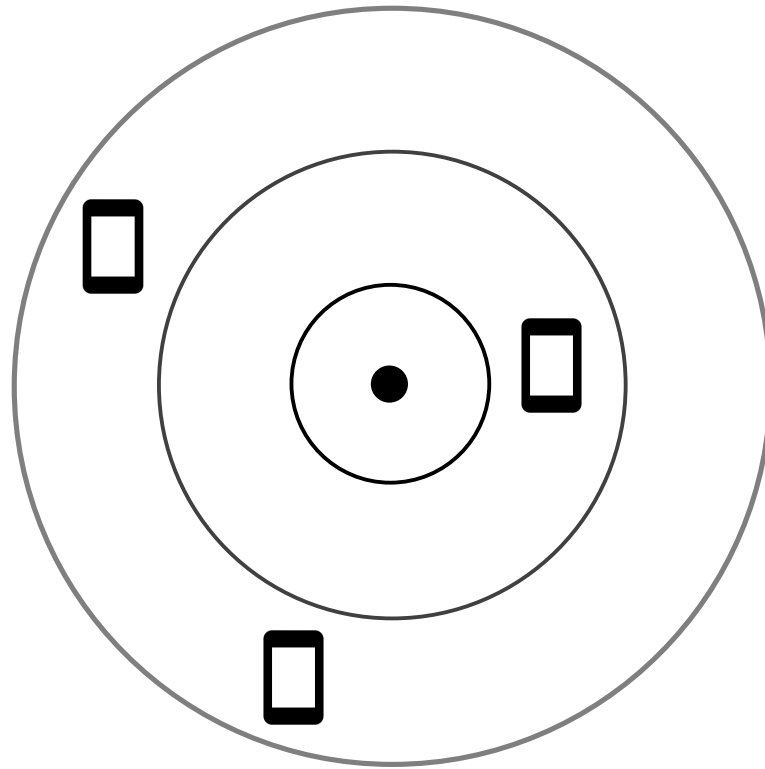




CHALMERS



Mapping Business Opportunities in the Light of the New Bluetooth Beacon Technology

*Master of Science Thesis
in the Management and Economics of Innovation Programme*

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Modest doubt is called the beacon of the wise.

- William Shakespeare

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Abstract

Problem: Digital transformation, which may be described as changes in both a company's operating model and value proposition, induced or enabled by digital technologies, is a concept that everyone talks about today. One of many technologies that can be part of the digital transformation is the beacon technology. Until today beacons have predominantly been used in the retail sector. ConsultingCo, a global IT- and business consultancy, has already developed a beacon platform and faces uncertainty regarding where else it makes sense to offer solutions and how to monetize from them. This thesis intends to help clarify this.

Purpose: The purpose of this thesis is to identify and evaluate opportunities for ConsultingCo to create and appropriate value from the emergence of Bluetooth enabled beacon technology. Opportunities are sought in eight industries, defined by ConsultingCo as the most relevant for beacons of those where the company is present.

Technology and Literature Review: The technology review describes how the beacon technology fundamentally works, how Apple's iBeacon and Google's Eddystone protocols are different, and outlines important limitations of the technology. Furthermore, the beacon technology is compared with other technologies for similar purposes, which reveals important strengths of beacons, including low cost, high accuracy, ability to work indoors as well as outdoors and compatibility with consumer devices. The literature review focuses on giving a theoretical background to how value can be created and appropriated. Operational excellence, customer experience and product offerings, and business intelligence are central concepts for the first part, while business models and competitive strategy are central for the second one.

Method: The process of fulfilling the purpose was divided into three steps. First, application ideas were generated. It was attempted to integrate a market and technology perspective in this by combining knowledge obtained through interviews with industry managers and external actors, with insights about the strengths of the technology. Second, the application ideas were assessed using an evaluation matrix with seven factors, developed by the authors. Third, the application ideas with the highest scores in the previous step were developed further in terms of purpose, functionality and technical setup.

Results and Implications: This report provides a longlist of application ideas for beacons that shows the breadth of how the technology can be used. It moreover describes some of these in more detail. Generally speaking, the application ideas can be broadly categorized into four groups according to the combination of the beacons' operating mode (action/data) and targeted user group (internal/external). There are interesting opportunities in all categories, but the internal use cases have a significant advantage through the higher degree of control offered in this setting. ConsultingCo should take advantage of its existing networks, relationships, framework agreements and own software solutions (IP) going forward. Furthermore, the company should investigate the beacon technology further, taking one specific setting or one application idea as a starting point, and work closely together with the right clients, to get proof of concepts and ambassadors. Right clients are such who have a genuine interest in and realistic expectations on this new technology.

Keywords: beacons, Bluetooth, iBeacon, Eddystone, software platform, proximity, positioning, indoor location, digital transformation, Internet of Things, business models, idea generation

Concepts and Definitions

aGPS	An extension of the GPS technology where, as a first step, the device determines an approximate position by cellular technology whereafter a scan for only the relevant GPS satellites is carried out.
Background service	A service on a (in the context of this report) mobile device that is run in the background without displaying a user interface on the screen. Background services can be app specific or system wide. While Android is allowing apps to run processes in the background, iOS is much more regulated and app developers are often left with a set of system services they are allowed to use. For example, iOS developers use the Core Location API to subscribe to location-related updates for their apps, and this is then managed on a system level, implying that developers have no control over when the system scans the environment for beacons.
Beacon positioning system	A Bluetooth beacon-based system that uses triangulation to calculate the exact position of a user or object within a geographical area. Compare with <i>Beacon proximity system</i> .
Beacon proximity system	A Bluetooth beacon-based system that delimits a geographical area into a set of zones allowing for the system to recognize a user or object entering or leaving zones, and the approximate distance between a beacon and a receiver. Compare with <i>Beacon positioning system</i> .
Bluetooth	In this report synonymous with Bluetooth LE, which is part of the Bluetooth 4.0 standard.
Business Intelligence	Processes, technologies and tools that turn data into information and knowledge that is used to improve a business.
Business Model	The link between value creation and value appropriation for a company.
Business Model Canvas	Brought forward by Osterwalder et al (2010), the business model canvas is a well-known tool for articulating business models.
Client	A client is defined as a buyer of ConsultingCo's products and services. Hence, a client is ConsultingCo's customer. Compare with <i>Customer</i> .

Customer	A customer is defined as a customer of ConsultingCo's clients. Compare with <i>Client</i> .
Digital Transformation	Changes in both a company's operating model and value proposition, induced or enabled by digital technologies. The result of new digital technologies deployed in ways that not only enhance traditional methods but create new innovative products and offerings. Westerman et al. (2014) argue that in order to digitally transform a company, it must excel in both digital capabilities and leadership capabilities.
Eddystone	Open source protocol for Bluetooth beacons created by Google and released in 2015. This specifies how beacons identify themselves by Eddystone-UIDs, but also how sensor data can be transferred. Further, the protocol allows for advertising URLs to the vicinity, paving the way for the Physical Web.
Framework Agreement	An agreement about a set of issues that simplifies the process of reaching future agreements. This is commonly used in public procurement. In Sweden, the Public Procurement Act stipulates certain steps that must be taken by the public sector when purchasing products and services. To make the procurement process faster, framework agreements are negotiated with some parties.
GPS	Abbreviation for Global Positioning System, which is a solution for outdoor positioning available worldwide. Triangulates a user's position relative to a set of satellites.
iBeacon	Protocol for Bluetooth beacons created by Apple and released in 2013. This specifies how beacons identify themselves by UUIDs, major and minor data fields.
Indoor location	All those services that enable smartphones or similar devices to position themselves indoors, compare with GPS that is used outdoors. Because of the complexity of getting accurate positioning indoors, these solutions are often combining multiple data sources such as radio frequency signals from cellular, Wi-Fi, and Bluetooth with sensor data such as pedometer and air pressure data.
Industry platform	A set of architectural guidelines that must be adhered to in order to deliver a useable product, seen for instance in the computer industry where there are clear rules for interfaces of different computer components.

Internet of Things	A network of physical objects that through sensors and communication capabilities are able to share information with each other.
Multi-Sided Platform	According to Hagiu (2014), multi-sided platforms are "technologies, products or services that create value primarily by enabling direct interactions between two or more customer or participant groups."
Omnichannel retailing	The integration of different channels for shopping, e.g. internet, physical stores and by phone. This integration essentially means that the customer experience is similar in all channels, e.g. products available in store should also be available online.
Physical Web	A concept brought forward by Google that allows objects such as posters, parking meters, vending machines etcetera to send URLs over the Eddystone protocol to smartphones or similar devices to swiftly open a communication channel to the object using the device's built-in web browser, hence neglecting the need of downloading apps for one-time use.
Platform	Broad term that could refer to many different things. Magnusson and Nilsson (2014) argue that there are three different types of platforms: product platform, industry platform and multi-sided platform. The first two are technical to their nature while the third is economic. See respective definitions.
Product platform	A common core from which derivatives can be created, e.g. Volvo Car's SPA platforms.
Push notification	A message pushed from a server to a device. This differs from what is called pull or fetch in that the message is delivered immediately, instead of being delivered the next time the device asks the server for updates.
RFID	Abbreviation for Radio-frequency Identification, defined as a form of wireless communication used to identify and track objects by radio waves (IMPINJ, 2016). See Section 2.2.
Tactile Paving	Textured ground surface indicators used to help blind people and visually impaired to navigate, for instance inside large buildings and at train stations or bus stops.

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1. Introduction

This chapter presents the background of this thesis by putting beacons into a context and framing the challenge underlying the purpose of the thesis. The purpose is thereafter introduced together with the research questions. Following next is a section about the delimitations of the thesis before the reader is provided with an overview of the report's structure that closes the chapter.

1.1 Background

The business world is changing fast and radically. According to Westerman et al. (2014), today's businesses are subject to a wave of innovations with a magnitude that has not been seen since earlier industrial revolutions. The implications of the integration and exploitation of new, digital technologies are far-reaching and affect companies beyond their borders (Matt et al., 2015), and companies failing to adapt and integrate them in their business processes may consequently see their business models turning obsolete or struggle with attaining competitive advantages (Liu et al., 2011). Considering the extent of the changes digital technologies bring, it is appropriate to talk about a transformation; a word which can be simply defined as to change something completely and usually in a good way (Merriam Webster, 2016). More specifically, the transformation in the business world could therefore be referred to as a digital transformation.

Digital transformation is a widely used although not entirely clear concept. In a company context, digital transformation may be described as changes in both the company's operating model and value proposition, induced or enabled by digital technologies (IBM Institute for Business Value, 2011). Pressure from increasingly globalized competition forces the company to deploy and integrate more cost effective digital technologies in its operating models and as new digital technologies become available for customers too, they start to change their expectations towards the company as well. This means that the company has to redefine its value proposition rather than just let digital technologies enhance or extend its traditional offerings. Consequently, digital transformation implies that the company changes both how and what it delivers to the market (ibid). Alternatively, digital transformation may be described as a collection of new products, services, tools and techniques put into practice. A few examples include big data, co-creation, cloud, artificial intelligence, 3D-printing, augmented reality and the Internet of Things.

