications, as well as information about advances in the technology. Companies using Extended Packaging technology at the consumer level will cooperate in appropriate ways to familiarize consumers with the Extended Packaging logo and to help consumers understand the technology and its benefits. GS1 would also act as a forum for both companies and consumers to learn of and address any uses of Mobile Commerce technology in a manner inconsistent with these guidelines. 4. Record Use, Retention and Security Barcodes used for Extended Packaging does not contain, collect or store any personally identifiable information. As with conventional barcode technology, data which is associated with barcode will be collected, used, maintained, stored and protected by the GS1 member companies in compliance with applicable laws. Companies will publish, in compliance with all applicable laws, information on their policies regarding the retention, use and protection of any personally identifiable information associated with Extended Packaging technology use. Business Requirements - 1, 5, 15, 16, and 17 [BR-1,BR-5,BR-15,BR-16,BR-17]

✅ **Note:** It may be easier to use stickers for the pilot rather than creating prototype packaging.

The use of a service mark or some call-to-action text is entirely optional and depends on the brand owner's product design strategy. Additionally, the decision to use a service mark or not will depend on whether the barcode used for Extended Packaging is the existing linear barcode on the product label or a new 2D barcode. In case of a linear barcode, it is strongly recommended that a service mark be printed on the product label to notify the consumer of the availability of Extended Packaging information.

2.2. Data carrier & product identification

It is important to uniquely identify a product so that additional information can be made available using the Extended Packaging process. Information can vary for like products (e.g. place of manufacture). As such, its important to differentiate products based on agreed upon rules. The Global Trade Item Number (GTIN) is the primary identifier used for identification of all products. It is a globally unique identifier and universally adopted across all industries. It is the most widely used physical identification standard in the world (implemented by more than 1,000,000 companies in more than 140 countries worldwide).

There are two common data carriers that transmit the GTIN for products; barcode and radio frequency tags. GS1 provides many standard barcode symbologies like EAN/UPC, UPC-A, UPC-E, GS1 DataMatrix, GS1 Databar, ITF-14 and GS1-128. Each symbology has a specific use depending on the business application and the item being barcoded.

Barcodes used to connect to mobile content provide a number of benefits:

■   Able to reduce the amount of information on products, shelves, other consumer facing packaging (reduces visual pollution).

■   Allow for personalized information and services – content is easier to understand and use:

   □   Location based services

   □   Language translations

■   Allows brands to provide most up to date information on the product.

Fore more benefits see the GS1 Mobile Commerce white paper.

Note: For information on deciding whether to use the linear barcode already on the packaging or to add an additional 2D barcode, see the device capabilities section. Moreover, it is obvious that only brand owners can decide upon the content of the product label. Also, it is important to factor in to the decision making process that linear barcodes are today the ubiquitous barcode in the Fast Moving Consumer Goods industry for all kinds of different applications.

2.2.1.   Linear barcodes

GS1 provides standard symbologies that are proven for use in Mobile Commerce Extended Packaging. The EAN/UPC family of linear barcodes, currently found on most consumer products should be considered the standard approach for Extended Packaging. The EAN.UPC symbology includes EAN-8, EAN-13 and other linear barcodes that are used for identification of trade items.

Figure 2-2 Examples of Linear barcodes
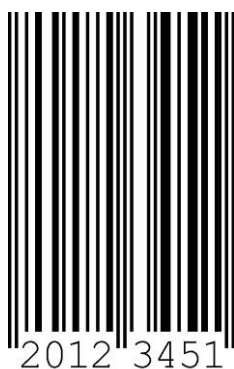
EAN-8   **EAN-13**

Candidate Recommendation	3
Description	EAN-8 and EAN-13 barcodes should be used to access Extended Packaging information when exists on the product packaging.

Candidate Recommendation	3
Rationale	▪ Business requirement - 3 [BR-3]. ▪ The EAN.UPC symbology is already used on millions of products world-wide and as such should be the default for Extended Packaging.
Standard	For EAN-8 and EAN-13 data carriers the rules in GS1 General Specification [GENSPEC] section must be followed at all times. See section 5 'Data Carriers'.

✅ **Note:** Use of UPC-A, UPC-E, GS1-128 and GS1 Databar, although possible has been intentionally left out with the purpose of promoting quicker and simpler pilots. They are not in scope now and will be evaluated in the future for use with mobile phones.

Candidate Recommendation	4
Description	GTIN must be used as the identifier for access to Extended Packaging information using EAN/UPC symbologies.
Rationale	Business requirement - 2 [BR-2]. Business requirement - 3 [BR-3].
Standard	For encoding of GTIN structures in GS1 data carriers follow recommendations in GS1 General Specifications [GENSPEC] section 5 'Data Carriers'.

Candidate Recommendation	5
Description	For shape, size, colour and placement of EAN/UPC barcodes on product label follow the GS1 General Specifications [GENSPEC] section 6 'Symbol Placement Guidelines'.
Rationale	Business Requirement – 5 [BR-5].
Standard	GS1 General Specifications [GENSPEC] - Section 6 'Symbol Placement Guidelines'.

2.2.2. Two Dimensional (2D) barcodes

2D barcodes provide more versatility compared to linear barcodes by providing additional efficiency. Because of built-in error correction mechanisms, 2D barcodes can be scanned more easily. GS1 DataMatrix 2D symbology is currently implemented in numerous sectors including automotive and healthcare direct part marking. Quick Response (QR) barcode symbology is prevalent in Japan and East Asia for Mobile Commerce enabled applications. Currently, QR Code is not a GS1 standard; however, since the GS1 carrier policy changed in 2008, it has been submitted to GS1 for approval.

Figure 2-3 Examples of 2D barcodes
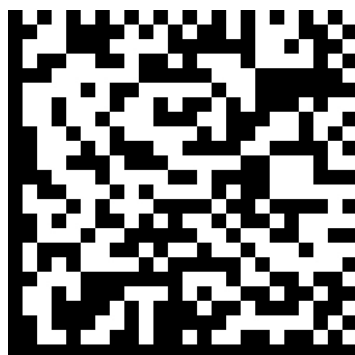
GS1 DataMatrix

QR Code

GS1 DataMatrix is a version of DataMatrix ECC200 and supports GS1 Application Identifiers (GS1 AI's) data and the Function 1 symbol character (FNC1). GS1 AI's and FNC1 are required in the GS1 DataMatrix header structure; in this way GS1 DataMatrix is then different from all other DataMatrix versions and other (non-GS1) data encoding methods.

Candidate Recommendation	6
Description	The Global Trade Item Number (GTIN) must be used for product identification using 2D barcodes.

Rationale	▪ Business requirement - 2 [BR-2].
	▪ GS1 Architecture Principles [GS1ARCH].
	  1. GS1 keys are the primary, mandatory identifiers in the GS1 System. Trade items, locations, assets, services, and other business objects use the same identification keys throughout all GS1 standards. This enables interoperability across the system and extends the value of unique identifiers throughout business processes.
	  2. The format of primary identifiers shall comply with data elements as defined in the Global Data Dictionary.
	  3. Non-GS1 identifiers shall not be primary identifiers in the GS1 System. Non-GS1 identifiers can be used only as an additional means of identification.
	  4. Pilots that use non-GS1 identifiers as primary identifiers are not in compliance with the GS1 System.
	▪ GS1 General Specifications [GENSPEC] Section 1.3.1 - All GS1 standards shall incorporate GS1 identification standards as mandatory identifiers exclusive of all other mandatory identifiers.

Candidate Recommendation	7
Description	GS1 DataMatrix and QR Code [QR] are the only two 2D barcodes that may be used for Extended Packaging pilots.
Rationale	▪ Business requirement - 3 [BR-3]. ▪ GS1 DataMatrix barcode currently implemented in numerous sectors including automotive and healthcare direct part marking. ▪ Quick Response (QR) code. 2D barcode well-known in Japan and East Asia for mobile applications. Currently, QR Code is not a GS1 standard.

Candidate Recommendation	7
Standards need	GS1 Mobile Commerce application standards for use in GS1 DataMatrix. ■ Although the GS1 DataMatrix is an approved standard, it needs to be approved for use in Mobile Commerce Applications. ■ Current GS1 DataMatrix specifications are generic and need to be customized for Mobile Commerce applications. Need specific rules like encoding, shape, size, placement, etc… for Mobile Commerce applications.
Standards need	QR Code Symbology as a GS1 standard symbology and for use in Mobile Commerce applications: ■ Need to recognize QR Code Symbology as a GS1 Standard for Mobile Commerce Applications. ■ Business Requirement - 2 [BR-2]

Note: Change Request (CR) 08-251 has been entered to officially endorse QR Code as a GS1 standard. For updates on this CR see GSMP CR system at http://cr.gs1.org/

Candidate Recommendation	8
Description	A single 2D barcode may be placed on the product packaging when an EAN/UPC barcode already exists.
Rationale	■ If there is more than a single 2D barcode it will be confusing for the user to know which barcode to scan and what information is available. ■ Enable scanning more phones on the market. ■ No perceived benefit for having more than a single 2D barcode on the packaging.

Candidate Recommendation	9
Description	2D barcodes should be used for mobile applications where additional product identification data is required; e.g. Batch Number, Lot Number, Serial Number.
Rationale	■ Business Requirement - 6 [BR-6]. ■ EAN-8 and EAN-13 linear barcodes do not support encoding additional data.

2.2.2.1. Encoding Format

When using 2D barcodes the data must be structured according to the rules of the GS1 System. Element strings begin with an Application Identifier (AI), which is then followed by the data that the AI denotes. Some of the benefits of AI's are:

- A high level of system security thanks to various integrity checks.

- Smaller overall barcode size due to concatenation.

- Allows data requirements to be determined by the business application.

- Lower equipment costs, and greater compatibility, due to global standards.

- The GS1 AI system is important for global interoperability of barcodes.

There is a business need to allow for additional data with the product identification to enable Extended Packaging applications.

Candidate Recommendation	10
Description	The GS1 AI specifications and the Element String format must be used for encoding of all data in supported 2D barcodes. Additionally a FNC1 must be used before all data structures to designate that these are GS1 barcodes.
Rationale	It is mandatory to use the Element String format when encoding data in GS1 2D barcodes.
Standard	GS1 General Specification [GENSPEC] section 3 provides standard element string formats for approved Application Identifiers.

Candidate Recommendation	11
Description	The GTIN should appear first in the element string before any additional AI data.
Rationale	■ Identification of the product must happen before the AI's can be applied. ■ Optimizes the size of the symbol by avoiding the use of separator character by pushing the variable length AI fields towards the end of the symbol. ■ Consistent way of formatting the element string across all Extended Packaging applications. Predictability is beneficial to reader software applications and helps developers use intelligent algorithms to improve barcode scanning performance.
Standard	For encoding AI's in a 2D barcode, see the AI encoding format as specified in the GS1 General Specifications [GENSPEC] Section 3 GS1 'Application Identifier Definitions'.

Figure 2-4 Block diagram for AI encoding format in 2D barcodes
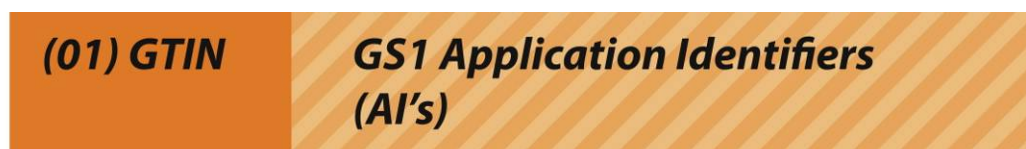
Examples

2.2.2.2. Application Identifiers

GS1 Application Identifiers (AI's) are 2, 3 or 4 digit numbers, as defined by GS1, which define the meaning and the format of the data that follows. Each AI and its associated data can be encoded into a 2D barcode in the same way - and using the same logical rules - as encoding data in the linear barcode symbol GS1-128. Application Identifiers should be clearly recognisable to facilitate key entry. This is achieved by putting parentheses around Application Identifiers in the Human Readable Interpretation under the symbol. The parentheses are not part of the data and must not be encoded in the barcode symbol. The GS1 General Specifications defines many AI's for enabling different applications.

Candidate Recommendation	12
Description	Only AI's listed in the table below may be used for Extended Packaging pilots. The data encoding must fulfil the corresponding GS1 AI specifications for these approved AI's.

AI	Data Content	Format	Rationale	Rules	Example Uses
01	Global Trade Item Number (GTIN)	n2+n14	BR-2	Must be present for all product identification	Identify product at resolution service and then provide link to brand website
10	Batch or Lot Number	n2+X..20	BR-3	Can be used in addition to GTIN	GTIN and batch or lot to check for product recall
15	Best Before Date	n2+n6	BR-3	Can be used in addition to GTIN	GTIN and best before date for food safety
21	Serial Number	n2+X..20	BR-3	Can be used in addition to GTIN	GTIN and serial number for proof of purchase
99*	HTTP URL	n2+X..30	BR-3	In case of direct mode, GTIN must be used in addition to the URL for personalized services	Direct method to manufacturers website
413	Global Location Number (GLN)	n3+X..20	BR-2	Must be used to identify a location	Proof of shopping locations
8018	Global Service Relation Number (GSRN)	n4+n18	BR-2	Can be used to identify a promotion, coupon or other mobile service	Coupon or promotion
Standards need	GS1 standard AI's that are applicable for Mobile Commerce Extended Packaging. ■ No standard GS1 AI's have been approved for use in Mobile Commerce applications. ■ The need for these AI's will be validated by the pilots.				
Standards need	An application identifier for HTTP URL. ■ To enable direct mode of accessing a product's mobile website. ■ The need for this AI to be validated by pilots.				

✓ * AI's 90-99 are assigned for company internal information. The AI 99 as assigned above for HTTP URL has been assigned from this block as a temporary measure, strictly for the purposes of piloting. If the need for an AI for HTTP URL is confirmed, it should be noted that the AI number will be different when standardisation takes place.

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Note: The maximum length of the data component of the AI's in this block is limited to 30 characters by the GS1 General Specifications.