One of the technologies that can be part of companies' digital transformation is the beacon technology. Beacons are small devices that can be used for various purposes - from proximity-based event triggering to working as sensors. Since Apple launched the iBeacon technology in 2013, actual implementations have predominantly been seen in the retail sector. One of the earliest to adopt the technology at a large scale was the American fashion retailer Macy's. Macy's deployed 4,000 beacons in 786 stores all over the U.S. during the fall of 2014 (Washington Post, 2014) to send messages to customers inside the stores. Similarly, the U.S. major baseball league (MLB) started to use beacons inside the big stadiums to push tailor-made notifications and offers to fans who had checked in (Engadget.com, 2014). Beacons have been used in this way in Sweden as well, but the most well-publicized example features a different use case where beacons are used to provide real-time updates of queue lengths to attractions in an amusement park (Mobil, 2014).

In the midst of this are companies like ConsultingCo, a global IT- and business consultancy. ConsultingCo has developed a platform for beacons, but faces uncertainty regarding where it makes sense to offer solutions and how to monetize from them. This thesis was initiated in January 2016, as one of the activities undertaken to clarify this.

1.2 Purpose

The purpose of this thesis is to identify and evaluate opportunities for ConsultingCo to create and appropriate value from the emergence of Bluetooth enabled beacon technology.

This purpose will be fulfilled by answering the following research questions:

1. What are possible applications of the beacon technology in the industries where ConsultingCo is present?
2. What are the most interesting opportunities related to the beacon technology for ConsultingCo going forward?
3. How could these opportunities be exploited?

By addressing these research questions, this thesis intends to serve as a fundament for business value creation for ConsultingCo with respect to the beacon technology.

1.3 Delimitations

Although ConsultingCo is a global company, the focus of this thesis has been on finding application opportunities on the Swedish market. Application opportunities were more specifically searched for only in the industries where ConsultingCo is already present. ConsultingCo operates in ten industries on a global level and is organized around these. Only nine of them are applicable in Sweden and one of those was not seen as interesting for beacon applications. Consequently, application ideas were in the end sought for in eight Swedish industries.

1.4 Disposition

The disposition of this report is as follows. First, in Chapter 2, a technology review is carried out in order to create a better understanding of the technology, its limitations and other technologies that are used for similar purposes. Thereafter, Chapter 3 provides a literature review concerning the concepts of value creation and appropriation which are central to the commercialization of new ideas as in this case with beacons. Chapter 4 outlines the methodology of this thesis work. In Chapter 5, the empirical results are presented. These are divided into three sections: Industry Overviews, where characteristics and trends for different industries that ConsultingCo targets are presented; Longlist of Applications, where longlisted application ideas are briefly described; and ConsultingCo and Other Actors, where ConsultingCo's resources and capabilities are described and competitors' solutions are examined. Chapter 6 starts by identifying the most interesting opportunities through an evaluation matrix, resulting in eight application ideas. These ideas are thereafter developed and business models related to them are discussed. Finally, Chapter 7 presents the conclusions and recommendations of this thesis work and Chapter 8 provides a discussion about the process and results.

2. Technology Review

The purpose of this chapter is to introduce the beacon technology and how it compares with other technologies for similar applications. First, beacons are introduced and discussed from the perspectives of a single beacon entity, different beacon protocols, and the beacon system. Thereafter limitations of the technology are outlined before a comparison with other technologies for similar purposes is presented.

2.1 Beacons

New Oxford American Dictionary defines a beacon as "a light or other visible object serving as a signal, warning, or guide, especially at sea or on an airfield" and acknowledges that a beacon could also be "a radio transmitter whose signal helps to fix the position of a ship, aircraft, or spacecraft". This transmitter could use different frequencies and protocols. One of the most obvious examples of beacons today is GPS satellites, that allow for devices to calculate their position and altitude relative to the earth. While GPS is well-suited for foreground location services in outdoor environments, such as navigation, it has its limitations in needing a clear view of the sky and energy usage. Therefore, location services based solely on the GPS technology do not work well in indoor environments and neither do they work well for running in the background since they consume too much power.

In the context of this report, beacons are defined as transmitters using a subset of the Bluetooth 4.0 protocol called Bluetooth LE to emit signals that can be received by other devices in the vicinity (Aislelabs, 2015; Gartner, 2015; Lighthouse.io, 2015). These transmitters comprise a microcontroller, a Bluetooth LE radio chip and a battery or other power source (Aislelabs, 2015). When configured, they emit Bluetooth LE signals with a preset transmit power and advertising interval. The transmit power determines the range of the signal, which can be up to 50 meters under favorable conditions, and the advertising interval affects the time it takes before a device can pick up the signal. Beacons are very energy-efficient and can be powered by 1000 mAh coin cell batteries for up to two years (ibid). At the receiving end, battery drain on both iPhone and Android should be less than one percent. Further, beacons are priced at around \$5-30 per unit and often sell at volume discounts (Estimote, 2016a; Kontakt.io, 2016a). The fact that they are small, relatively cheap and battery-powered makes beacons suitable in settings where they move, e.g. on a bus or on equipment that is to be tracked. This is in contrast to the traditional comprehension of beacons as large, expensive, energy-guzzling machines.

So far, it has been established that beacons are transmitters that send out signals at regular intervals. Important to mention is that most beacons operate in a transmit-only mode and send out signals whether there are devices in the vicinity listening or not (Gartner, 2015). The following sections will address what types of information these signals convey and how devices can benefit from picking up the signals.

2.1.1 Comparison of Protocols

In the context of programming, New Oxford American Dictionary defines a protocol as "a set of rules governing the exchange or transmission of data between devices". Both Apple and Google have their own versions of beacon protocols. Apple's iBeacon protocol was released in 2013 and

officially only supports iOS whereas Google's Eddystone protocol was released in 2015 and is platform independent (Appleinsider, 2013; Techcrunch, 2015). However, even though Google provides APIs for Eddystone on iOS it is not possible to wake up apps running in the background since this action requires core system services not available for third-party developers to extend (Kontakt.io, 2016b). The bottom line is that, despite the simplicity of the technology, there is not one common beacon protocol, meaning that companies that want to utilize beacons might need to set up multiple beacon systems in parallel, or decide on one of the protocols.

The difference between Apple iBeacon and Google Eddystone, as can be seen in Table 1 below, is that Eddystone supports sending URLs and small amounts of sensor data in addition to sending IDs. While sensor data and IDs require that an app is installed for handling the information, URLs allow for users to access content without having a certain app installed. Google calls this the Physical Web, and argues for its utility in situations characterized by one-time transactions such as when a car owner wants to pay for parking, via a smartphone, without downloading an app (Google, 2016).

Apple iBeacon	Google Eddystone
Content of Broadcasted Packets	
<ul style="list-style-type: none"> • UUID (Universally Unique Identifier): used to identify an owner of a group of beacons, e.g. a store chain • Major (optional): a number often used to identify a location, e.g. a store • Minor (optional): a number often used to identify a micro-location, e.g. a store department • Power and calibration data: output power and expected power at a certain range 	<ol style="list-style-type: none"> 1) Eddystone-UID <ul style="list-style-type: none"> • Namespace: similar to iBeacon UUID • Instance: similar to iBeacon Major and Minor combined 2) Eddystone-URL <ul style="list-style-type: none"> • The packet contains only a URL-field, meaning that users can access information without having a certain app installed 3) Eddystone-TLM <ul style="list-style-type: none"> • sensor data, e.g. beacon temperature
Compatibility	
iOS devices (as system service) and Android devices (as background process implemented ex officio) with Bluetooth 4.0 hardware support	Android devices (as background process) and iOS devices (as foreground process) with Bluetooth 4.0 hardware support

Table 1. Comparison of Apple's and Google's beacon protocols (GSM4, 2014; Estimote, 2016b).

2.1.2 The Receiving End of Beacons

The low energy consumption of Bluetooth LE in idle mode allows for it to be constantly on, enabling devices to frequently search for beacons in the vicinity without almost no effect on battery performance (Aislelabs, 2015; Apple, 2014). The function of frequently scanning the environment for iBeacons is a system service in iOS and installed applications can sign up for notifications on a set of beacon IDs. In Android, beacon scanning can be implemented as a background service. If one of the sought-for beacons shows up during the scan, the concerned app will be woken up to take actions. These actions could consist of showing locally cached content, pulling content from a server, or notify a server that a beacon has been detected. Figure 1 below shows communication directions of a beacon system.

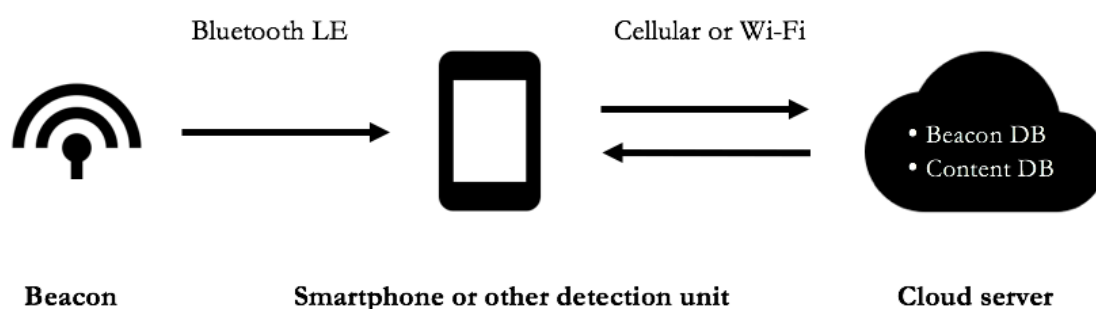


Figure 1. Communication directions within a beacon system.

Since beacons only send information and do not receive anything, users are free to opt in and opt out of potential tracking. If there is no installed application on the phone that can handle the information that a certain beacon has been discovered, nothing will happen.

In some situations, an application can take actions on its own, and for instance show product information that is already cached in the application. However, more often it makes sense to connect the application to the Internet to be able to provide dynamic information, and also communicate to a server that the device is present at a certain location. There is a huge amount of different beacon cloud platforms available on the market, and also larger systems with beacon functionality implemented. This will be discussed later in the report, in Section 5.3.2.

2.1.3 Limitations of the Beacon Technology

Although the beacon technology has a number of interesting features, problems and limitations that might hinder adoption exist - from lack of standardization in the industry to the maintenance need. Effectively addressing these issues is key to making the technology pervasive.

Vendors and Platforms

The immaturity of the technology and the current industry structure, characterized by many small vendors and proprietary platforms, inhibit adoption as it produces uncertainty among potential customers. Beacons have been on the market for a relatively short period of time and have consequently not been tested extensively. Since many of the beacon manufacturers and platform developers moreover are small and immature companies, concerns have been raised about

scalability and long-term viability (Gartner, 2015). These concerns are further accentuated by the lack of common standards. Concretely this means that beacons and beacon platforms have proprietary features or algorithms, which may not be interchangeable with products from other manufacturers (ibid). Investments in beacons may therefore be put on hold.

Signal

One of the problems that has been seen in tests is that the Bluetooth signal can be blocked or disturbed. The signal is to varying extent affected by different materials in the beacons' surroundings. Among the worst materials is thick metal, but also human bodies have been shown to block signals effectively. Since beacons share the frequency for the Bluetooth signal (2.4 GHz) with for example microwave ovens, Wi-Fi networks and cordless telephones, the signal can also be disturbed. To mitigate these problems, the signal strength can be increased, but that comes with the price of a shorter battery life.