2.2.2.3. Dimensions and Location

The size of a 2D barcode is dependent on many factors. Each 2D symbology defines the number of parameters that affect the size of the 2D barcode; x-dimension, minimum size, maximum size, quiet zone, etc. Additionally, the amount of space available on the product packaging will also dictate the size of the 2D barcode. The product label design will impact where the barcode can be placed on the packaging. The packaging substrate and the aesthetic appeal of the product label design will factor the decision on the choice of the colour to be used for barcode.

Candidate Recommendation	13
Description	The shape of the 2D barcode should be square.
Rationale	■ The square shape is the most commonly used format of DataMatrix. ■ Square shape allows for encoding of more data than the rectangle format for a GS1 DataMatrix barcode with one data region. ■ From a consumer experience perspective, the square shape for 2D barcodes is a more recognizable shape than a rectangle. Also QR Codes do not allow for rectangular format. ■ The square shape is more reader compatible than the rectangular shape - based on industry feedback. There's a good chance that the current installation of reader applications in the marketplace may not capture rectangular barcodes. ■ Reader software can be optimized if the shape is predictable; either square or rectangle but not both.
Standards need	Shape of the 2D barcode to be used for Extended packaging.

The rectangular shape has its advantages also and may be adopted in situations when it is not feasible to apply the square format:

■ Conforms to GS1 DataMatrix standards.

■ Allows product label design flexibility. Some packages may benefit from a rectangular shape where a square barcode would not fit - e.g. small labels.

■ Complementary shape to linear barcodes.

Reader applications / barcode scanning software however should support the full GS1 DataMatrix standard to ensure interoperability of barcode scanning globally. Ultimately, it is up to the brand owner to decide whether to use square or rectangular 2D barcodes on the product packaging.

Candidate Recommendation	14
Description	The number of characters encoded in a GS1 DataMatrix barcode should be the maximum of either 88 for numeric or 64 for alphanumeric characters.
Rationale	■ This is the maximum data capacity in a GS1 DataMatrix symbol with one data region. ■ These are GS1 and ISO recommendations that should be followed for achieving the best data capacity without too much increase in the overall symbol size.

Candidate Recommendation	14
Standards need	Number of characters that can be encoded in a 2D barcode based on barcode size and scan ability: ■ The maximum data capacity for each 2D barcode approved by GS1 for Mobile Commerce application needs to be established so that interoperability and conformance can be achieved. ■ The size of the 2D barcode increases as the number of characters encoded is increased. To ensure efficient and reliable scans using mobile phones, this maximum data capacity may be capped.

Candidate Recommendation	15
Description	The reasonable size of a GS1 DataMatrix barcode should be comprised between 16x16 to maximum of 26x26 matrix to enable the encoding of 88 numeric or 64 alphanumeric characters in a GS1 DataMatrix symbol with one data region.
Rationale	■ If the barcode is too large or too small it will hamper the ability of the consumer to scan the barcode properly using the mobile phone. The consumer experience needs to be made as easy as possible. It is important to restrict the maximum amount of data that can be encoded in the 2D barcode. ■ The size of the 2D barcode should be adequately large so that it can be properly scanned via basic camera based mobile phones. At the same time it should not be too large such that the product loses its aesthetic appeal or is difficult for the consumer to scan.

Candidate Recommendation	16
Description	The number of characters encoded in a QR Code barcode should be the maximum of either 322 for numeric or 195 for alphanumeric characters. This corresponds in the QR Code ISO standard (ISO 18004) to use versions 1 to 6.
Rationale	■ QR Codes don't really have zones of data; they provide instead internal alignment patterns. This results in one internal alignment pattern which is the most efficient use of the internal data capacity of a QR Code. ■ These are recommendations made by GS1 and ISO that should be followed for achieving the best data capacity without too much increase in the overall symbol size.

Candidate Recommendation	17
Description	For guidelines on dimensions and symbol location of GS1 DataMatrix barcodes in general, reference GS1 DataMatrix Introduction and Overview [GS1DM] section 1.2 'Technical Characteristics' and section 2.4 'Symbol Location'.
Rationale	Brand owners need information on shape, size and placement of GS1 DataMatrix symbols on a product label.
Standards need	Dimensions (shape and size) and symbol location of the 2D barcode to be printed on the product packaging for Mobile Commerce / Extended Packaging applications.

Candidate Recommendation	18
Description	Brand owner should decide where to put the 2D barcode on package. It can even be next to the linear barcode. 2D barcode is better on the front of the package as it would be easier for the consumer to identify.
Rationale	The manufacturer is the best judge of where to put the barcode to ensure the consumer will find it, but at the same time not distracting from the existing packaging.

Figure 2-5 Example product packaging from Japan showing placement of linear barcode, 2D barcode and service mark (provided by Heinz Japan)

✅ **Note:** Stickers can be used for the pilot to reduce the costs associated with creating prototype packaging.

2.2.2.4. Human Readability

2D barcodes are not designed to be human readable. The whole purpose of a 2D barcode is to encode data efficiently into a very compact space. However, human readability is desired for manual input when barcode scanners fail. Also, Extended Packaging is not just limited to mobile phones with cameras. As expressed in business requirement - 7 [BR-7], consumers should also be able to access Extended Packaging data without the use of a camera or mobile device (internet). Other methods such as manual input, mobile web access and SMS can be leveraged additionally.

Candidate Recommendation	19
Description	In the Human Readable Interpretation under the symbol, the AI's should be printed by putting parentheses around the AI.
Rationale	AI's should be clearly recognizable to facilitate key entry.
Standard	For guidelines on how to create human readable GS1 DataMatrix barcodes in general, reference GS1 DataMatrix Introduction and Overview [GS1DM] section 2.3 'Human Readable Interpretation'.

Note: The parentheses are not part of the data and must not be encoded in the barcode symbol

Candidate Recommendation	20
Description	The GTIN encoded in a 2D barcode can be printed just beneath the barcode if space permits on the product label. If a HTTP URL temporary AI is encoded in the 2D barcode, then the data title **'URL'** followed by the web address should be printed in the Human Readable Interpretation. Other data encoded in the 2D barcode may be printed on the product packaging.
Rationale	■ This allows consumers to manually type the GTIN (product identifier) into the software reader application. ■ Consumers will not know this is the same number as on the linear barcode. ■ Business Requirements 7 and 11 [BR-7, BR-11]. ■ See section 2.4 for details on HTTP URL encoding and the data title to be used for the corresponding human readable interpretation.
Standard	For guidelines on how to create human readable GS1 DataMatrix barcodes in general, reference GS1 DataMatrix Introduction and Overview [GS1DM] section 2.3 'Human Readable Interpretation'.
Standards need	Location and exact format of human readable interpretation on the product packaging for Mobile Commerce / Extended Packaging applications. ■ Need to ensure that the location of the human readable interpretation is consistent across products and predictable from a consumer experience perspective. Business Requirement - 11 [BR-11]. ■ To be able to reliably and easily scan the 2D barcodes from the product packaging, it is important for the consumer to be able to predict reasonably where the 2D barcode can be found on the product packaging. If the 2D barcode were too close to the linear barcode on the packaging, it would be confusing for the consumer and Point of Sale (POS) system salesperson as to which barcode should be scanned. Also, there is a possibility that close proximity of barcodes will increase the error scan rates for optical scanners.

2.2.2.5. FNC1 (Function Code 1)

Function Characters (FNC) provides special operations and application instructions to the barcode reading device. GS1 DataMatrix uses a special start combination to differentiate the GS1 DataMatrix symbol from the other Data Matrix ECC 200 symbols. This is achieved by using the Function 1 Symbol Character (FNC1) in the first position of the data encoded. It enables scanners to process the information according to the GS1 System Rules. The FNC1 is encoded in two separate ways within GS1 DataMatrix:

1. Start character (ASCII 232)

2. Field Separator (ASCII 29: <GS>)

   □ When used as part of the special combination – use ASCII 232

   □ When used as a field separator - use ASCII 29: <GS>

FNC1 is a special, non-printable, character. It is often inserted using a double byte "Latch to extended ASCII" but this is system dependant.

Function Code 1 (FNC1) has a dual purpose in GS1 Bar Code symbols:

1. **Start character:** This double start pattern (start character + FNC1) is reserved for GS1 System applications worldwide. This makes it possible to distinguish GS1 barcode symbols from extraneous non-standard barcode symbols. This FNC1 is translated in the barcode as the Symbology Identifier ']C1'. When FNC1 appears in the first symbol character position it signals that the data conforms to the GS1 Application Identifier standard format

2. **Field separator:** The FNC1 when followed by another element string in a single barcode symbol. An FNC1 is not required at the end of the last element string represented in a GS1 barcode symbol. When it is used as a field separator in a GS1 DataMatrix, it is transferred to applications by being converted to the ASCII character 29 (group separator - GS).

2D barcodes may contain one or more AI's in the encoded data. In most cases, the AI also decides the length of the data and the format of the data. When encoding AI's in a 2D barcode, all GS1 Application Identifiers indicated with (FNC1) are defined as variable length and must be limited by a Function 1 Symbol Character unless this Element String is the last one to be encoded in the symbol. When a scanner reads a FNC1 character, the next 2-4 digits will represent the applicable AI. As an example if "01" was the encoded data after the FNC1 character, the scanner would expect a 14-digit numeric GTIN data to follow.

Example: GTIN: "09507000000036", URL: "http://www.gs1.mobi/products.asp", Best Before Date: "December 12, 2008", the content of the GS1 DataMatrix corresponding to this information shall be as follows:

Figure 2-6 FNC1 example

Human readable interpretation
(01) 09507000000036
(15) 081212
(99) www.gs1.mobi/products.asp

GS1 DataMatrix Encoding:
<FNC1>*01*09507000000036*15*081212**<GS>***99***<259>**www.gs1.mobi/products.asp

2.3. HTTP URL: AI 99 (temporary)

The Application Identifier (99) indicates that the GS1 Application Identifier data field contains one part a link to a webpage within the Internet. This Element String is only used in conjunction with the identification of a Trade Item AI (01) and, therefore, should only be processed together with the GTIN of the trade item to which it relates.

A Uniform Resource Locator (URL) is a web address that specifies where an identified resource is available and the mechanism for retrieving it. The first part of the address is called protocol identifier and it indicates which protocol is used, the second part is called resource name and it specifies the IP address or the domain name where the resource is located. The protocol identifier and the resource name are separated by a colon and two forward slashes. The data is alphanumeric and may include all characters contained in the figure below.

The Application Identifier (99) indicates that the GS1 Application Identifier data field contains the Hyper Text Transfer Protocol (HTTP) Uniform Resource Locator (URL).

The HTTP URL must link to the brand owner's product web page (static or dynamic) that can provide additional information for the product.

Format of the Element String		
Application Identifier	**HTTP URL**	
99	X_1 ──────── variable ─────────▶ X_{30}	

Note: This Element String must not be used to identify a Trade Item. However, if this Element String appears on a Trade Item on its own (in error), it should not interfere with the mandatory Trade Item identification, the Global Trade Item Number (GTIN).

The data transmitted from the bar code reader means that one part of an URL has been captured. The protocol declaration 'HTTP', the colon and the two forward slashes must not be encoded; these referrers are part of the definition of this Application Identifier.

When indicating this Element String in the human readable section of a barcode label, the following Data Title should be used (see also Section 2.2.2.4): **URL**

This Application Identifier should only be used for value added services for the end user (consumer) within Mobile Commerce applications; if there are limitations to process GS1 keys (like GTIN). This Application Identifier should only be encoded in a GS1 DataMatrix or a QR Code.

Some data examples of Human Readable Interpretation for usage of AI 99 are

(01) 09507000000036 (99) www.gs1.mobi/products

(01) 09507000000036 (99) mobile.gs1.org/

(01) 09507000000036 (99) www.gs1.org/products.asp

Candidate Recommendation	21
Description	ASCII character set may be used as the encoding for use with the HTTP URL AI 99 (temporary).

Candidate Recommendation	21
Rationale	URL as defined by RFC 1738 Uniform Resource Locators (URL) [RFC-1738] can be made up of any ASCII characters. Whereas, the GS1 system mandates that for encoding the element string the ISO 7-bit coded character set for information interchange, the ISO/IEC 646 standard [ISO-646], encoding format must be used.
Standards need	Element string format should support ASCII character set as the encoding for use only with the HTTP URL AI 99 (temporary).

Candidate Recommendation	22
Description	Only HTTP URL may be used for URL encoding in 2D barcodes.
Rationale	- URL must link to brand owner product website for Extended Packaging information - The HTTP URL must NOT contain the protocol declaration characters 'http://'. Since this AI explicitly identifies a HTTP URL, putting the protocol declaration in the URL will result in the loss of valuable data capacity in the encoding and it would be redundant from an Application Identification perspective.
Standard	For creating HTTP URL's follow IETF standard formats for HTTP requests.

Note: The use of the HTTPS protocol as an AI, although possible, has been intentionally been excluded from these pilot guidelines with the purpose of promoting simpler and easier pilots.

Note: Although, it is possible to generalize this AI to support any URL, the scope of Mobile Commerce Extended Packaging has been restricted to the use of only the HTTP referrer in favour of simplicity and ease of adoption. Business requirements and feedback from pilots at a later date may highlight the need to support additional web protocols for a URL.

3. Information Exchange

3.1. Direct vs. Indirect mode of access

Once the consumer has scanned the barcode from the packaging there are two possible modes of information exchange; *direct* and *indirect*.

3.1.1. Direct mode

In the direct mode, all information (e.g. location of the trusted source, product code, etc…) is read directly from the barcode and the mobile phone is able to send the request directly to the trusted source. Typically, the trusted source is the brand owner. There are no intermediaries in this type of information exchange. The consumers' mobile device connects directly to the trusted source based on the information in the scanned barcode. The trusted source in this mode is a web based content delivery system like mobile web portal or a web service that the brand owner provides, which returns the extended data when connected to.