Power Supply

The beacons need to either have a battery or be connected to a power outlet to function. When the batteries have run out, either the batteries or the entire beacons must be replaced. With the price of beacons declining rapidly, the cost of exchanging batteries may well exceed the costs of installing new ones. As long as the battery lifetime exceeds the short technology cycles in the industry, it may consequently be argued that power consumption is not a big problem, since the beacons would be replaced anyway (Beekn, 2015). The alternative option, relying on power outlets, circumvents the potential problem of having to change batteries, but becomes less flexible, as power outlets must be within a reachable distance. The fact that most beacon applications use battery-powered beacons suggests that this flexibility is valued.

Privacy and Security

Last but not least, there are some privacy and security issues linked to beacons. Some users have a negative attitude towards beacons since they have concerns that beacons interfere with their integrity, but here it is important to clarify that it is an opt-in technology. Those who do not want to receive messages or get tracked, can choose to not download apps or deny access to location services. One security issue that might be challenging to handle is spoofing. Most beacons have a static ID that can easily be imitated, something that opens up for the act of piggybacking, which is when an actor makes use of another actor's beacon infrastructure. For example, a large food chain could visit its competitors, record their beacon IDs and then program its own app to listen for these, making it possible to reach the competitors' customers with an offer when they enter the competitors' stores. Some measures can be taken against this, but the main conclusion remains: beacon security is immature (Gartner, 2015).

2.2 Other Technologies for Similar Purposes

There are a number of technologies which can be used for positioning, tracking and proximity communication and thus compete with beacons. This section provides an overview of which these technologies are and how they work. Also, Table 2 shows what their advantages as well as disadvantages in comparison with beacons are.

Mobile or cellular networks can, in addition to facilitating communication, be used for positioning. A cellular network consists of several overlapping geographic areas referred to as cells. Within each cell is a cell tower and a base station, which receives signals sent by mobile phones (Que Publishing, 2013). Based on information about the time it takes for a signal to travel to multiple towers, the angle by which it approaches the cell tower, and its strength, it is possible to determine the position of the cell phone (Figueiras & Frattasi, 2010). Positioning using the cellular networks, has the advantages that it can be done over existing, extensive networks and does not require built-in GPS, which means that a large number of phones are compatible. At the same time, there is a risk for inaccurate results when the signal cannot travel freely to the cell tower, i.e. without trees or buildings in the way (HowStuffWorks, 2016a). Therefore, the technique does not work well indoors. This is, however, not a concern limited to cellular networks, but one that includes all wireless protocols. Though unique for this particular technology is that it requires a subscription.

GPS is an abbreviation for Global Positioning System - a widely adopted system used for positioning on land, at sea and in the air in various applications (Garmin, 2016a). The system consists of three parts to deliver the coordinates: orbital satellites, control stations and a GPS receiver. The satellites, monitored by the control stations, transmit microwave signals, which the receiver picks up and uses to triangulate a position (Mio, 2016). Many cell phones work as receivers. Cell phones with GPS functionality run a special form of positioning, called assisted GPS or aGPS. When a position is determined by aGPS, the cell phone first connects to the nearest cell tower or base station. As such are often equipped with GPS receivers, the cell phone can obtain the geographical coordinates without having to scan for satellites. Positioning can thereby be done faster and with less effort in terms of processing and battery use (Windows Central, 2009). The main advantages of GPS and aGPS are worldwide coverage and that neither any special subscription is required, nor that any investment or maintenance costs apply for the individual user. However, like positioning by cellular networks, the technology is not well-suited for indoor use and its accuracy is generally lower with about ± 15 meters (Garmin, 2016b).

Wi-Fi, short for Wireless Fidelity, is primarily a technology for wireless Internet access, but may also be used for positioning. In order to set up a Wi-Fi network, it is necessary to have a router, directing the data traffic to all the devices that want access to the network (HowStuffWorks, 2016b). Once the network is up and running, all devices that are in range, up to 150 meters, and have Wi-Fi enabled can be detected and positioned with the so-called fingerprinting method, which uses the MAC address and strength of the signal received, as long as the router supports this (Insoft, 2016). Wi-Fi is a better alternative than for example cellular networks or GPS for indoor positioning purposes, where it can even detect what floor the traceable device is on. This is something beacons can do too. In further comparison with beacons, a Wi-Fi network offers the advantages of being able to position any device with Wi-Fi enabled only, which at least today can be assumed to easily outnumber the devices with the combination of special apps installed and Bluetooth enabled. Another positive aspect is that positioning using Wi-Fi may be possible with limited or no further investments needed, as many networks are already in place. However, there are drawbacks with the technology as well. One of the most serious ones is integrity concerns, as people do not actively consent to sharing information about how they move (DN, 2014). The beacon technology can to some extent be said to share the same problem, but prompts the user

to an active consent and thus makes it more transparent. Further drawbacks of the Wi-Fi technology include less accuracy and dependency on external power sources.

Radio-Frequency Identification (RFID) is a form of wireless communication used to identify and track objects by radio waves (IMPINJ, 2016). RFID systems, which can identify and locate objects as well as sense their condition, consist of readers and tags, and can be either active or passive. Active RFID systems use two types of active tags with the ability to transmit the information stored on their microchips by broadcasting a signal. The basic distinction between the two is that one needs to receive a signal from a reader to start emitting a signal, whereas the other sends out a signal at pre-defined intervals, thus consuming more energy (ibid). Active RFID systems are commonly used in real-time locating systems over long distances. Unlike active systems, passive RFID systems do not require any batteries as the tags instead draw power from the reader (RFID Journal, 2016). Passive RFID tags are cheaper, smaller and easier to manufacture, but have a smaller range of less than ten meters. Another difference between the two systems is that a passive RFID system can read and transfer sensor values only when the tag is powered by a reader, while active RFID systems can monitor and record sensor input continuously (IMPINJ, 2016). Compared to beacons, RFID systems are very accurate and fast - 1,000 tags per second can be identified at nearly 100 % read rates – and, since the technology is mature, it comes with a well-defined set of use-cases, implying that it is known on beforehand whether the technology will work or not in a particular setting. The main drawback of the technology is that the readers, and active tags when applicable, are expensive. Furthermore, there is no chance to leverage the potential presence of consumer-owned devices (Lighthouse.io, 2016a).

Based on RFID is *Near Field Communication*, also known as NFC. This technology uses electromagnetic induction between two loop antennae to transfer of small amounts of data between two devices within a distance of less than 20 cm from each other (PC Advisor, 2015). Since a couple of years back the technology has been implemented in smartphones, with the intention to enable convenient payment and make credit cards redundant (M3, 2015). In addition to this so-called card emulation mode, NFC devices support a reader/writer mode and a P2P mode, whereby NFC devices can read and write information stored on NFC tags, and automatically exchange information, such as pictures and contact details (Android Developers, 2016). Compared to beacons, NFC tags are cheaper and use less energy, but beacons do on the other hand offer a much larger range and higher speeds for data transfer (M3, 2015). Moreover, Apple currently restricts NFC in its devices to only work with Apple Pay (Mobil, 2016).

A *QR-code*, where QR is short for Quick Response, is basically a barcode that can be read by a QR-scanner, which most smartphone cameras can function as if paired with an app. A QR-code can hold more than hundred times the information of conventional barcodes while simultaneously needing less space. The type of information a QR-code can hold is URLs, contact information, SMS and documents (QR code.com, 2016). QR-codes are easy to generate and only require a general QR-code scanner, unlike beacons for which a specific app may be needed. However, scanning a QR-code requires a bigger effort from the user and is thus more inconvenient than receiving the same information from a beacon.

SIMILAR-PURPOSE
TECHNOLOGY VS.
BEACONS

	ADVANTAGES	DISADVANTAGES
GSM/LTE	<ul style="list-style-type: none"> - Extensive network already existing 	<ul style="list-style-type: none"> - Less accurate - Does not work well indoors - Subscription needed
GPS	<ul style="list-style-type: none"> - Global network - No costs for setup or maintenance 	<ul style="list-style-type: none"> - Less accurate - Does not work well indoors
WI-FI	<ul style="list-style-type: none"> - Enabled Wi-Fi is sufficient for tracking - Existing infrastructure can be used 	<ul style="list-style-type: none"> - Integrity concerns - Less accurate - Requires external power
RFID	<ul style="list-style-type: none"> - Fast - Accurate 	<ul style="list-style-type: none"> - Active tags and readers are expensive - No possibility to leverage consumer devices
NFC	<ul style="list-style-type: none"> - Cheap - Fast connection 	<ul style="list-style-type: none"> - Works just for near field communication - Cannot be configured via Wi-Fi - Only works (fully) with Android and Windows
QR-CODE	<ul style="list-style-type: none"> - Cheap - Easy to generate - No specific app needed (only a QR-scanner) 	<ul style="list-style-type: none"> - Inconvenient for the user - Does not allow for passive tracking

Table 2. Comparison of the beacon technology with technologies for similar purposes.

3. Literature Review

This chapter presents central theoretical concepts for this thesis. The first part aims to outline different disciplines in which companies can create value. Understanding this is fundamental in order to find relevant applications for beacons, as the rationale of installing those is that they can contribute to value creation. The second part of this chapter, business models, extends the aforementioned reasoning around value by outlining how the created value can be appropriated. Business models are important to study in this context since new technologies imply business model changes and achieving a good fit between the technology and business model is critical for market success (Björkdahl, 2009; Baden-Fuller & Haefliger, 2013). The third, and last, part seeks to establish central premises for how a company should compete effectively.

3.1 Value creation

Treacy and Wiersema (1993) argue that companies can create value in three different disciplines, which are operational excellence, customer intimacy and product leadership. This is in line with Hagel and Singer's (1999) notion of the unbundled corporation. In the following two sections, the three disciplines will be discussed. Customer intimacy and product leadership will be discussed together in the section customer experience and product offerings, with the rationale of both of them being revenue driving and external while operational excellence has the character of being cost reducing and internal. Also, a discussion of the field of business intelligence follows. Here, business intelligence is seen as a supporting tool for reaching operational excellence, enhancing the customer experience and creating new and better products.

3.1.1 Operational Excellence

Operational excellence is *“a specific strategic approach to the production and delivery of products and services”*, according to Treacy and Wiersema (1993). Concretely it means that companies seek to become cost leaders or the most convenient alternative for customers in their industry by reducing costs and optimizing the production process. Broken down into performance goals, operational improvement aims to lower cost and enhance quality, speed, dependability and flexibility (Slack et al., 2010).

Popularized as a generalized version of Toyota's Production System, lean manufacturing is one approach to operational excellence. Lean manufacturing has four core principles, of which elimination of waste is arguably the most important one (Slack et al., 2010). Waste is defined as anything that is not value adding for the customer. Waste can be further broken down into seven categories: over-production, waiting time, transport, process, inventory, motion and defectives. Elimination of waste thus means to identify and reduce waste of these types in all parts of the value chain. While this can be done in a number of ways, common ways to achieve it include streamlining of flows, use of kanbans, a design of the production system with pull rather than push as a guiding principle, increased flexibility and reduction of setup times, changes in the layout and visibility of flows (ibid).

Management philosophies and methods originating from the manufacturing industry are today used in various contexts. New Public Management (NPM), which paved the way for the implementation of lean principles in healthcare, is one example of this (Lindskog, 2014). NPM has

become popular in Sweden among other countries and entails that management methods from the private sector are used for improvements in the public sector. Practically this means an increased focus on the customer and results, why clear areas of responsibilities are defined and goals are set and followed up (ibid). NPM further uses elements of competition to drive change. Besides having proven relevancy in other sectors, lean and similar principles have also turned out to be applicable in other functional contexts, e.g. R&D.