Figure 3-1 Direct Mode
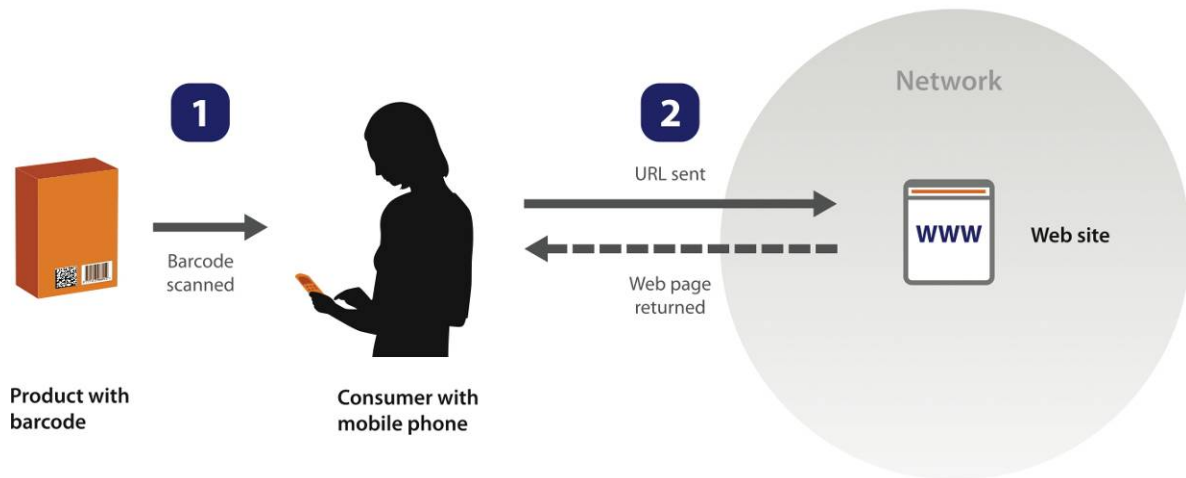
The most common example of direct mode access is when a URL is embedded in a 2D barcode. When the consumer scans the barcode they are able to use the web browser on their mobile phone to view the web page designated by the URL. It is important to note that in direct mode of operation the URL is opened unmodified and that the consumers' mobile phone is connected to the trusted source as intended by the brand owner. However from a technical perspective, due to the way internet/network addressing works and the complexity of telecommunications networks, the URL request may be channelled through and pre-processed by multiple entities (mobile service operators, mobile network operators, information providers, etc…) on its way to the trusted source. This being understood, from a functional perspective this is very much the direct mode of operation as being discussed in the context of Extended Packaging.

Direct mode of access enables the brands to engage in a direct dialogue with the consumer without any intermediaries. Linear barcodes result in the indirect mode of access.

3.1.2. Indirect mode

In the *indirect* mode, the information exchange occurs through an intermediate resolution step. The consumers' mobile device engages in information exchange through a lookup/resolution service that maps the scanned GTIN in the barcode to its trusted source of information. The lookup/resolution operation can be performed through a network based service or a local mapping table. The lookup/resolution service is essentially the proxy to the trusted information source. This can be accomplished in several ways. Some common examples are:

■ Consumer downloads and installs reader application software from a Mobile Service Provider onto the mobile phone. Mobile Service Provider acts as gateway to information from one or more trusted sources of information.

■ Retailer acts as the trusted source and provides connectivity to in-store retail network via custom mobile application. Retailer provides Extended Packaging information stored in is internal databases populated by brands using GDSN or similar trusted source for information sharing.

Figure 3-2 Indirect Mode
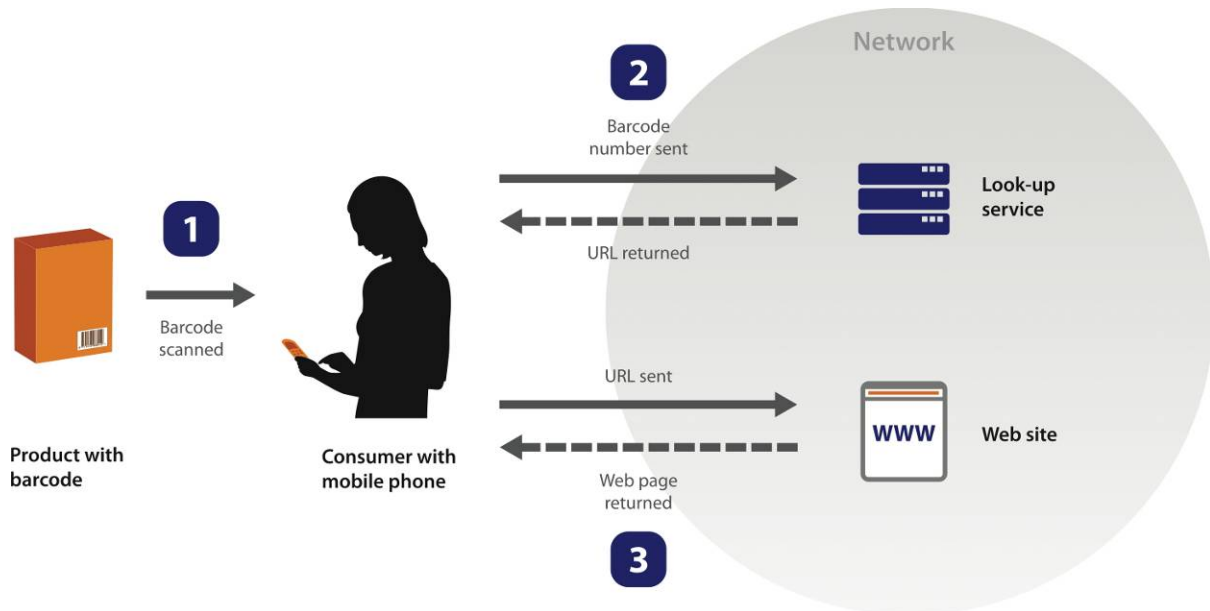
Depending on the indirect mode setup, the information returned to the consumers' mobile phone could be either a URL to the trusted source or information from one or more trusted sources. The *indirect* mode is the only way of access to Extended Packaging information when using linear GS1 barcodes. Both the *direct* and *indirect* mode of access is possible with 2D GS1 barcodes.

3.2. HTTP URL format

A brand owner can facilitate information exchange via their mobile website for products by providing a HTTP URL in two possible ways:

- Direct mode - HTTP URL encoded in a 2D barcode.

- Indirect mode - HTTP URL provided by a lookup service.

Additionally, the brand owner has the following factors to consider for the choice of URL to be used:

- In the direct mode, the length is limited to a maximum of 30 characters as specified by HTTP URL AI specification.

- In the indirect mode, the maximum length may or may not be restricted by the lookup service used.

- Provide a unique URL to a product's mobile web page.
  www.gs1.org/products/09507000000036.html

- Provide a generic URL to a mobile web page for all products.
  www.gs1.org/products.asp

- Provide a generic URL to a mobile web page for classes of products.
  www.gs1.org/products/publications.asp

- Provide a DNS sub domain for mobile web for products.
  products.gs1.mobi/

- Provide a sub section of the website for product information.
  www.gs1.org/products

These are just some of the factors that the brand owner has to consider for deciding the HTTP URL to be used. Ultimately, the choice of the URL will depend on the brand owner's mobile web strategy for product information. More candidate recommendations may be made at a later date based on the results of the pilot, where the main options will be tested.

Candidate Recommendation	23
Description	The HTTP URL used must link to the brand owner's mobile website for product information.
Rationale	Extended packaging is about providing information related to products.

Note: In the scenario where retailers provide access to Extended Packaging data using in-store retail networks, the retailer then substitutes the brand owner as the trusted source of information.

3.3. HTTP Request format

When using the HTTP URL to access additional product information, the reader application on the mobile phone makes a HTTP request to the information resource linked to the URL. The information resource then processes this HTTP request and returns a HTTP response to the requesting reader application. This response contains the Extended Packaging product information. The request / response can occur inside the reader application or in the mobile phones default web browser opened by the reader application.

When the request is made the GTIN and any additional AI's scanned from the barcode must be included in the URL used to make the request to the brand owner's information resource. All AI's (batch/lot number, serial number etc) must be included so that precise and relevant information can be returned to the consumer.

The GTIN scanned from the barcode must be included in the request for the following reasons:

■ There is no metadata in the barcode to know whether the web page linked to the HTTP URL is a generic website that the brand owner operates for product information or if it is product specific. As such, including the GTIN guarantees that if the web page is not product specific, the brand owner's web page can provide product information related to GTIN included in the query.

■ Also, as seen in the previous section, due to the many options the brand owner has, it is not possible to conclude the granularity level of the information resource from the provided HTTP URL. Having the GTIN in the request insulates the reader application from having to know the context of the URL (generic, product specific, product class, etc…) and thus having to require complicated processing logic.

■ The layer of indirection in the indirect mode provides the brand owner with the flexibility to change the HTTP URL associated with the GTIN/product, if required. The URL may be changed for many reasons such as branding, mergers and acquisitions, product strategy, web strategy, etc... Using the indirect mode, changes to the URL are much easier to manage if there is no existing context or state already attached to the URL. Including the GTIN in the request in this case prevents loss of product context information in case of URL changes. The same behaviour is also possible in the direct mode by using redirection on the web server side for any existing URL's. It is the responsibility and the right of the brand owner to change the pages associated to an URL whenever required.

For these reasons it is important to have a standard HTTP request format, which includes all data, scanned from the barcode on the product (GTIN and AI's). The standard format ensures that the brand owner's web resource has access to all information it needs related to the product.

Candidate Recommendation	24
Description	The HTTP Request MUST use the HTTP 'GET' method and the standard form submission syntax for the query string part of the URL.
Rationale	W3C and IETF define a standard syntax for formatting HTTP URL's. Using this syntax ensures that the request is understood properly and in a standard way by the requested web resource.
Standards	■ HTTP describes how to perform the 'GET' operation. ■ URL specifies how to create standard HTTP URL's. ■ HTML specifies how to create query strings.

3.4. Query String format

A typical URL containing a query string is as follows:

http://server/path/program?query_string

When a server receives a request for a page, it runs a program (if configured to do so), passing the query_string unchanged to the program. The question mark is used as a separator and is not part of the query string.

The main use of query strings is to exchange form content. In particular, when a form containing the field's *field1*, *field2*, *field3* is submitted, the content of the fields is encoded as a query string as follows:

field1=value1&field2=value2&field3=value3...

The query string is composed of a series of field-value pairs.

The field-value pairs are each separated by an equal sign.

The series of pairs is separated by the ampersand, '&'.

For each field of the form, the query string contains a pair field=value.

This 'name then equal sign then value then ampersand' convention is a W3C recommendation.

Candidate Recommendation	25
Description	The query string must contain all data scanned from the barcode and MUST use the following format: *AI number = AI data*
Rationale	Using this syntax has the following advantages: ■ The brand owners web resource can access all data scanned using the mobile phone. ■ GS1 has standardised AI numbers for application identification that provide a very simple and easy mechanism for use in query string. ■ New AI's can be approved for use at a later date without having to update the query format specification. ■ No need to standardise on key codes for use in URL like 'GTIN', 'serial', etc. The GS1 AI specification can be adopted without modification for use with URL query string.

Some examples are:

Example 1

Encoding (human readable interpretation)

(01) 09507000000036 (99) www.gs1.mobi/products.asp

HTTP Request

http://www.gs1.mobi/products.asp?01=09507000000036

Example 2

Encoding (human readable interpretation)

(01) 09507000000036 (99) www.gs1.mobi/products.asp (15) 081212 (21) MR820508540US

HTTP Request

http://www.gs1.mobi/products.asp?01=09507000000036&10=081212&21=MR820508540US

The most basic advantage of using the HTTP 'GET' method with the query string format is that the web resource receiving the query string can ignore part or all of it. If the web resource at the URL cannot recognize or understand the query string or any particular GS1 AI included therein it is simply not processed. This is a very important capability because if the HTTP URL links to product specific page then the GTIN included in the query string is simply ignored. This empowers the brand owner to include the HTTP URL that best suits its product packaging, marketing and mobile web strategy.

3.5. Extended Packaging use cases

3.5.1. Preconditions & Post conditions

A common set of pre-conditions for the uses cases in the sections below are:

- Mobile phone has camera function and internet connectivity or SMS capability.

- Reader Application pre-installed on the consumers mobile phone.

- Reader application pre-configured to connect to Mobile Service Provider for lookups.

- Camera on mobile phone is calibrated for EAN.UPC barcode scans (linear barcodes) and/or scanning 2D barcodes supported by GS1.

- Reader Application can decode GS1 linear, 2D barcodes and standard AI's approved for use with Extended Packaging.

- Reader Application preconfigured to send lookup request to Mobile Service Provider.

- Mobile Service Provider may provide SMS text service to consumer for product lookup.

- Brand owner has printed service mark or call-out symbol on product packaging.

- Brand owner has populated all product information made available to Mobile Service Provider.

- Mobile Service Provider provides access to database containing product information for multiple products.

- Mobile Service Provider can provide product data in a standard format.

- Reader Application can process product data received in a standard format.

- Mobile Service Provider knows which trusted data source to get information from based on GTIN.

A common set of post-conditions for the use case below is

- Reader Application displays extended product data formatted for device screen.

- Consumer can view product data on mobile device screen.

3.5.2. General information

Use Case ID	UC-1
Use Case Name	Get General Information
Use Case Description	Extended product data can be accessed based on a simple barcode scan and lookup. This is the most basic scenario.
Actors (Goal)	Consumer, Mobile Service Provider, Reader Application, Brand Owner and Information Provider
Preconditions	See preconditions in section 3.1
Post conditions	See post conditions in section 3.1
Scenario	**Begins when**... Consumer observes a service mark or call out symbol on the product label that identifies that Extended Packaging data is available. **Continues with**... Consumer initiates lookup for Extended Packaging data.

Direct Mode

Step #	Actor	Activity Step
1	Consumer	Scans the barcode on the product label using reader application on mobile phone.
2	Reader Application	Decodes GTIN, HTTP URL and any other additional AI data from the barcode scanned.
3	Reader Application	Formats a query with GTIN and any additional AI data appended to the URL and opens URL in the mobile phones default web browser.
4	Information Provider / Brand Owner	Brand owner product webpage at the URL returns product data specific to the GTIN requested.
5	Consumer	Mobile phone displays received product data on device screen.

Indirect Mode

Step #	Actor	Activity Step
1	Consumer	Scans the barcode on the product label using reader application on mobile phone.
2	Reader Application	Decodes the GTIN in the barcode.
3	Reader Application	Connects to the Mobile Service Providers lookup service and makes a GTIN lookup request for URL to Information Provider.
4	Mobile Service Provider	Provides URL of the Information Provider that carries product information for the given GTIN.
5	Reader Application	Formats a query with the GTIN appended to the URL and opens URL in the mobile phones default web browser.
6	Information Provider	Provides trusted source product information on the webpage at the URL specific to the GTIN requested.
7	Consumer	Mobile phone displays received product data on device screen

Use Case ID	UC-1

Indirect Mode – Image recognition

Step #	Actor	Activity Step
1	Consumer	Captures an image of the barcode on the product label using reader application on mobile phone.
2	Reader Application	Sends the image of the barcode captured to the Mobile Service Providers image based barcode recognition network service, requesting URL to Information Provider.
3	Mobile Service Provider	Decodes the GTIN in the barcode image received.
4	Mobile Service Provider	Formats a query with the GTIN appended to the URL of the Information Provider that carries product information for the given GTIN and returns this URL.
5	Reader Application	Opens URL in the mobile phones default web browser.
6	Information Provider	Provides trusted source product information on the webpage at the URL specific to the GTIN requested.
7	Consumer	Mobile phone displays received product data on device screen.

SMS Query

Step #	Actor	Activity Step
1	Consumer	Reads human readable GTIN printed on the barcode on the product label.
2	Mobile phone	Consumer uses the SMS application on the mobile phone to send a SMS message with GTIN to the publicly known Shortcode from Mobile Service Provider.
3	Mobile Network Operator	Routes SMS from consumer's mobile phone to Mobile Service Provider.
4	Mobile Service Provider	Connects to the Information Provider that carries product information for the given GTIN.
5	Information Provider	Provides product data in a secure way.
6	Mobile Service Provider	Formats data in a mobile web page and sends a WAP Push to the Consumers mobile phone.
7	Consumer	Mobile phone displays received product data on device screen.

Ends when... Consumer can view product data on mobile device screen.

Use Case ID	UC-1
Consumer Experience	▪ The consumer uses general information received to make an informed purchasing decision. ▪ Consumer may be interested in information regarding the batch/lot number or even serial number related information. ▪ By providing the consumer precise information about the specific item, the trusted source reassures the consumer against any fears the consumer may have about the product. In case of recalls, it is very easy for the consumer to know if he owns a recalled item, without giving any personal data. ▪ This information can also be used to increase loyalty to the brand, by providing value added information about the product/item. Note that the general information customs and rules vary with location, nationality, and jurisdiction.
Typical use cases	▪ Consumer is shopping in a retail store and is interested in buying a product. He wants to know about any additional information about the product offered by the brand owner. (E.g. recipes, allergens, promotions, etc...) ▪ A brand owner calls back specific lots of products with defects. The call is relayed through the media, not always specifying which lots are defective. At home (or anywhere with the product), the consumer can scan the barcode on the packaging to see if the product is concerned, or receive a direct message for a product that can be confirmed by scanning. ▪ In a shop, the consumer scans the 2D barcode on the product packaging to learn more about how, where and when this specific item was made. The brand owner web site provides information about origin of the parts or ingredients, story about the production, etc…

3.5.3. Preferential information

In this business scenario, the consumer sets preference information in his mobile phone for the type of information the consumer is interested in. The barcode reader software provides the ability to make preference settings. When the consumer scans the barcode, the appropriate trusted information source is then queried for the information type as specified in the preference settings.

Preferential information is considered out of scope for the current version of the Extended Packaging Pilot Handbook.

3.5.4. Interactive Information

Interactive information exchange involves an informative dialogue between the brand owner and the consumer. In this type of a business scenario, the brand owner provides an interactive channel for communication with the consumer. The conversation revolves around the consumers specific and often preferential needs related to the product. The Extended Packaging information delivered involves use of audio visual media and interactive media content like games, live shopper dialogue, etc…

Interactive information is considered out of scope for the current version of the Extended Packaging Pilot Handbook.

3.6. Recommended Information Exchange scenarios

The GS1 Mobile Commerce Extended Packaging work group identified 11 possible information exchange scenarios (see Appendix C). To enable strategic learnings via the pilot, the scenarios were narrowed down to the three best using the following criteria:

▪ Must be within current scope of Extended Packaging.

▪ Should be supported by GS1 MO's (willing to pilot).

- Focus should be accessing Brand Owners and Retailers website /data (general information).
- Should be based on existing GS1 standards and services.
- Full implementation can commence in 2-3 months.
- Brands and Retailers are willing to implement.
- Can be supported by handsets on the market.

The purpose of identifying these in detail is to enable GS1 Member Organizations to facilitate the pilots. By GS1 Members Organizations (GS1 108 local country offices) facilitating the pilots:

- Local requirements can be incorporated
- Connections with important stakeholders can be utilised (e.g. retailers and universities for consumer environment).
- Resources to manage the pilots can be provided
- ensure neutrality and conformance amongst all pilot participants
- Existing business processes can be utilised (e.g. providing Extended Packaging data through existing GS1 managed data sources).
- Learnings from the pilots can be efficiently fed back into the standardisation process (next phase of this project).

The other scenarios can be piloted and the learnings will be important for the development of the optimal architecture for Extended Packaging. Currently, they have been deemed as a lesser priority based on the criteria identified above. For detailed instructions on piloting by stakeholder see Section 5 'Pilot Considerations'.

3.6.1. GEPIR resolution for brand owner product website

Data Carrier	Linear or 2D barcode
Code	Linear barcode - GTIN 2D barcode - GTIN + optionally other information such as standard GS1 AI's (lot number, serial number) excluding HTTP URL
Lookup Service	GEPIR
Information provider	Brand Owner
Data Source	Brand Owner
Direct / Indirect mode	Indirect mode
Description	The user scans the barcode with his mobile phone. The reader application then reads the data in the barcode, requests GEPIR for a URL corresponding to the GTIN, then opens the URL returned by GEPIR in the mobile phones web browser with the GTIN and any additional AI's scanned. The brand owner's mobile website can then provide specific information on this particular item. If additional data like lot number, etc… is provided as part of the query, then the brand owner can provide more detailed information like where it was produced, how and when.

Pre-conditions	See preconditions defined in section 3.1. Additionally: ■ Reader Application can scan GS1 approved 2D barcodes and decode GS1 Application standards for Mobile Commerce. ■ Reader Application customized and authorized to connect to GEPIR network. ■ Brand Owner has registered GTINs with its local GS1 Member Organizations GEPIR. ■ Brand Owner has registered a URL for each GTIN or GS1 Company Prefix in GEPIR. ■ Registered URL points to product mobile web page. ■ Brand owner provides a web/WAP page that would bring a valuable experience to the consumer (a WAP page would be more adapted to mobile usage). ■ Brand owner can provide relevant information on specific item/lot number or similar GS1 Application Identifiers related to the product scanned.
Post-conditions	See post conditions defined in section 3.1, Additionally: ■ Reader Application can successfully retrieve information from GS1 GEPIR network.
Actors	Consumer, Brand Owner, GEPIR and Reader Application

Figure 3-3 GEPIR resolution for brand owner website

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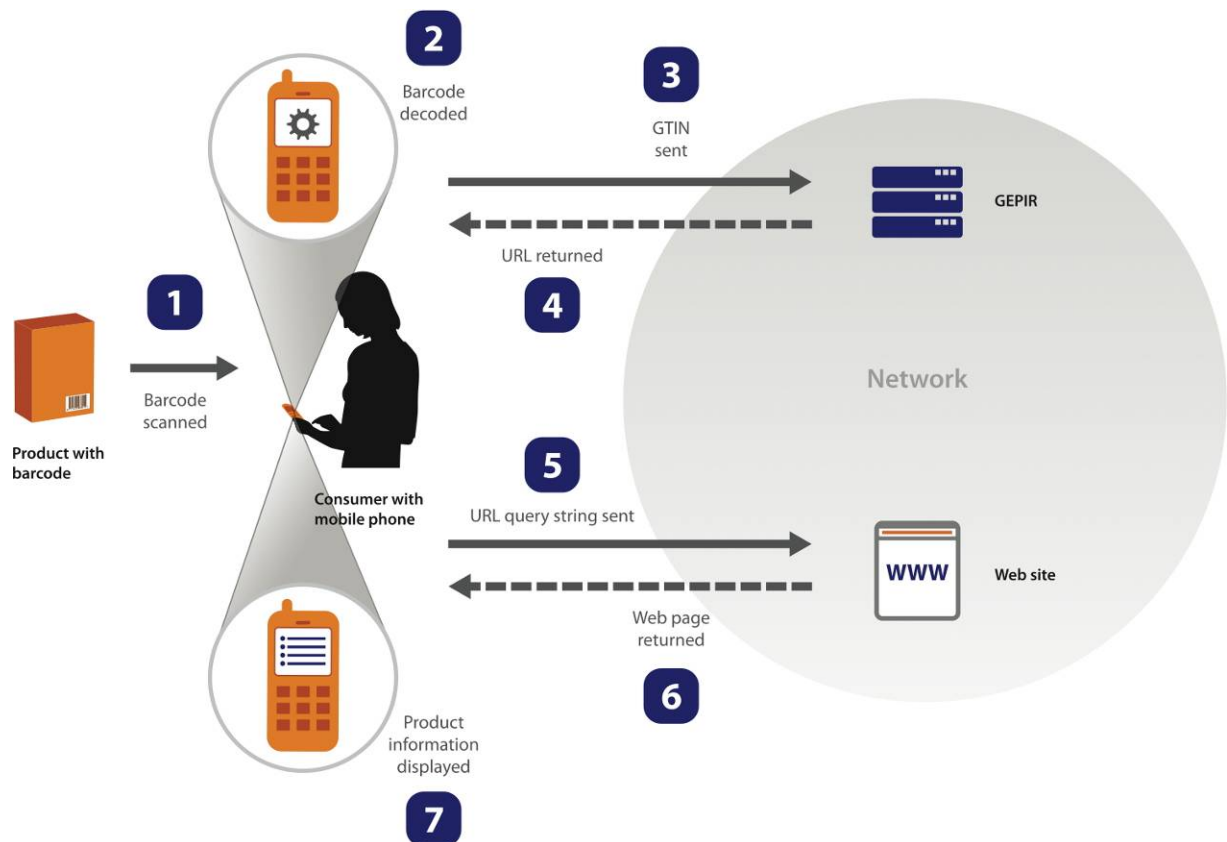
Scenario	**Begins when**... Consumer observes a service mark on the product label that identifies that Extended Packaging data is available.
	Continues with... Consumer initiates lookup for Extended Packaging data.

Step #	Actor	Activity Step
1	Consumer	Scans the linear or 2D barcode on the product label using reader application on mobile phone.
2	Reader Application	Decodes the GTIN and any additional AI data in the barcode in case of a 2D barcode.
3	Reader Application	Connects to GEPIR and makes a GTIN lookup request for URL to Brand Owners website.
4	GEPIR	Returns the registered URL to brand owners product web site for mobile devices.
5	Reader Application	Formats a query with the GTIN appended to the URL. If 2D barcode scanned then any additional AI data read is also appended to the URL. The URL is then opened in the mobile phones default web browser.
6	Brand Owner	Provides product information on the webpage at the URL specific to the GTIN and any additional AI data requested.
7	Consumer	Mobile phone displays web page on device screen.

Ends when... Consumer can view product data on mobile device screen.

Type of information exchanged	

- URL of the brand owner product website.
- GEPIR lookup for a URL is performed by requesting the item information for a given GTIN. The item information contains all URLs registered corresponding to the GTIN.
- Technically, the 'getItemByGTIN' method is called which returns a 'gepirItem' schema. This 'gepirItem' schema contains a 'linkURI" data attribute that can store a URL corresponding to the GTIN.
- Any information contained in a web/mobile page related to the product (GTIN)
- For additional AI data:
  - o Date of production
  - o Location of production
- Lot specific composition, parts or components traceability ("made with Vietnamese rice and Malaysian soya …", "Not assembled in China", etc…).
- Any kind of information on the producer, which can be different from the brand owner (seen in Japan, for some fresh products sold by cooperatives, the mobile site contained information and pictures about the family who produced it).
- Traceability and recall information (with lot or serial number).
- Specific instructions to this item, due to variety in production.
- Item master data.
- Company Contact Information.

In summary, brand owner decides what content to be sent to the user. This is relevant for the sake of pilot. The consumer perspectives and additional input will be considered at a later date based on pilot feedback.

Standards	EAN.UPC barcodes, GEPIR, GS1 Application Identifiers, GS1 DataMatrix (can use QR Code too), HTTP

Pros	■ The brand owner is totally free to define any service he wants to provide to the consumer. ■ GEPIR is implemented in 100+ countries. ■ Existing installations to provide knowledge. ■ Business requirement - 20 [BR-20], Information in GEPIR is globally available. ■ Portals can be used to add GTIN and product information (URL) standard. ■ Easy to implement. ■ Less data in the barcode than if encoded with an URL - less space on the packaging ■ Provides solution for recall for the consumer, but also for the retailer (the 2D barcode can be scanned by retailers' hardware and checked against items/lots recalled). ■ Increases customer's loyalty to the brand.
Cons	■ Work needs to be done to optimize GEPIR performance to be production ready. Mainly practical for pilots.
Existing implementations	■ GS1 France Code OnLine service implements this GEPIR based resolution scenario. ■ Similar to this scenario is the Ibaraki fresh food cooperative case in Japan, but not based on GS1 standards (they encode an URL with a serial number of the item in a QR Code).
Pilot requirements	■ An interface needs to be defined for any application to access local GEPIR Solution Providers with applications connecting to GEPIR will require a GLN (party identifier) to connect with GEPIR ■ An interface needs to be defined for manufacturers to upload (manually or automatically product information into GEPIR). Until this is defined each GS1 MO will use their own. ■ Production of 2D barcodes with GTIN + additional information. ■ Adding these barcodes to the product packaging (either by print or by stickers). ■ Provide 2D barcode reading mobile application with GEPIR as resolution.