3.1.2 Customer Experience and Product Offerings

Treacy and Wiersema (1993) claim that companies pursuing a strategy of customer intimacy *"...continually tailor and shape products and services to fit an increasingly fine definition of the customer."* This process is often seen as expensive, but can still be motivated if customer relationships and investments in them are being evaluated on the basis of the lifetime value of the customer for the company.

According to Westerman et al. (2014), there are four ways in which companies can work with new digital technologies to transform the customer experience:

1. Understanding customer behavior and designing the customer experience from the outside and in
2. Increasing reach and engagement
3. Putting customer data at the heart of the customer experience
4. Seamlessly meshing the physical and digital experiences

By seeking a deeper understanding of customer behavior, both in terms of what, how, where and why, the company can redesign the customer experience to better cater for customer needs. Customer segmentation is a powerful tool for identifying gaps between the current and desired experience. Further, reach and customer engagement should be increased by embracing technologies such as mobile applications and social media, to create a two-way communication channel and engage in conversations with customers. Also, customer data can provide information and insights that help the company further develop its offerings and customer experience. Often, mobile applications and enterprise systems have enabled collection of huge amounts of data, but this data is not utilized to the extent it could be. Data analysis will be elaborated upon in the section about business intelligence. Finally, Westerman et al. (2014) argue the importance of seamlessly meshing the physical and digital customer experiences. By this, it is meant that the company should be perceived the same way, and provide the same products and services no matter what channel a customer uses. For instance, a physical store should offer the same products as its corresponding web shop.

The fashion brand Burberry provides some interesting learnings about the use of digital technologies to transform the customer experience. The company decided to target millennials in emerging economies, which implied a need to significantly increase the use of digital technology. Burberry carried out several digital initiatives such as having runway shows broadcasted live to their stores all over the world while letting customers order directly on iPads and providing full access to its global collection in all stores. It also had its Chief Creative Officer overseeing everything that customers could see in order to create a consistency of brand communication over all customer touch points. Finally, the company embraced new ways of customer profiling and personalization meaning that shop clerks could see exactly what a customer had been buying in

another Burberry store or on the Internet, by tying individual customers to email addresses. Similar methods of linking purchase data from different stores and the web store together are used by many companies today, for instance by Apple and Macforum.

Treacy and Wiersema (1993) say that companies tuned for product leadership *"strive to produce a continuous stream of state-of-the-art products and services"*. For this, they need to be creative, able to quickly commercialize their ideas and constantly pursue new solutions that might render their existing products obsolete. A well thought-out customer experience can support creativeness in bringing new external ideas to the table and help the company in quickly commercializing new ideas. For instance, Starbucks has a portal called My Starbucks Idea, which is a community in which customers can share ideas and vote for the best ones. Regarding commercialization of new ideas, Apple has for many years streamed their product launch events online to customers around the globe, and created a hype around them.

3.1.3 Business Intelligence as a Supporting Tool

The rapid growth of data about operations and customer behavior available to companies during the last decades, especially because of new ways of automatic collection of data fueled by new sensors and ICT's, has raised questions about how all this data could be transformed into valuable insights that can guide decision makers in search for competitive advantage. These questions are fundamental to the field of Business Intelligence (BI). Loshin (2012, p. 7) proposes a definition of BI, used by Data Warehousing Institute:

"The processes, technologies, and tools needed to turn data into information, information into knowledge, and knowledge into plans that drive profitable business action. Business intelligence encompasses data warehousing, business analytic tools, and content/knowledge management."

The definition rests on the Data-Information-Knowledge-Wisdom (DIKW) hierarchy, often attributed to Russell Ackoff (Rowley, 2006), even though Wisdom is omitted. Here, data is defined as being discrete, objective facts or observations that, since it is unorganized, have no meaning (Loshin, 2012; Rowley, 2006). By organizing the data and establish relationships, it gets contextualized and thereby transformed into information, which can be useful. When the information is understood, in the sense that patterns are recognized, the information is being turned into knowledge.

As indicated in the definition, BI is not just about tools and technologies for gathering data and transforming it. It is as much about processes, in the sense that without good processes, data might not be utilized at all, and even if analysis is performed and valuable insights are derived from it, actions must still be instigated in order for the BI to have an impact (Loshin, 2012). Also, BI aims at collecting and organizing data from multiple sources throughout the organization, which means that reports could be created that previously have not been possible to create. Further, BI could be made available to large parts of the organization by customizing what queries that can be run by different employee roles. Hence, BI can make information instantly available to the organization, rather than people having to wait until the next time a report is created by their superiors and shared with them. This enables more rapid decision-making which in turn can render competitive advantages (or disadvantages if not implemented).

Gartner (2013) proposes that analytics is divided into four categories: descriptive, diagnostic, predictive and prescriptive. Whereas descriptive analytics simply describes what has happened, diagnostic analytics seeks to explain why it has happened. Predictive analytics tries to predict what will happen in the future, and prescriptive analytics provides recommendations on what to do given these predictions. During the most recent years, scholars have debated the impact of predictive analytics. For instance, Christensen et al. (2013) raise the question of whether management consulting will be packaged and sold as software in the future.

3.2 Value Appropriation

Value appropriation describes how to monetize from ideas. Here, the concept of business models, and the popular business model canvas in particular, is introduced as one way to create a structure around how this can be done. Furthermore, a section about competitive strategy presents the VRIN framework.

3.2.1 Business Models

Business models are tools that explain how organizations create, deliver and capture value (Björkdahl, 2009; Osterwalder & Pigneur, 2010; Johnson et al., 2008). One of the benefits of using business models as a unit of analysis is that they take a holistic perspective when explaining a business.

The Business Model Canvas

A common way of mapping a business model is using the business model canvas, proposed by Osterwalder and Pigneur (2010), see Figure 2. Here, the business is split into four main areas, that are customers, offer, infrastructure and financial viability. These are divided into nine building blocks. Starting with one or more value propositions, the company seeks to satisfy certain customer needs derived from the segmentation of customers. To accomplish this, the company needs to establish customer relationships and channels for communication and delivery of the value proposition. The company must also have access to the right resources and have competences for performing certain activities in order to deliver the value proposition. Resources could be acquired and activities sourced externally, why some of the company's partners might be imperative for realizing the business model. Finally, the business model must be financially viable wherefore the canvas maps the cost structure and ways of deriving revenue from the value proposition. In the following, some of the building blocks will be elaborated upon as they are seen as the core in value appropriation.

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
	Key Resources		Channels	
Cost Structure			Revenue Streams	

Figure 2. The business model canvas.

Customer Segments and Value Proposition

Since no business can survive without its customers, the first building block in the business model canvas to have a closer look at is the one about customer segments. A segment is made up of customers with common characteristics that define what is important to them and how they respond to different types of marketing stimuli (Hutt & Speh, 2010). Sometimes there is one large group of customers largely sharing the same needs and problems in the market. In such a situation the segment is referred to as a mass market. Serving a mass market, there is no need for the business to distinguish between value propositions and distribution channels for the customers. In other cases, when the customers have slightly different needs and problems, are reached through different channels, require different types of relationships or value different aspects of the offer, it is apt to have a business model around segmented customers. If customer segments are unrelated, having very different needs and problems, the business model can be said to be diversified. Another situation occurs when two or more interdependent customer segments are served. In this case, where the business can be seen as a multi-sided platform, the business model relies on multiple customer segments sides to work (Osterwalder & Pigneur, 2010).

The value proposition describes what value the business delivers to the customers, i.e. what benefits the customer can expect from the products and services (Osterwalder et al., 2015). Examples of kinds of value a company can deliver are performance, cost or risk reduction, convenience and design (Osterwalder & Pigneur, 2010). A good value proposition achieves a fit between what the customer wants and what is offered. The first part, what the customer wants, relies on understanding the customer. This entails finding out what the customer is trying to get done and in which context as well as what outcomes or benefits are wanted (gains) and what disturbs or hinders the customer in the process of trying to get this done (pains) (Osterwalder et al., 2015). The second part, what is offered, is simply a description of the types of products and services offered to the customer to create the gains and relieve pains identified.

Revenue Models and Pricing Models

There is a wide variety of different revenue models that could be used in business models. Osterwalder and Pigneur (2010) give the following examples: asset sales, subscriptions, usage fees, freemium (i.e. a basic service for free with additional add-on services for sale), renting, licensing (regarding use of some IP), intermediation fee (for providing a marketplace) and advertising sales. In order to visualize a revenue model, concerned actors could be mapped in a diagram together with payment flows and corresponding transaction amounts.

Besides determining the revenue model of the company, product or service, a pricing model must be created. Since different customers might have different perceptions of value, they will ultimately be willing to pay different amounts for the same product or service. Osterwalder and Pigneur (2010) propose two broad ways of pricing: fixed menu pricing, based on static variables, and dynamic pricing, based on market conditions. Fixed menu pricing encompasses list prices and customer segment dependent pricing. Also, prices could be based on quantity purchased or linked to product features. Dynamic pricing could, on the other hand, concern auctions or other demand and supply mechanisms. For instance, the ride-sharing company Uber employs a dynamic pricing model to match demand with supply. However, dynamic pricing models could in some cases result in large price fluctuations, which is shown year after year in New York City on New Years Eve,

when Uber users get to pay ten times the normal rates (Time, 2016). A more relevant dynamic pricing model in the context of this report is prices negotiated on the level of individual customers. Individual negotiations incur high transaction costs, but they make it possible to better account for individual customer characteristics such as implementation risks, willingness to pay, desired payment conditions and so forth.

Finally, it is worth considering whether the company's first priority is revenues or customers. Here, cash flows and liquidity should be considered together with potential for growing the user base more quickly, which can bring a more long-term financial stability to the firm, for instance through network effects.

3.2.2 Competitive Strategy

Competition and how firms should form their strategies should also be considered in relation to value appropriation. There are different views on what is the main source of firms' profits and hence how firms' strategies should be formed. Some scholars, of which one of the most prominent is Porter (1979), claim that profits mainly stem from the external environment of the firm; the industry that the firm is situated in. Therefore, it is argued, firms' strategies should revolve around positioning themselves within a profitable industry and seeking monopoly rents, i.e. profits stemming from market power (Porter, 1979; Grant, 1991). The implication is that companies within the same industry are advised to pursue similar strategies, despite the fact that they might have very different internal environments.

The resource-based view of the firm, brought forward by, among others, Penrose (1959), Wernerfeldt (1984), Barney (1991) and Grant (1991) states on the contrary that firms should pursue different strategies based on their resources and capabilities rather than industry context. According to this view, firms may be seen as bundles of resources (Wernerfeldt, 1984) and by leveraging their unique set of resources and capabilities to build competitive advantage, they can seek to earn so called Ricardian rents from the market. Further, it is argued that a firm's resources and capabilities are a better foundation for its strategy than the external environment because the external environment changes rapidly (Grant, 1991). In building a strategy around resources and capabilities, it is first necessary to know what those are.