3.6.2. GEPIR resolution for local product data

Data Carrier	Linear or 2D barcode
Code	GTIN + other info (lot number, serial number, …)
Lookup Service	GEPIR
Information provider	Mobile version of GEPIR
Data Source	3rd party information provider
Direct / Indirect mode	Indirect mode
Description	The brand owner includes GTIN and other information (serial number, lot number separated by GS1 Application Identifiers) in a linear or 2D barcode on the packaging. The user scans the linear or 2D barcode with his mobile. The mobile application reads the GTIN or GTIN + information, requests the GEPIR with the GTIN or GTIN and additional information. GEPIR internally sends a request item information for a given GTIN (getItemByGTIN) The returned output schema is the GEPIR Item data model. The source for the GEPIR item data model can be at the GS1 International Data Driver connected to GEPIR, a local GDSN Datapool or other trusted sources.
Pre-conditions	See preconditions defined in section 3.1. Additionally: ■ Reader Application customized and authorized to connect to GEPIR network. ■ Brand Owner has registered GTINs with its local GS1 Member Organizations GEPIR or GS1 Member Organization has access to product information about GTINs from a trusted source. ■ GEPIR mobile extension can provide a web/WAP page that would bring a valuable experience to the consumer.

Post-conditions	See post conditions defined in section 3.1. Additionally: ▪ Reader Application can successfully retrieve information from GS1 GEPIR network
Actors	Consumer, Brand Owner, GEPIR, Reader Application

Figure 3-4 GEPIR resolution for local product data

Scenario	**Begins when**... Consumer observes a call out symbol on the product label that identifies that Extended Packaging data is available.

Continues with... Consumer initiates lookup for Extended Packaging data.

Step #	Actor	Activity Step
1	Consumer	Scans the 2D barcode on the product label using reader application on mobile phone.
2	Reader Application	Decodes the GTIN and any additional AI data in the barcode.
3	Reader Application	Connects to GEPIR and makes a GTIN lookup request for URL to product page.
4	GEPIR	Returns a URL that links to the products mobile webpage via a GEPIR service for mobile phones.
5	Reader Application	Formats a query with the GTIN and any additional AI data appended to the URL and opens the URL in the mobile phones default web browser.
6	GEPIR	Returns a product webpage with information loaded from GDSN or other local data source specific to the GTIN and the AI data requested.
7	Consumer	Mobile phone displays mobile webpage on device screen.

Ends when... Consumer can view product data on mobile device screen.

Type of information exchanged	GEPIR defines a standard trade item model (gerpirItem) and this <u>may</u> be returned as part of the data exchange. Additionally, a GS1 MO can provide additional product information with its mobile GEPIR service, using trade item attributes retrieved from a local GDSN data pool.
	Some of the attributes of the standard 'gepirItem' schema are listed below;
	▪ xml:lang may be used as an attribute. It specifies the language of the response text fields for this line (if other than English)
	▪ gtin is mandatory and shall be exactly 14 digits
	▪ informationProviderGln is mandatory and is the GLN of the party responsible for populating the database entry for this item
	▪ manufacturerGln is optional. It is used if only if different from informationProviderGln. If used it is the GLN of the party responsible for the production of this item (usually the GTIN owner)
	▪ itemName is mandatory. It is the name by which this item is normally known to the actors. It should not include brandName or descriptiveSize
	▪ brandName is mandatory. It is the brand under which this item is marketed
	▪ tradeItemUnitDescriptor is mandatory. It is one of: BASE_UNIT_OR_EACH, PACK_OR_INNER_PACK, CASE, DISPLAY_SHIPPER, PALLET, MIXED_MODULE
	▪ descriptiveSize is optional. If used it is an expression known to the actors
	▪ netContent is optional. If used it is a measure of the contents of this item appropriate to the nature of the product.
	▪ Unit of Measure (uom) is mandatory if netContent is used. It is one of: PCE, GRM, KGM
	▪ linkURI is optional. Up to three links may be returned to sources of additional information. These are:
	- an html-coded page for display in a web browser window
	- an xml-coded item message for use in an application
	- a text string for display in a simple field in an application
	▪ format is mandatory if linkUri is used. It is one of:
	▪ html, xml, text
	▪ classificationCode is optional. If used it is the string classifying this product in the associated system
	▪ classificationSystemCode is mandatory if classificationCode is used. It is one of:
	UNSPSC, ISIC, GPC
	▪ lastChangeDateTime is optional
	▪ childItem is optional. If used it gives the GTIN(s) which are part of the hierarchy of this item
	▪ gtin is mandatory if childItem is used. It is the GTIN of the child instance (14 digits)
Standards	GEPIR, GS1 Application Identifier's, GS1 DataMatrix, EAN-13, HTTP
Pros	▪ Standard
	▪ Easy to implement
	▪ Increases customer's loyalty to the brand
	▪ Raise awareness of GS1
Cons	▪ Information providers need to link existing data sources into GEPIR. This may require contracts to be setup between GS1 Member Organization and the information provider.
	▪ GEPIR works with global information, but does not support country-specific information. Potentially some attributes could be misleading if the values vary by country e.g. text in a different language. This makes GEPIR good for a pilot but not for international expansion (e.g. to support travellers) unless GEPIR is restructured to support the business-defined data structures already defined as GS1 GDSN Standards.
Existing implementations	GS1 Germany Mobile Commerce platform

Pilot requirements	▪ Production of linear or 2D barcodes with GTIN or GTIN and additional information.
	▪ Adding these barcodes to the product packages (either by print or by sticking).
	▪ Provide linear or 2D barcode reading mobile application with GEPIR as resolver.

3.6.3. Direct access to brand owner product website

Both GTIN and URL are encoded within the 2D barcodes using the Application Identifiers. By including the GTIN with the URL, greater flexibility is possible for the consumer to obtain additional value added services and information from other sources.

The combination of GTIN and URL provides support for both direct method (access the defined URL) and indirect method (GTIN can be identified and used by a different application/website through a lookup service - see other specific scenarios [Appendix C]).

Brand owners web sites support a substantial amount of information about their products, contact information relevant to the end user and various interactive web capabilities. This information is created and maintained by many different departments principally Sales and Marketing.

These web sites are manufacturer specific and in many cases also brand and/or category specific. The web sites are open to all who elect to visit, search and dialogue on them. Intranet sites (behind the firewalls) may also be accessed by the Mobile Commerce consumer with special permissions from the brand manufacturer/web site owner. Likewise, the privacy of the consumer is protected through "permission processes".

Important characteristics of this scenario are: the generic/universal direct/indirect software approach, ability to leverage existing web investments, richness of data currently available from the brand owner.

Data Carrier	2D
Code	GTIN + other info (lot number, serial number, …)
Lookup Service	None.
Information provider	Brand Owner
Data Source	Brand Owner
Direct / Indirect mode	Direct mode
Description	The 2D Bar Codes are capable of containing a substantial amount of information and can be easily read by mobile phones equipped with cameras.
	The brand owner includes GTIN, URL to the products mobile web site and other information (serial number, lot number, etc… separated by GS1 Application Identifiers) in a 2D barcode on the packaging.
	The user scans the 2D barcode with his mobile.
	The mobile application reads the URL in the barcode, and opens the mobile browser at the URL, with GTIN and additional data read as parameters.
	In this way the mobile phone then connects the consumer directly with the brand owner's website.
	The brand owner mobile site can then provide specific information on this particular item or lot number: where it was produced, how and when, etc. The website can be an existing internet/extranet/intranet web site, WAP site, web service, web portal, a .mobi site, etc…

Pre-conditions	See pre-conditions defined in section 3.1. Additionally: ■ Brand owner provides a web/WAP page that would bring a valuable experience to the consumer (a WAP page would be more adapted to mobile usage). ■ The web site is formatted for mobile phones. ■ Brand owner can provide relevant info on specific item/lot number or similar GS1 Application Identifiers related to the product scanned.
Post-conditions	See post-conditions defined in section 3.1.
Actors	Consumer, Brand Owner, Reader Application

Figure 3-5 Direct access to brand owner website

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Scenario	**Begins when**... Consumer observes a call out symbol on the product label that identifies that Extended Packaging data is available. **Continues with**... Consumer initiates lookup for Extended Packaging data.

Step #	Actor	Activity Step
1	Consumer	Scans the 2D barcode on the product label using reader application on mobile phone.
2	Reader Application	Decodes GTIN, HTTP URL and any other additional AI data from the barcode scanned.
3	Reader Application	Formats a query with GTIN and any additional AI data appended to the URL and opens URL in the mobile phones default web browser.
4	Brand Owner	Brand owner product webpage at the URL returns product data specific to the GTIN requested and any additional AI data provided.
5	Consumer	Mobile phone displays received product data on device screen.

Ends when... Consumer can view product data on mobile device screen.

Type of information exchanged	The information is whatever is on the manufacturer's website with no intermediary or interpretation needed, ■ Contact information for additional inquiries is provided directly from the manufacturer. ■ The manufacturer already has substantial amount of information available to offer the consumer on their websites. These sites are in production and work well so the manufacturers leverage what they have. ■ The manufacturer can tailor its consumer offerings resulting in potential strategic advantage. ■ The manufacturer may choose to collect/assemble/scrutinize the data to better understand their consumer – data mining, consumer insights, marketing, promotions, etc. ■ Product alerts and recalls may be publicized through this additional venue adding to consumer product safety measures.
Standards	GS1 Application Identifiers, GS1 DataMatrix (can use QR Code too), HTTP
Pros	■ Data source is definitive (manufacturer – direct method) and can be extended to alternate data sources (indirect method). ■ Leverages existing platforms and infrastructure (e.g. internet web/WAP/.mobi sites). ■ Secure early experience with using 2D barcodes and software. ■ Initially, more phones will be able to scan 2D instead of linear barcode. ■ Can support direct and indirect info exchange. ■ Info exchange is easier to accommodate. The direct exchange does not rely on intermediaries. The direct exchange utilizes the existing infrastructure. ■ Open public nature of Web communications. ■ Manufacturer can dialog direct with consumer and get a better understand of consumers preference and shopping behaviour. ■ Manufacturer can preserve Consumer Privacy. ■ The manufacturer may choose to collect/assemble/scrutinize the data to better understand their consumer – data mining, consumer insights, marketing, promotions, etc… ■ Product alerts and recalls may be publicized through this additional venue adding to consumer product safety measures.

Cons	■ Product packaging will need to be changed to contain 2D Bar. Costs versus business value will need to be assessed. ■ Applications that use the direct mode are more susceptible to URL hijacking (i.e. a sticker with a non-brand URL can easily be added to packaging).
Existing implementations	Similar to this scenario is the Ibaraki fresh food cooperative case in Japan, but not based on GS1 standards (they encode an URL with a serial number of the item in a QR Code).
Pilot requirements	■ Production of 2D barcodes with GTIN and additional information. ■ Adding these barcodes to the product packages (either by print or by sticking). ■ Provide 2D barcode reading mobile application with GEPIR as resolver.

3.7. GEPIR Information Exchange

GS1 currently offers the Global GS1 Electronic Party Information Registry [GEPIR] as a prototype lookup/routing service available for connection by Mobile Software. GEPIR is a distributed database that contains basic information on over 1,000,000 companies in over 100 countries. Any company with a valid GS1 assigned Global Location Number (GLN)/Party Identifier is able to search online or perform mobile queries. Basic information such as product owner (brand), product name, and links to additional information such as websites is available when populated by brand owners.

To set up an active connection to this information (Solution Providers, Mobile Service Providers) or to begin populating product information (Manufacturers and Retailers) please contact your local GS1 Member Organisation (based on the location of your company headquarters).

Some GS1 Member Organisations offer a Proof-of-Concept testing platform to develop a business case specific to populating information for consumer by these means.

It is recommended that you work with a GS1 MO or a Solution Provider piloting a standard connection to GEPIR to ensure the full benefits of this scalable general information exchange means can be realised:

■ Do not need to change packaging to update information connections.

■ Protection from URL hijacking (consumers receive correct product information).

■ Trusted source for Extended Packaging information.

Figure 3-6 GEPIR Information Exchange

GS1 Global Electronic Party Information Register (GEPIR)
is a distributed database that contains basic information
on over 1,000,000 companies in over 100 countries
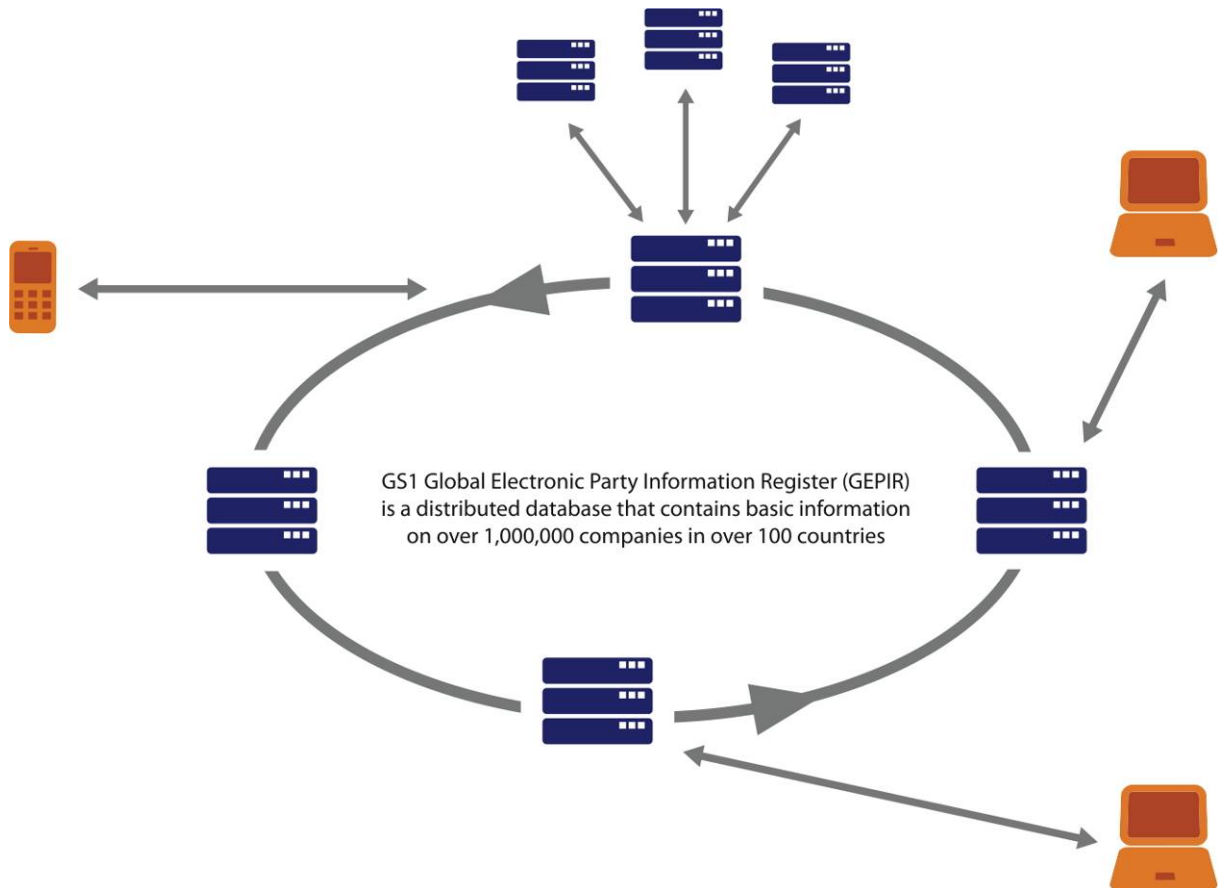
3.8. GDSN Data Exchange

GS1 is testing the use of the Global Data Synchronisation Network [GDSN] Certified datapool as a means to provide/connect to local product data information.