Resources can be divided into a) tangible resources consisting of financial and physical resources, b) intangible resources consisting of technology, reputation and culture, and c) human resources consisting of know-how, communication- and collaboration capacity and motivation (Grant, 2015). Tangible resources of a company tend to be easiest to recognize since they are on the company's financial statements. Intangible and human resources are harder to recognize, e.g. even though patents and pending applications are published it might be difficult to assess the ownership of them since changes in ownership can be made with bilateral agreements and do not need to be registered. The most basic definition states that, while resources are productive assets owned by the firm, capabilities are what the firm can do with those resources (Grant, 2010).

It is important to recognize that not all resources and capabilities are equal in terms of strength and that this should be taken into account when building the strategy. Barney (1991) defines four types of resource characteristics and argues that a resource is only capable of generating a sustained competitive advantage when it has all four of them. The four characteristics mentioned are

valuable, rare, imperfectly imitable (hereafter inimitable) and non-substitutable, and together form what is commonly called the VRIN framework.

Valueability, in the sense that effectiveness and efficiency improvements can be generated, is a fundamental criterion for an asset to be considered as a resource. If many companies have the same valuable resource it can, however, not produce a competitive or sustained competitive advantage. This can only be achieved when the resource is rare. For a rare resource to be capable of creating a sustained competitive advantage, it must be inimitable too. A resource is inimitable when it is dependent upon unique historical conditions, has a causally ambiguous relationship with the firm's sustained competitive advantage or is socially complex in its nature, alternatively combines at least two of these. Even if the resource is inimitable, a sustained competitive advantage cannot be guaranteed. This occurs first when the resource is not possible to substitute for another one. That the same result that the resource produces cannot be reached in a different way, that is.

4. Methodology

The process of fulfilling the outlined purpose of the thesis and answering the earlier posted research questions was divided into three phases as represented in Figure 3 below. In the first phase, a large number of application ideas for the industries where ConsultingCo is present was generated. In the second phase, all of these application ideas were compared and assessed in relation to defined criteria. In the third phase, the most interesting application ideas from the mentioned assessment were developed further. More detailed descriptions of each phase follow in this chapter.

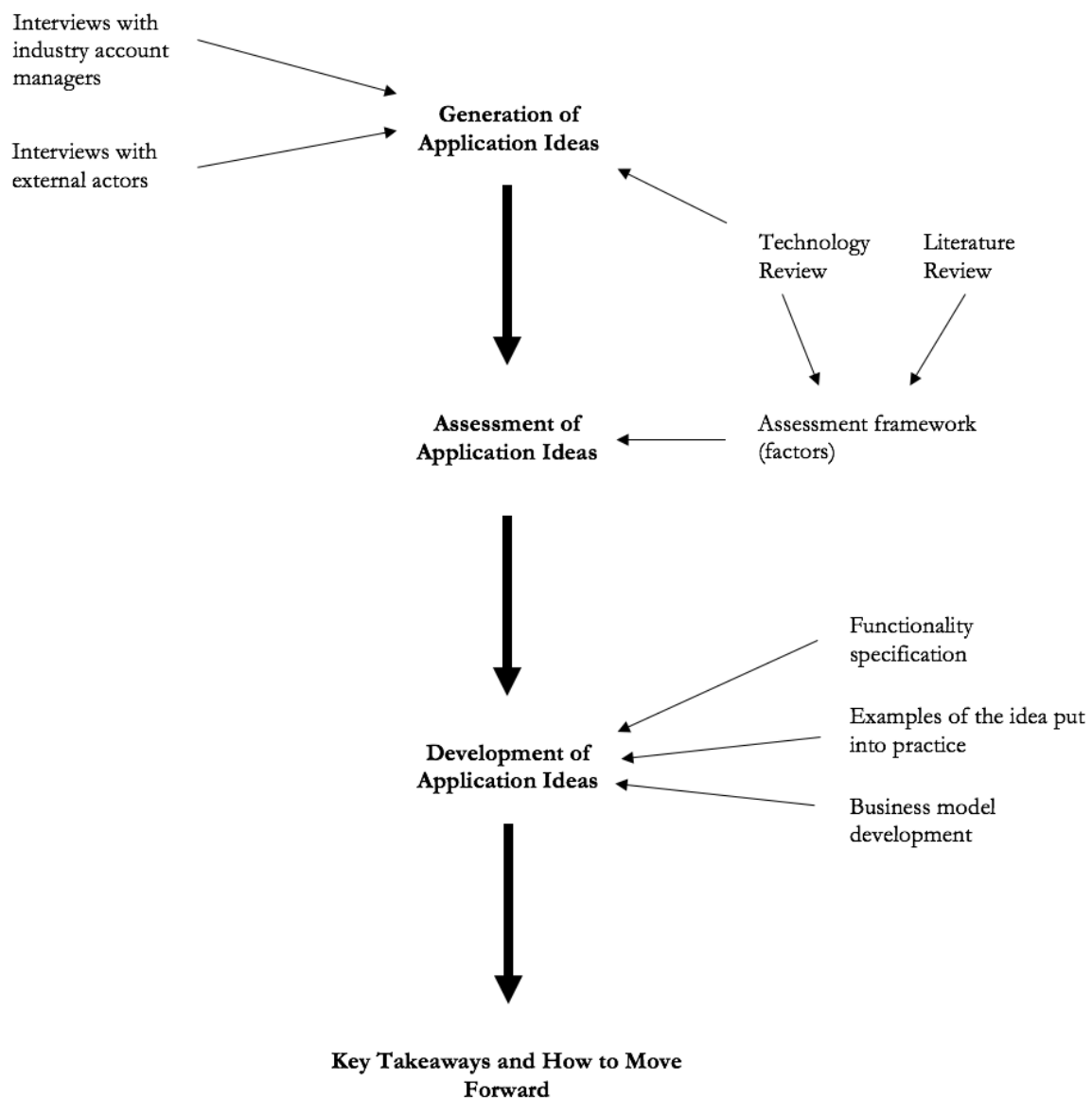


Figure 3. The work process outline of this thesis.

4.1 Generation of Application Ideas

In the idea generation phase, a technology and market perspective were sought to be integrated. The reason for this connects to the commonly used notions of technology push and market pull

as approaches to innovation and the problems that applying either one in its pure form can result in. The essential difference between technology push and market pull is found in the origin of the innovation: the research and development department or marketplace. The technology push approach builds on application of a technical capability, obtained through internal or external research (Brem & Voigt, 2009), that leads to an emerging technology or a new combination of existing technologies (Herstatt & Lettl, 2004). The market pull approach starts, on the other hand, with identification of latent, unsatisfied customer needs in the marketplace (ibid). While the market pull and technology push concepts are useful to describe innovation processes in theory, applying either one alone is typically not a good idea in reality, since each one has deficiencies and shortcomings in its pure form. Using a strict market pull approach may lead to “face lifting” of an existing product without sufficiently challenging the technological relevance, whereas a strict technology push may lead to a “lab in the woods” situation where the organization loses the market perspective (ibid). In order to succeed, a combination of the two approaches is typically necessary.

Since a solid understanding of the technology was regarded as cardinal for generating feasible ideas, a review of the technology was undertaken as the initial step of the process. In the review process, academic papers, books, news articles, blogs and other web sources were used for the purpose of learning about what the technology can do, how it works and what its strengths and weaknesses in comparison to other technologies for similar purposes are. Based on the acquired understanding of the technology’s strengths and capabilities, own ideas were generated through brainstorming and discussions. The brainstorming sessions and discussions were mostly limited to include only the authors, but sometimes engaged developers at ConsultingCo as well. It was a deliberate choice to not have any restrictions in this process as ConsultingCo’s business spans several industries with contrasting operations and therefore holds plenty of different opportunities, including such that could be unknown to the authors. Furthermore, an open mindset was regarded as important since ideas with seemingly limited potential may be seeds to better ideas, why discarding ideas early could have a negative effect on the outcome. A broad Internet search and compilation of examples of early applications of how beacons have already been used and ideas of how the technology could be used in the future was thereto conducted in parallel. The results of this work were used to generate more ideas as well as to modify the ideas that had already been generated.

In order to integrate the market perspective in the idea generation phase, 17 interviews were conducted with industry and account managers of ConsultingCo as well as external actors. The ConsultingCo managers were interviewed in a semi-structured way about the key characteristics and trends of their industry or account. In analogy with Osterwalder et al.’s (2015) suggestion to build the value proposition around what the customer tries to get done and and pains that should be avoided in this process, challenges were particularly listened for. The managers were also asked about potential application areas for the beacon technology. A semi-structured interview method was chosen to get comparability between the industries while still allowing for interesting sidetracks, and the template used can be found in Appendix I. The interviews with external actors, intended to complement the interviews with the industry managers and broaden the market perspective, were more unstructured in their nature, meaning that a template of questions was not used. This was due to the fact that the external actors all had different roles, degrees of experience relating to beacons and that information about earlier or planned beacon projects available on beforehand was mostly very limited. The external actors were approached for different reasons,

ranging from having experience of involvement in beacon projects to representing interest groups and thereby having expertise regarding certain matters. Insights gained through the interviews were used to alter the ideas already generated and add new ones. Again, this was done through brainstorming and discussions.

4.2 Assessment of Application Ideas

The goal of the idea assessment phase was to find the most interesting opportunities related to the beacon technology for ConsultingCo. Ideas can be assessed and evaluated in a number of ways and some examples of evaluation methods and tools are pass-fail evaluation, SWOT analysis, scenario planning and Delphi-method (Innovations Management, 2016). Pass-fail evaluation uses in its simplest form one criterion, such as budget, timeframe, fit with company culture or practical viability, against which the idea should be measured (ibid). When the idea does not meet the expectations for the specified criterion, it will not go on to a more in-depth evaluation. The method is appropriate when having a large set of ideas that needs to be reduced to a more manageable size and would consequently have been suitable in this situation. However, finding one single criterion that excluded enough ideas, while maintaining a high quality in the selection process, proved to be practically impossible. An evaluation matrix was therefore employed instead.

Using an evaluation matrix means that the idea is rated on a number of criteria, whereby multiple ideas can be compared on a single criterion basis as well as on a total score basis (Innovations Management, 2016). The evaluation matrix used in this case consisted of seven criteria (technology, competition, value potential, market size, market readiness, match with resources and capabilities, wow factor) and three different scores (+, 0, -). The criteria and meaning of the scores will be returned to in Section 6.1. The advantage of this method is that it is well rounded and comprehensive. There is, however, also a problem with the method in the sense that it is time consuming. In order to progress with the work, a simplistic and pragmatic approach to the rating had to be adopted. The potential drawbacks of this were assumed to be compensated for as the ideas were all rated on the same criteria and in the same way. Thus, the grading in the matrix is only useful for relative idea assessment, i.e. to find which of the ideas that have the highest potential, and not for evaluating the value potential of ideas on their own, since more profound analysis is needed for that.

4.3 Development of Application Ideas

The last phase, the idea development phase, consisted of substantiating the above identified application ideas by providing more clear descriptions of how they were intended to work, also from a technical perspective, and how ConsultingCo should realize them. The first part was achieved through discussions between the authors regarding the purpose of the ideas as well as examples of them in practice with mockups to provide an example of what the user interface could look like and by this better communicate the functionalities of the applications. The work relating to the second part revolved around the business model canvas with additional input on how to sell the ideas to the industries sought from the respective industry managers as well as potential clients.

5. Empirical Results

This chapter intends to provide an overview of the characteristics and trends of the eight industries considered as relevant for beacon applications within the scope of this project. Furthermore, several examples of application ideas in these industries are given. Finally, ConsultingCo and some of its competitors are presented.

5.1 Industry Overviews

ConsultingCo targets ten industries globally. For beacon applications in the Swedish market, together with ConsultingCo defined as the scope of this project, only eight of them are seen as relevant. To establish a basis for generation of ideas regarding where beacons could be applied, characteristics and trends were outlined for each one of them. Manufacturing, transportation and logistics are described in the same section since they have the same manager and share some characteristics.

5.1.1 Manufacturing, Transportation and Logistics

Industry Characteristics

Manufacturing, and transportation and logistics are highly important industries for the Swedish economy. While manufacturing, as the second biggest industry after services (Pierre Audoin Consultants, 2014a) and accounting for 20 % of the Swedish GDP (Ekonomifakta, 2016a), has a strong direct impact on the economy, the smaller transportation and logistics industry, accounting for about 5 % of the Swedish GDP (Transportföretagen, 2015), is nonetheless important given its role as an enabler of activity and growth across industries in a time of dispersed value chains and multiple end markets.

Companies belonging to the manufacturing, and transportation and logistics industries are sensitive towards changes in the global economy. Several companies in the Swedish manufacturing industry are large, multinational companies relying heavily on exports. Thus, the global economic development is a general concern and, as a result of the weak development over the last years, commonly perceived as a barrier to growth PwC (2015). Operating on a global market also means that the companies within the manufacturing industry are subject to competition from countries with lower costs than Sweden, where costs, for labor in particular, tend to be high. Companies in the transportation and logistics industry likewise face competition from actors based in foreign countries with more advantageous labor rules and cost structures.

Given the competitive situation in these industries, there is a strong focus on reducing costs. This also affects the characteristics of investments in software and IT services. Typically, such are aimed at generating efficiencies rather than large-scale development activities (Pierre Audoin Consultants, 2014a). Particularly noteworthy in this respect is that the IT-systems that are currently in place in the manufacturing industry are highly complex and expensive to run, due to years of investments without any structured decommissioning (Interviewee A2, 2016). Although not necessarily being the only explanation, this at least significantly contributes to manufacturing having larger software and IT service expenditures than any other industry (Pierre Audoin Consultants, 2014a).

Industry Trends

One particular trend seen in the manufacturing industry is that companies are seeking new ways to connect with its customers by trying to enhance the customer experience and seek to move away from selling products to selling services (Interviewee A2, 2016). The latter may be referred to as servitization (Johansson & Svensson, 2015). One early example of this is Rolls-Royce charging the customers per flight hour rather than having them pay for the engine, parts and services separately (Economist, 2009). This way of charging is beneficial for the customers, as it gives them a high degree of cost control and reduces downtime. At the same time the supplier is guaranteed to sell parts and services associated with the core product; business that could otherwise have been lost to a third party.

Besides the above mentioned trend, key focus areas in the manufacturing industry include a) creating strong and competitive product portfolios, b) improving the efficiency of internal operations processes, and c) enhancing the up- and downstream supply chain management, according to Pierre Audoin Consultants (2014a). In the transportation and logistics industry, initiatives are similarly undertaken to improve operations and transform the customer experience, for example by automated check-ins and harmonization across all customer touch points (Pierre Audoin Consultants, 2014b).

5.1.2 Government

Industry Characteristics

The public sector, here used interchangeably with the term government, is the third largest sector in terms of GDP contribution (Pierre Audoin Consultants, 2014c). Among its many functions are defense, public order and safety, economic affairs, environmental protection, housing and community amenities, recreation, culture and religion, and education and social protection (OECD, 2011).

The responsibility to provide the aforementioned services is divided between state, county council and municipalities in Sweden. Since the majority of the public service delivery is devoted to the local level, i.e. the 21 county councils and 290 municipalities, the public sector is highly fragmented (Pierre Audoin Consultants, 2014c). The county councils' main responsibility is health- and dental care (see next chapter), whereas the municipalities are responsible for social care, primary and secondary education, planning and building issues, environmental and health protection, water and waste management, emergency services, civil defense, libraries as well as housing (Regeringskansliet, 2008). The county councils and municipalities are furthermore heterogeneous as there are big differences in how many people they have to serve, economic conditions, and geographic size and location.

Industry Trends

There are ongoing discussions regarding the structure of the public sector with respect to the number of county councils. A suggestion, based on an official investigation, to replace the current county councils with six large regions was recently brought forward with the intention to create economically stable conditions in the regions (Svenska Dagbladet, 2016) as well as to generate higher quality and more consistent standards for public service delivery (Pierre Audoin Consultants, 2014c).

Further important trends in the government sector are tied to demographic changes. Firstly, the population in Sweden is expected to grow in the coming years, with the growth coming from the number of births exceeding the number of deaths as well as net immigration. Secondly, the population will be aging, since the increase is anticipated to be the largest in the older age groups. According to a forecast made by SCB (2014), the number of people aged at 65 years or above will increase from roughly 1.9 million to over 3 million in 2060. The consequences of this is that a smaller share of the population will have to support a larger one. Thereto the older segment is likely to have higher expectations on activity level and quality of life, which may call for higher healthcare expenses. Taken together, it will be necessary for the government to do more with less. Thirdly, the urbanization trend is expected to continue, which means that more people will want to live in the cities. However, the areas of the cities can not grow infinitely, which is why the space and infrastructure must be used in a better way (Interviewee A3, 2016). Finally, young citizens have different and new expectations towards the government. A recent study, conducted by CGI (2016), concluded that young citizens are willing to contribute, but that they want to do it on their terms. This means that the government has to fundamentally change how it thinks about communication with younger generations as well as what services it should offer and how those should be offered.

The concept smart cities is often mentioned as one way to address the above mentioned trends collectively. A smart city builds on a smart combination of endowments and activities of self-decisive, independent and aware citizens, which results in a good performance in relation to six criteria: economy, mobility, environment, people, living and governance (Europeansmartcities 3.0, 2014). A smart economy is characterized by entrepreneurship, innovation spirit and flexibility of the labor markets, while smart mobility concerns local, national and international accessibility and a sustainable transport system. In a smart environment sustainable resource management is similarly a key phrase along with ecological awareness. Smart people and living refer to social factors such as lifelong learning, level of qualification, open-mindedness, individual security, housing quality, cultural facilities, tourist attractiveness and economic welfare. Lastly, smart governance means public and social services, and participation in public life (ibid).

Realization of the smart city concept implies digital transformation, thus requiring implementation and use of digital technologies in all areas of society. To commence this development, a cooperation between the Swedish government and the Swedish Association of Local Authorities and Regions was initiated (Svenska Dagbladet, 2015a). The cooperation, called Digital First, aims to make the daily life better for Swedish citizens and companies by taking advantage of the possibilities offered by digital technologies. Some priority areas for the early launch phase have been established, including facilitating teachers' work, improving people's health and contributing to increased independence as well as improved working conditions for healthcare and caring professionals (ibid).

5.1.3 Health

Industry Characteristics

The Swedish healthcare sector is divided between public and private healthcare providers. A major difference between these two segments is to be found in how decisions are made. Public healthcare is decentralized to county councils and political decisions on this level are often required for larger

IT projects within public healthcare (Interviewee A4, 2016). This has the tendency to make collaboration projects between different county councils more difficult. Even if the collaboration takes place on an IT executive level, the executives lack decision power and are slowed down by political decision making processes, that can be different in the different county councils. Further, the public sector is obliged to follow the public procurement act, which stipulates that the public sector must choose the vendor offering the lowest price. A negative consequence of this is that some vendors might compromise with quality in order to win bids.

The healthcare sector has an enormous need of IT solutions, which in many cases are critical from an operational point of view. Products purchased by the sector include administrative systems (e.g. payroll handling, financial reporting) and support systems for physicians and nurses (for instance handling medical records and the planning of surgeries), but also medical technology such as heart rate monitors, pacemakers etcetera (Interviewee A4, 2016). Also, more fundamental IT products and services are purchased, such as infrastructure in the form of networks and servers.

Industry Trends

There are several important trends within healthcare services. The first is an increased degree of collaboration among different county councils. For instance, the 3R project is a joint effort of Västra Götalandsregionen, Stockholms läns landsting and Region Skåne to establish a common information system for handling patient records (Västra Götalandsregionen, 2014). Further, there are ongoing discussions in Sweden about merging the 21 county councils to six, something that, if realized, will affect how the public healthcare is organized (Dagens Medicin, 2016). Another trend is the increased servitization of healthcare, spurred by new digital technologies. It will be more common in the future that patients collect data themselves, through smartphones, wearables and other devices, that then is delivered to the physician for further analysis. Finally, the aging population in Sweden will put extra cost pressure on healthcare in the future, something that calls for new ways of improving operations by the means of simplified processes, supported by IT solutions.

5.1.4 Financial Services

Industry Characteristics

The common denominator of companies belonging to the financial services industry is that they manage money. Examples of such companies therefore include banks, insurance companies, investment funds and credit-card companies. In comparison with Western European peers, such as France, Germany and the UK, banking in Sweden represents a smaller share of the national economy. The banking market is concentrated, with four (Handelsbanken, Nordea, SEB and Swedbank) of about 100 banks in total dominating the market. Besides the group of four banks that control approximately 75 % of the market, the remaining banks can be clustered into three groups: savings banks that have been converted into private companies, niche banks and banks with foreign owners (Pierre Audoin Consultants, 2014d). These traditional banks are, however, challenged by new entrants such as Klarna, iZettle and Collector (Pierre Audoin Consultants, 2015a). Moreover, companies like Apple, Google and Facebook, with own ecosystems where payments could be facilitated, posit possible future threats (ibid). The Swedish insurance market is about half the size of the banking market (Svenska Bankföreningen, 2015) and represents 1 % of national GDP (Pierre Audoin Consultants, 2015a). There are several hundreds of companies

operating on the Swedish market. A handful of those are very big companies, while the rest of them are very small, local firms. As for banking, the market is concentrated, with the big companies controlling the vast majority of the market share (Pierre Audoin Consultants, 2015b).

Industry Trends

There are two key trends in the banking industry, besides the increasingly strict regulatory environment, having a strong effect on investments in software and IT services. These key trends are both related to how to respond to the new competition mentioned above. Firstly, the banks are trying to provide a higher quality service by getting closer to their customers. This puts a special focus on digital channels, with mobile banking as one particularly critical area, and aligning all channels to ensure consistent service delivery (Pierre Audoin Consultants, 2014d). Secondly, the banks are trying to control their costs in order to have a competitive price. Yet relying on complex legacy systems, there are opportunities for creating efficiencies and thereby reducing operating costs, which drives investments in such projects (Pierre Audoin Consultants, 2015a).

Another strong trend affecting the banking industry is the development towards a cashless society. The cash in circulation has decreased from 99 billion SEK in 2011 to 77 billion SEK in 2015 (Sveriges Riksbank, 2016), while the number of ATMs has decreased from 3,074 in 2011 to 3,059 in 2013 (Svenska Dagbladet, 2013). At the same time, card and mobile payments have seen strong growth (Capgemini, 2014).