The GDSN is built around the GS1 Global Registry®, GDSN-certified datapools, the GS1 Data Quality Framework and GS1 Global Product Classification, which when combined provide a powerful environment for secure and continuous synchronisation of accurate data.

If GDSN data can be successfully developed into the mobile information network in general, consumers will always have the latest brand information in their mobile phones about products, and any changes made to the brand's databases can be automatically and immediately provided to consumer applications.

Currently, the GDSN Network contains information about more than 3 million products (GTINs) and with the possibility of providing consumer focused data additional GTINs and product information will be populated over time.

Many of the desired information types/attributes are currently available in GDSN (see Appendix B) and there is a streamlined/standard process for requesting new ones.

It is recommended that you work with GDSN Inc. or a GDSN Certified Data pool implementing a standard connection to GDSN to ensure the full benefits of this scalable preferential information exchange means can be realised:

■ Do not need to change packaging to update information connections.

■ Can populate information on product to supply chain partners and consumers at the same time.

■ Can allow for specific queries on information.

■ Protection from URL hijacking (consumers receive correct product information).

Figure 3-7 GDSN Data Exchange
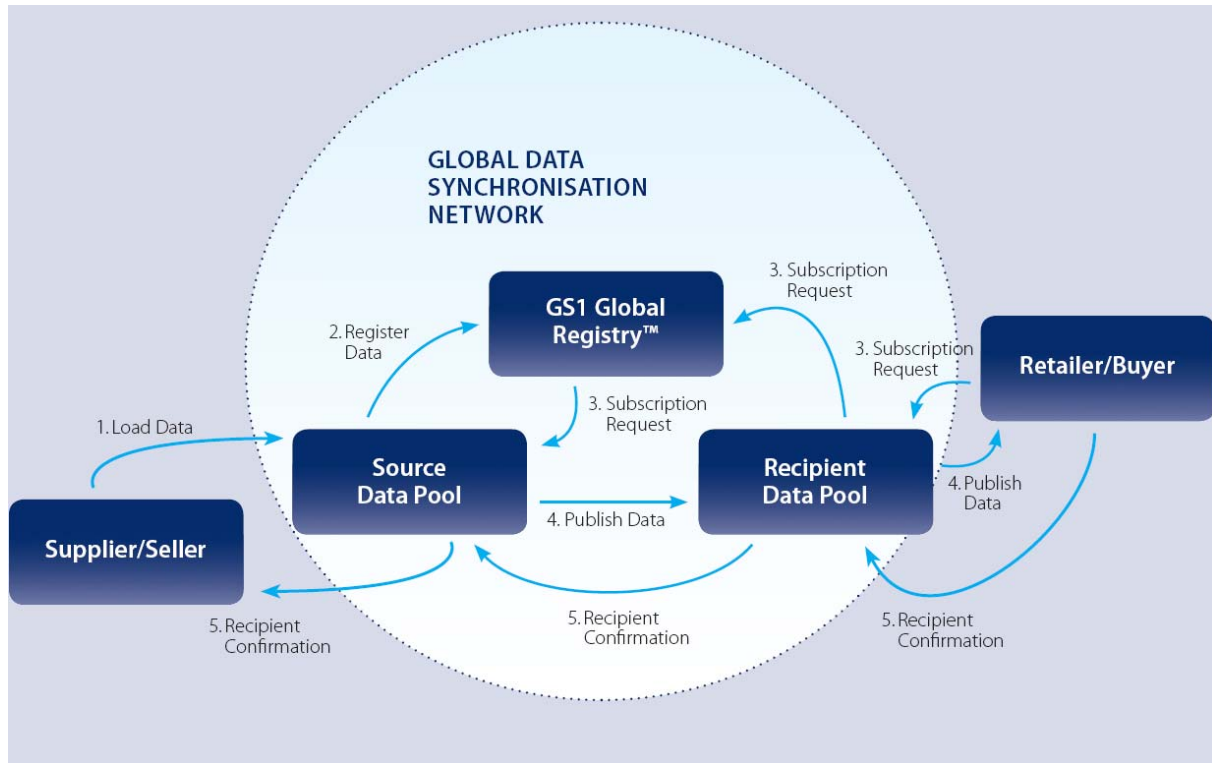
GDSN Mandatory Attributes:

Listed below are some mandatory data attributes, which capture basic information about the product in the data synchronisation process:

■ GTIN

■ GLN

■ Global Product Classification (GPC) codes

■ Target market

■ Product status, and

■ Dates, among other basic information

Additionally, there are many attributes that are considered 'optional'. The trading partners synchronising data using the GDSN determine their use.

In summary, 25 mandatory attributes are required for basic trade item synchronisation in GDSN. The GS1 Global Registry requires 8 of these attributes. The other 17 attributes are required to exchange data across the network. There are 10 'boolean', yes/no questions related to the product for which data is being synchronised. The other 7 attributes require actual product related data.

4. Mobile Devices

To enable Extended Packaging, mobile phones must be able to recognize and decode linear and 2D barcodes as specified earlier. For mobile devices equipped with a camera, it is possible to scan the barcode on the product packaging provided a barcode reader application exists for that make and model of the mobile device. If the mobile phone does not have a camera, Extended Packaging can still be possible via SMS if the mobile network operator can provide such a service. Alternatively, it should also be possible to manually key-in the human readable product identification from the barcode and search for the Extended Packaging information source using a lookup service.

4.1. Reader Application

There are many kinds of barcode reader applications available in the market today. Reader applications will scan and decode the barcode and/or provide the consumer with an interface for manual input. Reader applications are customized for individual mobile phones or a class of mobile phones so that they can efficiently make use of the resources available on the phone for scanning the barcodes and retrieving the Extended Packaging data. Reader applications are customized for particular business applications by the mobile handset manufacturer. Some of the features to be factored in for selection of the reader application are:

■ Optical Scan / Camera support

■ Manual Input allowed

■ Linear barcodes supported

■ 2D barcodes supported

■ Mobile operating system, make & model supported

■ SMS support

■ Mobile web access (Data / Browser)

Selecting a reader application that supports GS1 standards and candidate recommendations and other industry and open standards will ensure scanning interoperability and protect the consumers' investment in the technology.

GS1 maintains online a list of reader applications, which can help you choose the reader application for your mobile phone for demonstration and piloting purposes. Additionally GS1 has also published a strategy paper that will provide useful insight and guidance in the area of mobile phone based scanning. These documents can be found at:

http://www.gs1.org/productssolutions/mobile/

Candidate Recommendation	26
Description	Use reader applications that can recognize GS1 DataMatrix, EAN-8 and EAN-13 barcodes at the minimum.
Rationale	■ Business Requirement - 2 [BR-2]. ■ Business Requirement - 3 [BR-3]. ■ Minimum requirements as not all reader applications on the market support all GS1 symbologies. There are many readers that also support non-GS1 symbologies and as such it is important to use one that supports GS1 barcodes.

4.2. Optical Scan (Camera) capabilities

GS1 DataMatrix/QR barcode recognition requires mobile phones with VGA camera, camera API support and computing resources. Most modern mobile phones with basic camera function should be able to read 2D barcodes provided a reader application exists for that mobile phone.

However, the same is not the case for linear barcodes. Recognition of linear barcodes requires sharp images with fine detail, good contrast and lighting (see figure 4-1 below).

Figure 4-1 GS1 EAN-13 barcode recognition (provided by ETH Zurich)
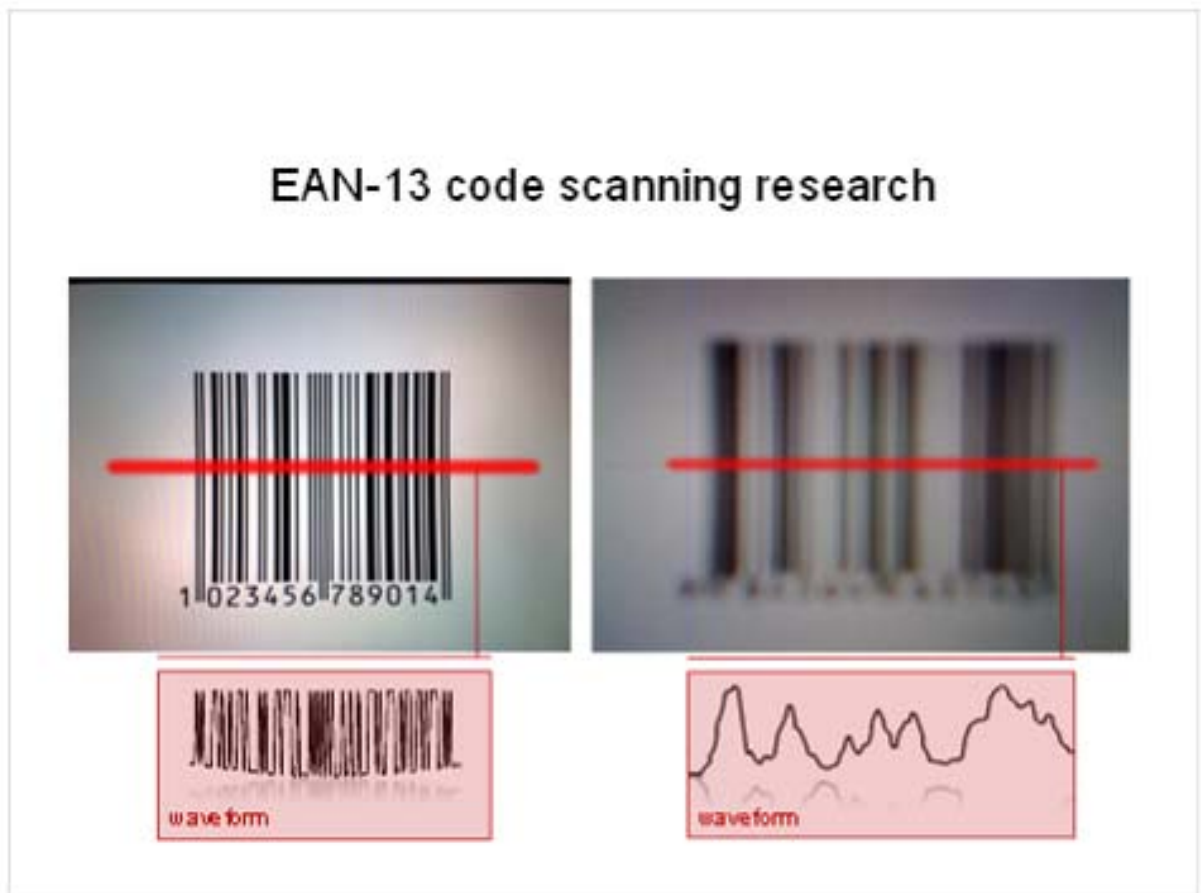
To achieve that kind of image quality, VGA phones are usually sufficient but require better optical imaging capabilities. Today's EAN-13 recognition requires cell phones with autofocus or macro lens. There are many such smart phones available in the marketplace today.

Candidate Recommendation	27
Description	Camera based phones with the following minimum capabilities are preferred if fast, reliable and error free scans are desired: ■ Autofocus ■ Macro lens ■ LED light
Rationale	See reasons stated above in this section.

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Currently, the installed base of mobile phones for EAN-13 detection with built-in camera is growing. Scanning of linear barcodes compared to 2D barcodes needs slightly improved imaging with better optics and autofocus capabilities. Market share of autofocus cameras is increasing. Novel cheap autofocus systems are being developed. Latest EAN-13 detection algorithms from R&D do not require autofocus and intelligent software systems are being developed to scan blurred barcodes.

Figure 4-2 Recognizing a blurred EAN-13 barcode (provided by ETH Zurich)

Though mobile devices are capable of scanning both linear and 2D barcodes, there are fewer phones currently in the market that can scan linear barcodes. Due to technology advancements, the ability to add macro lenses and the rate at which consumers replace their mobile phones, mobile phones will be more enabled to read linear barcodes in the future. As mobile phone camera technology continues to improve over time and with breakthroughs in image recognition algorithms for decoding blurry barcodes it is anticipated that scanning of linear barcodes will be widely implemented in the near future.

EAN-13 barcodes are already on every retail product. It is more pragmatic and feasible to increase the installed base of linear barcode reading capable mobile phones than to add an additional 2D barcode on the product packaging. The data capacity of EAN-13 (GTIN) is sufficient for large majority of Mobile Commerce applications. Based on these arguments the following candidate recommendation can be made:

Candidate Recommendation	28
Description	EAN/UPC linear barcodes should be the preferred barcode for enabling Extended Packaging applications. Although, the ultimate decision to use the existing linear barcode on the product or to put an additional 2D barcode ultimately depends on the brand owner and their product strategy.
Rationale	See reasons stated above in this section.

However, for specific use cases (e.g. promotions) it is up to the brand owner to assess if a product with and existing linear barcode needs an additional 2D barcode.