5.1.5 Utilities

Industry Characteristics

The utilities industry, the second smallest in terms of gross value added to the Swedish economy (Pierre Audoin Consultants, 2014e), has undergone significant changes during the past decades. The power market, which is the industry's most important subcategory, was subject to deregulations in the 90s. Since then, power consumers can choose from a number of vendors, who in turn buy power from the spot market Nord Pool, where all the power producers sell their energy (Nord Pool, 2016; GodEl, 2016). The ownership of the grid used to distribute the power is divided between the state and private actors.

Besides the power market, utilities also comprise companies working with real estate, fresh water, district heating as well as environmental services and waste management.

Industry Trends

The purpose of the deregulations in the 90s was to lower the prices for the energy customers. The implications of this political decision are expected to continue to impact the market by increasing the pressure on the companies to undertake actions for operational improvement and transformation of core business activities.

In addition to the market's changed competitive situation, there is an ongoing transition to less reliable production methods, such as wind and solar power, due to increased environmental consideration. Simultaneously, those who traditionally have been consumers are also becoming producers (Interviewee A5, 2016). Intending to handle the fluctuations effectively, research is conducted concerning how to adapt the grids. Smart grids, as these are referred to, aim to cost efficiently integrate information about the behavior and decisions from all actors connected to the

net to ensure high quality and availability, while minimizing the losses and guaranteeing safety (Konsumenternas energimarknadsbyrå, 2016).

Environmental services are also expected to have increased importance going forward (Interviewee A5, 2016). This is consistent with the global development where a stronger emphasis is put on sustainability.

5.1.6 Retail and Consumer Services

Industry Characteristics

The Swedish retail sector has a turnover corresponding to about 15 % of GDP (Business Sweden, 2015; Ekonomifakta, 2016b). As such, the retail sector is very important for the economy and a key driver of growth. The annual growth rate for the retail industry has fortunately been positive for close to 20 consecutive years and has for many of those even superseded the GDP growth (Business Sweden, 2015). This environment attracts also many foreign investors, which can be explained by a favorable combination of the country's geographic location, making it a good logistics hub for serving more of the Nordic markets, and a population with strong purchasing power. The Swedish market has a large middle-class segment with high spending power and a relatively small difference between high and low-income households. Only Irish and Dutch people have a higher GDP per capita in purchasing power parity (ibid). Although many foreign brands are available, domestic players are still dominant on the market (Pierre Audoin Consultants, 2015c). Some of those, such as H&M and IKEA, are internationally renowned and have the majority of their incomes from other markets.

Online sales have consistently achieved double digit growth for the past years (HUI, 2016) and now accounts for 6 % of the total retail sales with slightly more than one third of the Swedes (35 %) making at least one purchase online per month (Business Sweden, 2015). The most frequently purchased products online are consumer electronics, clothes and books (ibid), but even the food segment has started to see alternatives for online shopping (Pierre Audoin Consultants, 2015c).

Industry Trends

As mentioned earlier, the Swedish population is expected to grow in the years to come, which is positive for the retail sector. Since the population growth is partly a consequence of immigration, with different cultures represented among the immigrants, the future demand will be diverse (Business Sweden, 2015) and open up for new business opportunities. The competition is, however, fierce in many areas, like consumer electronics (Pierre Audoin Consultants, 2015c). Through consumers' increased preferences for online channels, more purchases are also subject to international competition, especially in fashion (Business Sweden, 2015).

Online commerce is expected to continue to grow with more store retailers establishing online sales channels (Business Sweden, 2015). It is important to note that traditional store retailers choose to complement rather than replace store sales with online ditto as the former channel offers attributes, such as allowing customers to physically apprehend products, of that cannot be easily replicated. Consequently, one big focus area in the retail sector is to align and unify the channels to ensure a consistent customer experience regardless of channel (Pierre Audoin Consultants, 2015c).

5.2 Longlist of Applications

By drawing on multiple sources, such as web pages, interviews with industry managers at ConsultingCo and adding the authors' own ideas, a longlist of possible applications was established. The complete list is available in Appendix II, and contains 53 different application ideas. These application ideas were then categorized along two dimensions that the authors have found most fundamental for describing the beacon applications. This is depicted in Figure 4 below.

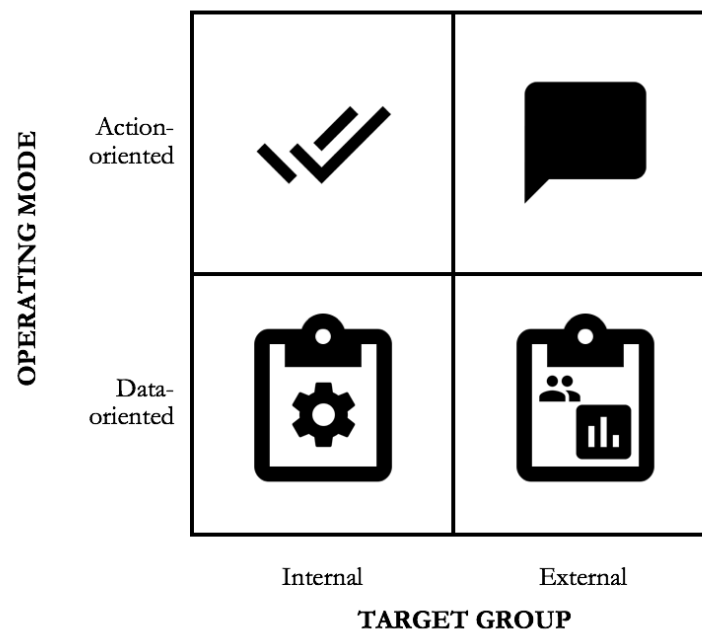


Figure 4. Categorization of beacon applications.

The horizontal axis captures from where the main part of the benefits stems; whether the application mainly aims to reduce costs by improving operations, i.e. target internal actors, or drive revenues by enhancing the customer experience and/or creating new innovative products, i.e. target external actors. The two different target groups are thus in line with the three value disciplines of a company, proposed by Treacy and Wiersema (1993) as well as Hagel and Singer's (1999) notion of different businesses within the business. Also, the target group dimension could be seen in the light of Porter's (1985) work on generic strategies of cost leadership and differentiation. Thus, this dimension shows what strategic objectives of a firm that can be catered for by a certain beacon solution.

The other dimension of the segmentation matrix below is the operating mode of the beacon system, and it is divided into data orientation and action orientation. This aims at describing the "how" of beacons, namely two fundamentally different ways of utilizing beacons. The first way, the data-oriented operating mode, implies that the beacon system captures data about the environment it is embedded in. By analyzing this data, preferably by utilizing a BI solution, important conclusions can be drawn on how to improve the business. This is in contrast to the other way of utilizing beacon systems, the action-oriented operating mode, by which it is meant that data is captured and actions are instigated immediately and automatically after capture.

By combining the two dimensions, four different categories of beacon applications are formed. All collected ideas regarding beacons have been categorized using this categorization matrix, and a few examples for each category are presented in the next sections.

5.2.1 First Quadrant: Data-Internal

Categorized as belonging to the first quadrant (data-oriented and internal) were eleven ideas. The ideas broadly concern the themes logging, reporting or tracking. Logging is here defined as the act of collecting data without a specific purpose other than storing it for future use, whereas reporting is the act of collecting data with a specific purpose. Thus, tracking is a specific case of reporting.

#1 Asset tracking: The logic of beacons could be reversed by putting beacons on moving objects and keeping the receivers at fixed positions. This provides an interesting solution for tracking assets, such as valuable equipment. A core activity in lean manufacturing is, according to Slack et al. (2010) among others, reducing waste. The waiting times as well as extra motion and transport associated with search for assets can undeniably be seen as waste and since many companies and organizations at least claim to adhere to the principles of lean manufacturing, this should be a concern. It was also stated as a problem in some of the interviews that it is not always known where valuable assets in a hospital setting are (Interviewee A1, 2016; Interviewee A4, 2016). Time is critical in this environment, which means that a solution that enables finding things faster, as asset tracking does, is of great interest:

“Being able to find the resources when the need is the greatest is a matter of patient safety.”
(Interviewee A4, 2016)

#3 Finding colleagues or specific competence: In larger workplaces, beacons could enable employees to find their colleagues more easily. For instance, in activity-based offices it might be difficult to find colleagues since they have no dedicated workspace. Instead they move between different environments during the day. By dividing the office into zones, and installing an app on the employees' smartphones, it will be much easier to find colleagues for ad-hoc conversations. Other workplaces, like hospitals could also benefit from this solution. In some urgent situations, it might be important to quickly be able to find the nearest physician with a certain specialization. Speed is moreover one of the performance goals in operations management (Slack et al., 2010) and consequently a priority.

#6 Attendance and time reporting: Most schools in Sweden have an information system for presence registration. This, however, demands manual labor that is allocated on the teachers (Interviewee B10, 2016). One of the priority areas in the initiative Digital First is to facilitate teachers' work (Svenska Dagbladet, 2015a) and to reduce their administrative workload would surely be one way to achieve this. In some cases, presence registration is instead distributed to students. For instance, the authors have experienced systems where a time-dependent code is handed out to the students. This could be simplified even further, by distributing an app to the students and having the teacher activate a beacon, allowing for automatic registration without any actions taken by the students. Also, in workplaces, the more traditional way of doing time reporting, by distributing clock cards to the employees, could be replaced with a beacon solution whereby registration was done automatically when entering the workplace.

#7 Resource use reporting: Car pools, and other associations or businesses that have a need for measuring resource use, can automate the reporting procedure by deploying beacons. Valuable insights could be gained that guide decision making in organizations by recording how assets or facilities are used. For instance, the gathered data could show that a quiet reading room is never used and hence would serve better as a meeting room. It was mentioned in an interview with the manager for the manufacturing industry (Interviewee A2, 2016) that there is a trend that customers pay for use instead of ownership. In some cases, e.g. when resources are removed from a storage space to a site where they will be used, this idea would enable such new charging methods. Also, the manager said it would be interesting for manufacturing companies to record how assets are used, to enable substantial savings from resource optimization. This has proven useful for instance for Swiss Federal Railways, that in a quote argues its investment in beacon technology to optimize forklift usage was returned in just two weeks (Senionlab, 2016a).

#8 Compliance controlling: This application area encompasses all processes where it is imperative that procedures are followed. For instance, compliance controlling could be used to make sure that guards have visited all checkpoints on their rounds, or that personnel in elderly care have visited all their patients when their workday ends. This idea would moreover directly support at least two of Slack et al.'s (2010) performance goals in operations, as consistency is fundamental for dependability and enables higher quality.

#9 Occupancy monitoring: In for instance universities it can be a hassle to find free tables. By the aid of beacons that monitor different zones, app users can get a better overview of which places are crowded and which are less crowded. Such information about utilization and variations can be useful for levelling flows and thus improve operations.

#10 Scenario assessment: Scenario assessments could be used by emergency services when surveying the evacuation capabilities of buildings. By temporarily mounting a set of beacons and asking people to download an app, valuable insights regarding evacuation patterns could be gained when conducting evacuation tests. For instance, bottlenecks could be identified.

#11 Operational data: Beacons can be used to gather operational data regardless of whether the process flows consist of people (e.g. at hospitals) or products. This data can then be analyzed in order to instigate process improvements. Continuously improving operational processes and seeking ways to eliminate waste is a necessity to remain competitive. As mentioned earlier, Interviewee A2 (2016) saw a need for ideas enabling resource optimization, which this one does.