5.   Pilot Considerations

5.1.   Extended Packaging pilot

Extended Packaging Pilot Goal and Framework

The primary goal of the Extended Packaging Pilot is to test the end-to-end user experience of retrieving additional information about products by using a mobile phone, as specified in the Pilot Handbook. The first pilot tests will concentrate on this goal and a report will be generated indicating the pass/fail criteria achieved. GS1 MOs will leverage existing services, available information, and software to expedite the learning process and facilitate construction of test environments.

The many local tests conducted by GS1 country Member Organisations will be managed and assisted by GS1 Global Office. Companies (brands, solutions providers, network operators) should work with the GS1 Member Organisation within their location/country for easy of participation.

The stakeholders for the pilot are consumers (to test the usability and demand for the process), brands (to test the population of information, packaging, and environmental changes), solution providers (to test mobile applications, and enable the necessary architecture), data/information pools (to test transmission of information), and universities (to assist with development of the test environment and conducting the testing).

Note: Pilot participants may not want to test competitive products with the same test environment, so that pilot results may be shared amongst the piloting group. Beyond the reporting of the pass/fail criteria established by the guideline, information about consumer demand, company implementation needs, or considerations for rollout are not required to be reported to the greater mobile group unless it is by the consent of the participating pilot companies.

Reporting Pilot Findings

GS1 Member Organisations will be collecting pilot findings using a Global Extended Packaging Pilot Template provided by GS1 Global Office. The following information will be collected during the pilot and will greatly assist the standards development process and development of the IT Architecture behind the long term solution to Extended Packaging.

Reporting Failed Codes

It is necessary to report failed barcodes to develop barcode reader specifications and improve quality and performance in this area. When barcodes fail to read in either the field (participant gives up) or lab (cannot read after 20 seconds of trying) it should be considered a failed read. The following information should be collected and reported:

- Colour (CMYK)
- GS1 DataMatrix, EAN-13, EAN-8 or QR Code
- Data encoded
- Substrate of packaging
- Sample or picture of packaging with barcode (if available)
- Size of barcode
- Lighting
- Whether or not a logo/icon was embedded in the barcode (QR Code only)

- Mobile phone brand and model
- Copy of the barcode
- Barcode reader application software vendor, application and version

Legal consideration

It will be important to capture the legal concerns related to this process to develop solutions that will protect companies and build consumer trust. Companies should be conscious of business requirement 17 [BR-17] that specifies that the "consumer must be informed of what data is collected". It is also important to realize how consumers will use this information. For example, if a brand is providing allergen information about a product and a consumer trusts this information, there may be some liability if the information provided is inaccurate and a consumer is harmed. Companies should be aware of consumer privacy and follow relevant privacy laws (e.g. only use personal data if the consumer has given their explicit consent).

Performance

Ideas for enhancing speed (e.g. content optimization, caching, etc…) should be monitored. These will be part of an IT Architecture Analysis that will be used to develop the post pilot (long term) solution for Mobile Commerce as facilitated by GS1 and other process stakeholders.

Scalability

The use requirements for the information network will grow proportionally with the consumer understanding and desire for this communication channel. The information network must be robust to handle this growth. The IT Architecture Analysis will consider this use, however, local projections for use, type of connections, etc... will be helpful in supporting the ultimate architecture to be developed.

Security

Innovations and best practices for securing information in the Extended Packaging information exchange against malicious attack/use should be captured and reported as part of the pilot report.

5.2. Pilot considerations for Brand Owners and Retailers

Linear barcodes

Use of linear barcodes does not take much consideration. Since these are already on most consumer level packaging it is better to drive the development of applications that can scan these (depending on the phone capabilities), or allow for manual input of the GTIN (number under the linear barcode). Consumer education toward this new manner of product information retrieval will be vital and thus it is important that consumers see these barcodes in a new light.

2D barcodes

Use of 2D barcodes can have positive and negative results that should be further understood by piloting. Since these will stand out beyond the typical linear barcodes and there are more phones on the market able to read them, they are an attractive new way of introducing this technology to consumers. Updating packaging can be expensive, so for piloting the use of stickers will make it easy to provide this new connection point. This is a long term danger for the direct mode of access in general, as hijackers can simply put their own stickers on products and applications set to use the direct mode of access will go to the wrong (non-brand provided) websites.

Furthermore it should be noted that although, this guide focuses on GS1 DataMatrix and the QR Code, GS1 Databar is also capable of supporting the candidate recommendations outlined in this document.

Choosing linear or 2D barcodes

Choosing between using the existing linear barcode on the product packaging or applying an additional 2D barcode on the packaging affects how information exchange will take place. The following decision table will help you make the decision on the choice of using direct vs. indirect mode of operation as well as whether to use the existing linear barcode on the product packaging or apply a new 2D barcode

The following decision table provides some guidance on the choice of the barcode type to be used for Extended Packaging:

Packaging	Direct mode	Indirect mode
Use existing linear barcode	No	Scenario 1 - GEPIR resolution for brand owner product website Scenario 2 - GEPIR resolution for local product data
Add a new 2D barcode	Yes	Optional Add only if additional AI's need to be encoded
Add GTIN to 2D barcode	Yes	Yes
Add URL to 2D barcode	Yes	Optional Add only if want to enable additionally direct mode of access
Add additional AI's to 2D barcode	Optional	Optional

Encoding 2D barcodes

For encoding the 2D barcodes there are a number of online sites and software that will provide this service. A list of these is available by going to the GS1 website Mobile Commerce page. Though the primary information encoded in the 2D barcodes will be the GTIN here are some thoughts for use of the other application identifiers:

(10) Batch / Lot Number – should be used to for providing information on more specific products. Some examples of information would be related to traceability, expiration information, promotion (ex. Seasonal, sporting events)

(15) Best Before Date – can be used for products that either don't have this information or where consumers may have difficulty interpreting it (language issues, handicap, etc...)

(21) Serial number - should be used to for providing information on more specific products. Some examples of information would be related to anti-counterfeiting, warrantee information, etc...

(99) HTTP URL – Please note this is a temporary Application Identifier and thus is invalid for production applications and global or local use. The standard URL AI will be provided by the standardisation process to start directly after the publication of this guideline. The use of this AI is contingent on the functioning of the brand website. If the website has been configured to accept GTIN forwarding from the application at the main directory level (i.e. www.gs1.com), then only the brand website needs to be encoded in the URL. If the website has not been enabled for this, then the full product URL should be encoded in the AI (i.e. www.brand.com/product). It is preferable to enable the GTIN forwarding method, as it keeps the character length of the URL down and there is a maximum capacity of 30 characters. Never encode "**http://**" in a URL as it is assumed by the application and the URL will not function if it is duplicated.

(413) GLN – Primary use in Extended Packaging will be used in the retail environment to identify the store or location in the store (ex. Shelf, isle, and kiosk) for the mobile phone. This is a primary GS1 key and thus may be encoded by itself (i.e. without the GTIN)

(8018) Global Service Relationship Number (GSRN) – can be used for providing service level information (e.g. Warranty information, where to get a product serviced, special offers or information tied to the product).

In Store Applications

For Point of Sale (Store) identification of product information a 2D barcode may additionally be placed on signage like posters, shelf labels, at shelf end markers, spotters, etc… For Point of Sale identification, follow specifications for encoding for 2d on product.

Website Development

Whether for product websites or in store network websites, web pages that are viewed over the phone must be optimized for performance (speed to load) and content (viewing on a small screen). For recommendations on designing web pages that are ready to be viewed on mobile phones see W3C Mobile Web Best Practices [W3CMOB] document.

5.3. Pilot considerations for Mobile Handset Manufacturers

Today, billions of products around the globe already have an existing EAN.UPC barcode. In the future many more products will also be tagged with GS1 DataMatrix or QR Codes. Consumers are demanding access to additional product information on the go using their personal mobile phones. New business models are being implemented to revolutionize Mobile Commerce and make information accessible to the consumer in a variety of ways. Hence it is important that handset manufacturers design mobile phones that can reliably scan of GS1 barcodes. To achieve this, mobile phones need to have basic camera functionality and image processing capabilities as specified in Section 3 'Mobile device and software capabilities'.

Handset manufacturers should also provide application development framework/ API that allow software developers to write custom applications for the operating system on the mobile phone. Additionally, the development framework / API should also allow access to important mobile phone functions like:

■ Camera lens control - zoom and autofocus.

■ Camera light/flash control – for illuminating target barcode in dark conditions.

■ Data storage access – for storage.

■ SIM access – for access to subscriber information.

■ Internet access – so that HTTP queries can be made to retrieve additional information.

It is suggested that handset manufacturers get in touch with:

■ Reader Application developers to ensure that reader applications can be successfully installed and operated on their mobile operating system and device platforms

■ Retailers to pilot ant test scan-ability of a variety of retail items in store under real world conditions for;

   □ Ambient Light

   □ Barcode print quality

   □ Multiple angles of skew for scanning

   □ Scanning distance

   □ Performance of camera functions; lens, image quality, network connectivity, etc …

The GS1 Member Organization in your local country should be able to facilitate the setup of pilots with retailers and reader application providers.

5.4. Pilot considerations for Mobile Network Operators

GS1 recommends that you contact your local GS1 Member Organisation to see how you can play a role in the pilot. Filed tests with actual mobile customers will help you understand the demand for this functionality and how it can be integrated with other similar features (non product information). To ensure interoperability and the ability to scan products marked in the future it is important to at a minimum monitor the pilot activities and understand the normative standards that will be used. Additional test connections can be established between MNO data registries and GS1 data sources to test possibilities and create enhanced services.

GS1 and the Brands represented in this working group do not support the use of proprietary barcodes or information services. Our mission is to develop an open foundational network that will lead to interoperable services and a consistent consumer experience.

5.5. Pilot considerations for GS1 Member Organizations

Facilitating Pilots

If you are a GS1 Member Organisation with local members interested in Mobile Applications or if there are Multi-National Retailers interested in studying the possibility of Mobile Commerce in your locale, you should contact GS1 Global Office by sending a email to Cameron Green (Cameron.green@gs1.org) to find out what information and resources are available to you from Global Office and other implementing MO's.

Pilots should be separated into two types of tests: field tests (with consumers) and lab tests.

Field test environment could be in a store or on a university campus (this one would tap into a good demographic of future shoppers). This could be an interactive shelf (various products cross category with general instructions and usability testing). A kitchen experience to test after store use would also be optimal. You should collect the standard demographic information of the consumer plus:

- Do you shop online?
- What info would you be interested in seeing?
- Was it easy to scan?
- Would you do it again?
- Would you recommend it to a friend?

GS1 Global will provide a common survey to be administered by the facilitating GS1 Member Offices.

When collecting learnings, it may also be beneficial to separate the focus similar to the set up of this guideline into two separate areas: 1) packaging and consumer experience, and 2) information exchanges and information storage. For example when doing consumer testing it may be easier to preload information on the phone to ensure that technical issues and network performance do not skew the results you are looking for. Speed and network performance can be enhanced without a consumer, but it is critical to have a consumer to understand issues of usability and demand for information.

5.6. Pilot considerations for Mobile Service Providers

Mobile service providers play vital role in the Mobile Commerce ecosystem. They provide variety of mobile services related to products. Most importantly they can provide access to information aggregated from a variety of trusted data sources like GDSN etc. If you are a mobile service provider it is recommended that you get in touch with the GS1 Member Organization in your country to pilot the following:

- Provisioning of connections to trusted information sources within the country / industry.

- Registering of data sources on the GEPIR network for product information.

- Testing of information request routing.

- Establishing pilots with retailers and brand owners in the region.

- Access to GDSN data pools for business to consumer data.

5.7. Pilot considerations for Mobile Software Providers

Mobile software providers developing barcode reader applications should contact your local GS1 Member Organization to:

- Enable access to the GEPIR network.

- Implement EAN.UPC and GS1 DataMatrix barcode scanning functionality.

- Setup of pilots with handset manufacturers to test for compatibility with popular mobile phones in the local market.

- Setup of pilots with retailers in local region to implement scan-ability tests for a variety of products and connectivity with in-store retail networks for access to product information in retailer's databases.

- Setup of pilots with brand owners to test direct mode access to and display of product information on the mobile phone.

- Setup of pilots with mobile service providers and GS1 GEPIR network to test the indirect mode of access to Extended Packaging information.

Additionally, when a 2D barcode containing a GTIN and a URL is scanned:

- If indirect mode is implemented, then the reader software should provide an option to the consumer to select either the direct mode or the indirect mode of access.

- whenever multiple sources of information are available, the reader application must allow the consumer to select the information source he would like to trust.

6. References

- **[GS1MCOM] The GS1 MobileCom Opportunities and Challenges White Paper**

  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.

  http://www.gs1.org/docs/mobile/GS1_Mobile_Com_Whitepaper.pdf.

- **[GS1MOB] GS1 Position Paper on Mobile Barcodes**

  This position paper aims to give manufacturers, retailers and other existing users of the GS1 system guidance on what barcodes they should consider for mobile phone applications. Since the distribution of the position paper, the Quick Response (QR) Code has been submitted for GS1 approval through the Global Standards Management Process, but is not yet a GS1 standard.

  http://www.gs1.org/docs/mobile/GS1_Mobile_Com_Barcodes_Position_Paper.pdf

- **[GENSPEC] GS1 General Specifications**

  It is the core standards document describing how barcodes and identification keys should be used to comply with GS1 standards. They are used throughout the GS1 System. All aspects of the GS1 System are included in this document:

☐ **Section 1. Basics and Principles of the GS1 System:** Provides an introduction to the core components of the GS1 System

☐ **Section 2 Application Identification:** Provides a definition for each GS1 application using a template format. Each application is uniquely identified and contains a description, the associated GS1 Key, its definition and links to relevant data structures and attributes (Section 3), rules (Section 4), carrier specifications (Section 5), placement (section 6), and unique processing requirements (Section 7).

☐ **Section 3 GS1 Application Identifier Definitions:** Describes the meaning, structure, and function of the GS1 element strings so they can be correctly processed in users' application programs

☐ **Section 4 Application Rules:** Provides the rules for use of GS1 Keys in their application environments. Differences in industries are included as well as the data relationship rules for Application Identifier use.

☐ **Section 5 Data Carriers:** Provides a detailed description of the data carriers that are endorsed GS1. It includes symbol specification tables for use in the supply chain operational environment as well as the related barcode production and quality assessment required to achieve excellent scan rates.

☐ **Section 6 Symbol Placement Guidelines:** Provides guidance on symbol placement as well as transport label standards and tag standards

☐ **Section 7 AIDC Validation Rules:** Provides rules for validating and processing GS1 Element Strings without human intervention. Check digit and calendar date algorithms are also included.

☐ **Section 8 GS1 Standards Glossary of Terms:** A standard vocabulary used throughout the GS1 System

For access to the latest version of GS1 General Specification contact your local GS1 Member Organization.

■ **[GS1ARCH] GS1 Architecture Principles**

The GS1 Architecture provides the overarching principles for the GS1 System of standards and guidelines.

For access to the latest version of GS1 Architecture principles document contact your local GS1 Member Organization.

■ **[GS1DM] GS1 DataMatrix Introduction and Technical Overview**

This guide is designed to help in defining standard implementation of GS1 DataMatrix. It is a synthesis of recommendations for encoding, printing and reading GS1 DataMatrix barcode, which eventually will enable user companies to make the most appropriate decisions for their business.

http://www.gs1.org/docs/barcodes/GS1_DataMatrix_Introduction_and_technical_overview.pdf

■ **[GEPIR] – Global Electronic Product Information Registry (GEPIR)**

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. The service is provided jointly by different GS1 Member Organisations.

For access to the latest version of documentation and to establish connectivity with GEPIR, contact your local GS1 Member Organization. Additional information on GEPIR can also be found at the link below:

http://gepir.gs1.org/V31/xx/

■ **[GDSN] – Global Data Synchronisation Network (GDSN)**

GDSN is a network of interoperable data pools and a global registry called the GS1 Global Registry, for communicating master data (Catalogue Item and Party) between trading partners. The GDSN conceived and supported by GS1 and leading companies and industry groups worldwide, is a global, Internet-based initiative that will enable trading partners to quickly and efficiently exchange supply chain data that is accurate, up-to-date, and compliant with universally supported GS1 System standards

GDSN standards and documentation can be found at

http://www.gs1.org/productssolutions/gdsn/

To establish connectivity with GDSN for Mobile Commerce pilots, contact your local GS1 Member Organization.

- **[GPC] Global Product Classification (GPC)**

It is the classification system used in GS1 applications. To ensure products are classified correctly and uniformly, GDSN uses GS1 Global Product Classification (GPC), a system that gives buyers and sellers a common language for grouping products in the same way, everywhere in the world.

http://www.gs1.org/productssolutions/gdsn/gpc/library.html,

- **[HTTP] Hyper Text Transfer Protocol (HTTP)**

Internet Engineering Task Force (IETF) Request for Comments (RFC) 2616 is a standard for transfer of data using internet protocols.

http://www.ietf.org/rfc/rfc2616.txt

- **[URL] Uniform Resource Location (URL)**

Internet Engineering Task Force (IETF) Request For Comments (RFC) 1738, specifies a Uniform Resource Locator (URL), the syntax and semantics of formalized information for location and access of resources via the Internet.

http://www.ietf.org/rfc/rfc1738.txt

- **[HTML] HyperText Markup Language (HTML)**

A W3C Recommendation is a programming language used to create documents for display on the World Wide Web. It contains recommendations on how to format a query string for use with HTTP URL's.

http://www.w3.org/TR/REC-html40/interact/forms.html#form-content-type

- **[W3CMOB] W3C Mobile Web Best Practices v 1.0**

This document specifies Best Practices for delivering Web content to mobile devices. The principal objective is to improve the user experience of the Web when accessed from such devices.

The recommendations refer to delivered content and not to the processes by which it is created, nor to the devices or user agents to which it is delivered.

It is primarily directed at creators, maintainers and operators of Web sites. Readers of this document are expected to be familiar with the creation of Web sites, and to have a general familiarity with the technologies involved, such as Web servers and HTTP. Readers are not expected to have a background in mobile-specific technologies.

http://www.w3.org/TR/mobile-bp/

- **[QR] QR Code**

A QR Code is a matrix barcode (or two-dimensional barcode) created by Japanese corporation Denso-Wave in 1994. The "QR" is derived from "Quick Response", as the creator

intended the barcode to allow its contents to be decoded at high speed. QR Codes are common in Japan, where they are currently the most popular type of two dimensional barcodes.

http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=43655

■ **[RFC-1738] Uniform Resource Locators (URL)**

This document describes the syntax and semantics for a compact string representation for a resource available via the Internet. These strings are called "Uniform Resource Locators" (URLs).

http://www.ietf.org/rfc/rfc1738.txt

■ **[ISO-646] ISO 7-bit coded character set for information interchange** - Specifies a set of 128 control and graphic characters such as letters, digits and symbols with their coded representation. Applies to alphabets of the Latin script.

http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=4777

Appendix A.   Business Requirements

Number	Business Requirement	Rationale	
1	Need a mechanism to identify availability of additional information. A call-to-action SHOULD be provided	**Rationale**	Initiate user action, eliminate language dependencies. Consumers can know that additional information is available, how it can be accessed and know the relevant terms and conditions of use. Ease of use and transparency
		Mandatory / Optional	Optional
		Role	Manufacturer
		Category	Packaging
2	GS1 system of identification must be used for all identification (including products)	**Rationale**	Information can be linked to unique SKU's (SKU = Stock Keeping Unit - a uniquely identifiable product available for sale) e.g.; Kellogg's Rice Krispies. Interoperability of barcodes. Ubiquity. System should not be subject to change or reallocation
		Mandatory / Optional	Mandatory
		Role	Manufacturer Retailer
		Category	Packaging
3	GS1 standardized symbology should be used to access additional information	**Rationale**	Interoperability of symbology Ubiquity. System should not be subject to change
		Mandatory / Optional	Mandatory
		Role	Manufacturer Retailer
		Category	Packaging
4	A globally standardized unique identification for types of products i.e.: (cereals) may be provided by retailers for additional information	**Rationale**	Retailers want to help educate consumers to improve their buying decisions. Information linked to a product category e.g. cereals
		Mandatory / Optional	Optional
		Role	Retailer
		Category	Packaging

Number	Business Requirement	Rationale	
5	Guidelines for consistent size, shape and location of mark-up / logo should be provided.	Rationale	If too much variation in shape is allowed, consumers will not become familiar with purpose of the barcode. Codes should be a standard shape, even if size and location have to change because of packaging design. Ease of use for consumer to identify mark-up and improve awareness
		Mandatory / Optional	Mandatory
		Role	Manufacturer Retailer
		Category	Packaging
6	A globally standardized system of codes that allows data to be of variable length may be used.	Rationale	This allows for inclusion of additional data fields as may be required. Such as serial number, lot number, etc. Different manufactures will require tracking of additional data
		Mandatory / Optional	Optional
		Role	Manufacturer
		Category	Packaging Information Exchange
7	Backup in case data capture doesn't work	Rationale	There must be human readable characters associated with the mechanism on a product for accessing product information.
		Mandatory / Optional	Optional
		Role	Manufacturer Mobile phone manufacturer
		Category	Packaging Consumer Experience
8	Consumer should be able to select the type of information he receives.	Rationale	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. This is to ensure relevance of information that is supplied back to a consumer. If a consumer feels that the information they are receiving is not applicable, then they will be less inclined to use moving forward
		Mandatory / Optional	Optional
		Role	Mobile Phone Manufacturers Mobile Network Operators/Carriers Service Providers
		Category	Consumer Experience Information Exchange

Number	Business Requirement	Rationale	
9	Access to information should be optimized for speed.	**Rationale**	Ensure that response time of application is consistent and timely. This will be in order to avoid consumers who are unwilling to utilize because of long response times for information
		Mandatory / Optional	Mandatory
		Role	Mobile Phone Manufacturers Mobile Network Operators/Carriers Service Providers
		Category	Consumer Experience Information Exchange Information Storage
10	The format of the information that is relayed back to a consumer must be easily navigated and read via mobile device	**Rationale**	Mobile Internet at times offers challenges when navigating content, etc. due to formatting. We will need to ensure that such formatting and navigation constraints are kept to a minimum across platforms
		Mandatory / Optional	Mandatory
		Role	Mobile Phone Manufacturers Mobile Network Operators/Carriers Service Providers
		Category	Consumer Experience Information Exchange Information Storage
11	The mechanism to access product information should not require special phones or other hardware i.e. It should work with broad spectrum of mobile devices on the market including camera phones	**Rationale**	It is important that the application be able to work with phones that are currently in the market. Requiring hardware changes, or special phones, will be costly and greatly limit the rollout, and success.
		Mandatory / Optional	Mandatory
		Role	Manufacturer Retailer
		Category	Consumer Experience
12	Consumers should be able to read barcodes at a 360 degree angle and at significant angles of skew using their mobile device	**Rationale**	Consumers should not need to change the orientation of a product or their phone to read the barcode. Make it easier for the consumers to read the barcodes with their mobile device
		Mandatory / Optional	Optional
		Role	Users
		Category	Consumer Experience
13	Consumer should be able to search for product information using mobile web access and SMS if device is capable	**Rationale**	Consumers using mobile phones without camera can also access Extended Packaging services. Consumers using mobile phones without WAP function can also access Extended Packaging services.
		Mandatory / Optional	Optional

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Number	Business Requirement	Rationale	
		Role	Service Providers
		Category	Consumer Experience Information Exchange
14	Access to additional information must be cost effective to the consumer.	**Rationale**	Access to information should be free or low cost to drive adoption of Mobile Commerce
		Mandatory / Optional	Optional
		Role	Manufacturer Retailer Service Providers Mobile Network Operators/ Carriers
		Category	Consumer Experience Information exchange
15	Information provided to the consumer should be from a trusted source	**Rationale**	Consumer trust and confidence in information made available. Reliable and accurate information An example of this would be ingredients/allergen information
		Mandatory / Optional	Mandatory
		Role	All roles
		Category	Packaging Consumer Experience Information Exchange Information Storage
16	Access to additional information must be consumer initiated.	**Rationale**	Consumer trust. Consumers will not use this capability if constantly spammed by marketing information. Consumer is in control and decides to get information they want when they want it (opt-in to use information for other purposes)
		Mandatory / Optional	Mandatory
		Role	Retailer
		Category	Consumer Experience Information Exchange
17	Consumer must be informed what data is collected.	**Rationale**	Clear privacy understanding and transparency to build consumer trust
		Mandatory / Optional	Mandatory
		Role	All roles
		Category	Consumer Experience Information Exchange Information Storage
18	Information made available should be up to date and must indicate when it was last updated.	**Rationale**	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)
		Mandatory / Optional	Optional

Number	Business Requirement	Rationale	
		Role	Information Provider
		Category	Consumer Experience Information Exchange
19	Information data exchange must follow standard GS1 approved communication protocols, message syntaxes (XML/EDI, etc...) and data attributes (Master data, etc …)	**Rationale**	Interoperability and ease of link to data source 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. Non-Standard attributes will impede the ability for easy information sharing and leveraging of structures across the industry. All information (master data in the supply chain) must be made available in common format. Applications should use common terminology and field lengths for all kinds of information
		Mandatory / Optional	Mandatory
		Role	All roles
		Category	Consumer Experience Information Exchange Information Storage
20	The information should be globally available	**Rationale**	Consumer should be able to access information anywhere in the world.
		Mandatory / Optional	Optional
		Role	Information Provider Mobile Network Operator / Carrier
		Category	Consumer Experience Information Exchange
21	The information content should be localized	**Rationale**	The consumer should be able to get the information relevant to his locale
		Mandatory / Optional	Optional
		Role	Information Provider
		Category	Consumer Experience Information Exchange

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Appendix B.   Examples of Extended Information

The following examples are information that could be provided generally through websites, applications and GEPIR mobile pages. The preferential access to it (i.e. providing upon request) will be developed at a later phase.

Examples

- Allergen information (peanuts, soy, eggs, milk, etc…)
- Conversions (language, metric/imperial, Celsius / Fahrenheit, etc…)
- Best use instructions (use before date, compatibility, primary demographic, recipes, etc...)
- Nutritional/Serving information (serving size, percentage of sulphites, etc...
- Warrantee Info (term of warrantee, parts covered, where to service)
- Environmental Info (recycling, carbon footprint, organic)
- Ethical concerns (religious, fair trade, animal friendly, vegan, etc...)
- Examples of Extended Information

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Appendix C.   Information Exchange scenarios

#	Name	Data Carrier 1D/2D	Code	Lookup Service	Information Provider	Data Source
1	1D + GTIN (GCP data)	1D	GTIN	GEPIR	GEPIR	Brand Owner
2	1D + Retail Database by GDSN	1D	GTIN	Not applicable (retailer phone application)	Retail Database	GDSN + other
3	1D to Manufacturer database	1D	GTIN	Not applicable	Manufacturer Database	Brand Owner
4	1D to GEPIR to brand website	1D	GTIN	GEPIR	Brand Owner	Brand Owner
5	2D to GEPIR to brand website	2D	GTIN +	GEPIR	Brand Owner	Brand Owner
6a	2D to brand website	2D	URL+	Not applicable	Brand Owner or brand owner's trusted source	Brand Owner
6b	2D to brand website	2D	URL+ GTIN	Not applicable	Brand Owner or brand owner's trusted source	Brand Owner
7	1D to GEPIR cascaded to Local Data Source	1D	GTIN	GEPIR	Mobile GEPIR	GDSN / other
8	2D to GEPIR cascaded to Local Data Source	2D	GTIN	GEPIR	Mobile GEPIR	GDSN / other
9	1D to ONS to brand owner EPCIS	1D	GTIN	ONS	EPCIS	Brand Owner
10	2D direct to phone	2D		(Out of scope) Does not meeting the definition of Extended Packaging. Embedded coding in 2D Barcode for accessibility		
11a	1D/2D to service provider website to many websites	1D	GTIN	3rd Party lookup service	Many information providers	Many information sources
11b	1D/2D to service provider website to many websites	2D	GTIN / URL+	3rd Party lookup service	Many information providers	Many information sources