5.2.2 Second Quadrant: Action-Internal

Categorized as belonging to the second quadrant (action-oriented and internal) were 19 ideas. These ideas are about providing guidance, access or automating internal processes. Applications associated with guidance help people to follow a certain path through facilities or processes. Access-related applications provide users with access to either physical or digital resources. Finally, automating applications trigger actions depending on movements of objects or people. These applications might provide the most apparent examples of how beacons can tie the physical and digital world together by inducing actions in one of them triggered by actions in the other one.

#12 Digital indoor map: Large buildings, such as hospitals, may be difficult to navigate, especially for new or infrequent visitors. This problem is recognized by Interviewee B3 (2016), who believes

that beacons could be helpful in trying to solve it. Through deployment of beacons, visitors can find their way more easily and thus be more independent. This allows the organization to spend time on its operations rather than helping visitors find their way or even searching for those who get lost.

#13 Location-based warnings: The solution seeks to make sure that there are no employees in hazardous zones by pushing notifications to them or their supervisor if they approach these. This could for example be used to send reminders about personal protective equipment or in the chemical processing industry, if the air within a facility gets polluted.

#17 Context-based information lookup: Beacons can be used to provide operators in a factory with detailed work instructions for a specific station or product and give detailed information about objects in the vicinity. Another interesting application of this is to let doctors and nurses walk into a room at the hospital and immediately give them access to the relevant patients' medical journals.

#18 Localize customers: If beacons were implemented in restaurants or stores, it would be possible for waiters and shop assistants to see the location of the customers. Especially in combination with a system that records interactions, their jobs could be made both easier and more effective. In a restaurant setting, it would be possible for the waiter to easily find the right table and in the store example, the shop assistant could be alerted when a new customer enters and directed where to go to greet the customer.

#20 Job learning: Similar to the context-based information lookup, detailed instructions could be shown for employees at relevant times and places. In this case new employees are however the target group and special emphasis consequently put on training, meaning that it should support new employees in learning the job on the job. Enabling integration of physical cues from the relevant environment in the training could have a positive impact on the learning process. A training program that makes the onboarding process faster and emphasizes the correct behavior is motivated by better achievements in relation to all four performance criteria discussed in Section 3.1.1. One example of how this has already been used comes from an American McDonald's restaurant, where beacons are used to trigger reminders and checklists to assist the new employees in getting all their tasks right (Piper, 2015).

#23 Access management: Beacons could be used in solutions for access management whereby users, either equipped with the actual beacons or smartphones listening for mounted beacons, could be authorized to access for example buildings and cars without physical keys. Such solutions have been trialed and could in principle work as demonstrated by Starwood Hotels and Resorts (Starwood Preferred Guest, 2016). Also, Volvo (International Business Times, 2016) released a video earlier this spring, showing how users could open Volvo cars with nothing but their smartphones as long as access had been granted by the owner in a special app. Although this solution does not use beacons it uses the Bluetooth protocol. Beacons could also be used to grant access to applications in the digital space, e.g. unlock a computer only if the user is physically close to it.

#24 Proximity-based activation: Furthermore, beacons could be used to trigger actions that would make operations more efficient, e.g. doors could be opened as forklifts approach. It could also be used for energy-saving purposes in homes, offices and factories to regulate light, heating and/or

ventilation. The more unpredictable the use of the space, the higher the degree of relevancy for beacons as irregularities make controlling by schedules challenging.

#28 Meeting room management: A common hassle in offices is the discrepancy between meeting room reservation statuses and actual use of meeting rooms. Beacons would make it possible to have accurate real-time updates, allowing the relevant system to cancel reservations not used after a certain period of time or show a room as occupied if someone walks in when it is free. The idea of using beacons to make the process of handling meeting rooms more efficient is comparable with reducing the setup times and as such one way to achieve operational improvement.

5.2.3 Third Quadrant: Data-External

Categorized as belonging to the third quadrant (data-oriented and external) were two ideas. These ideas are about understanding customers better. By this, it is meant that the applications seek to find customer patterns to better understand the customers of a specific business, and their needs.

#31 Instant feedback: Beacons can be used to trigger short customer surveys upon exit from a venue to get better information about the customer's experience. Similar functionality is already implemented in some apps, where customers may be prompted to share their thoughts about the experience and service right after having paid. Using beacons for the same purpose would be a better option as it would make it possible to ask the same questions upon the customer's exit, when the experience is completed as opposed to when it has just started. Moreover, beacons enable to send out the surveys at specific places indoors and not only based on a geofence, and add information about the customer's location to the results. All in all, beacons can serve as a gateway to richer and more relevant data. Following the example of how beacons could furthermore be used in cities to provide citizens with information about planned construction projects (which will be described in idea #39), beacons could be used to arrange polls at the places where the projects are planned. This could engage those who use the space and consequently drive interaction and inclusion. Participation in public life is one of the factors defining smart governance (Europeansmartcities 3.0, 2014). Moreover, a survey of Nordic citizens highlights that the younger citizens want better possibilities to interact and make their voice heard (CGI, 2016).

#32 Track and visualize customer flow patterns: This application seeks to provide a better understanding of customers by tracking and visualizing customer flow patterns. According to Westerman et al. (2014) creating a better understanding of the customer is one of four ways companies can work with new technologies to transform the customer experience. The implementation could be done in two ways. The first is that customers opt in by installing an app, where the beacon functionality is bundled with other functionality that is of value to the customer, e.g. coupons and frequent customer programs. This is similar to how a shopping mall in the Finnish capital Helsinki equipped members of its loyalty program with RFID-tags to carry on their keychains (Physical Cookie, 2015; TBWA Helsinki, 2014). In exchange for benefits tied to the loyalty program, those customers gave away data about how they moved around in the shopping mall. The other way of implementing customer tracking is by attaching beacons to shopping baskets or carts. In this case, tracking is anonymous unless the beacon is tied to the customer at the checkout process.

5.2.4 Fourth Quadrant: Action-External

Categorized as belonging to the fourth quadrant (action-oriented and external) were 21 ideas. These applications seek to support the business in advertising, personalizing or enhancing the customer experience. While advertising applications aim to push out offerings to potential customers in the physical vicinity, personalizing applications aim to assist companies in tailoring offerings all the way down to the level of individual customers. Last, enhancing applications aim to find new ways of creating customer value.

#35 Advertise offerings and discounts: This is probably the application area of beacons that has been recognized the most in the press. Done right this could be a powerful complement to other marketing initiatives. It is, however, important to remember that if customers get too many offerings pushed to their phone, or if the relevancy is low, they will eventually opt out. One of Sweden's major food retailers ran a trial of this idea in one of their stores in 2014. Despite experiencing some minor technical issues, due to the early stage of the technology, beacons were seen as a highly interesting tool for communicating with the customer in a relevant place (Interviewee B2, 2016). A product marketer at a restaurant chain also finds the beacon technology compelling for advertising purposes, especially since it offers the possibility of tracking how many have seen and used a certain offer (Interviewee B9, 2016).

#38 Loyalty program: Traditional loyalty programs use numbers or physical cards to identify customers and reward purchases. Beacons could enable identification via the customer's smartphone and, in addition to purchases, reward visits to the store or certain actions in the store. Vällingby City, a shopping mall in Stockholm, has used beacons as part of its loyalty program since the fall of 2015 (Dagens Media, 2015). It has already been established that beacons can be used to gather data about how customers move, but that privacy and integrity concerns are critical barriers. Using beacons for a loyalty program offered to the same customers could mitigate this problem. According to Interviewee B5 (2016), a food retailer has already used a strategy where customers by default accept tracking when they register for membership in the chain's loyalty program, and moreover notes that customers born in the 80s and 90s generally accept giving away information in exchange for better offers.

#39 Location-based information: Beacons could be deployed as digital information signs in certain contexts, for instance in museums and cities. One important advantage of these digital information signs compared to traditional signs is that they are dynamic in the sense that information could be changed over time. In museums, beacons could be used to give the visitor more information about a piece of art information about a piece of art or enable more interaction in the exhibition hall (Interviewee B3, 2016). In a city environment, beacons could provide information about the area, upcoming events or plans.

#40 Personalized suggestions: Based on purchasing history or personal profile, beacons could be used to give a customer tailored suggestions upon entering the venue. Suggestions, delivered directly to the user's smartphone, could for example be about what new items to have a look at or relevant tours to do.

#41 Personalized service: If customers have opted in, store assistants could use the technology to discover customers entering the store that have not been served. It would also be possible to show the store assistants information about a returning customer's latest purchases, visits etcetera so

they are able to better help the customer. One company which has already implemented digital technologies to improve the customer profiling and thereby enable shop clerks to give the customers personalized service is the fashion brand Burberry. This example was elaborated upon in Section 3.1.2.

#42 Tools for visually impaired: Beacons could be used for helping blind people to find their way through large facilities such as shopping malls, train stations and airports. By deploying a set of beacons and equipping the visually impaired with a smartphone and headset, spoken information could be given about the environmental context, e.g. "This subway station has two platforms, which both are reached by taking the stairs consisting of 26 steps.". This was tested in London's subway in the beginning of 2015 and Wayfindr, the organization behind the trials, says on its webpage that it will release an open standard for audio-based navigation during the spring 2016 (Wayfindr, 2016). Using such open standards for creating a navigation system intending to reduce uncertainties and make public spaces more accessible could be one way to realize one of the initial priorities in the Digital First-initiative, namely letting digital technologies contribute to increased independence for people (Svenska Dagbladet, 2015a). A representative of the Swedish Association of the Visually Impaired expressed enthusiasm towards the beacon technology in applications for helping people navigate and claimed that there are plenty of opportunities to find interesting areas of application (Interviewee B6, 2016).

#43 Caring aid: Bracelets with integrated beacons could be used to make sure that elderly demented people do not leave their homes. Through built-in accelerometers, it might also be possible to use beacons to detect rapid movements, and take further actions to investigate that they have not fallen and hurt themselves. Beacon bracelets could also be used to make sure that children do not escape their kindergarten. Using beacons in the described ways would enhance the key activity of safe and reliable care in the respective settings with less interference on privacy than for example video surveillance. The idea would moreover improve operations through assisting the individuals working in this sector with keeping an eye on the care recipients, thus potentially reducing stress and freeing up their time for more value-adding activities. Using digital technologies to create good conditions for employees in the care and welfare sector is one of the priority areas in the Digital First-initiative (Svenska Dagbladet, 2015a).

#47 Parking meter: An app could be provided as a substitute to traditional parking meters. Drivers would then be able to start and stop the parking meter through an app, guided by beacons. This app could also monitor where there are free parking spots and help the drivers to find their parked cars. In an alternative configuration, URLs are shared to smartphones via the Eddystone protocol, providing the user with a web app, bypassing the need of downloading a specific app.

#48 Omnichannel sales: Physical and digital sales channels can be merged to create a better customer experience. Customers typically want to see products they are contemplating to buy before making a purchasing decision - a behavior that refers them to physical stores. In some situations, it is, however, more convenient for the customers to get the products delivered to their homes than buying them in the physical store. This could for instance be the case when the customers are on the go or in a different city, alternatively when the item is bulky or not in stock in the right color. An app, with beacons integrated, could make it possible for customers to still visit the physical store, but order easily online and get it conveniently delivered to their homes. The role of beacons in this is to support the app by providing context. This means that a list of

nearby products can be compiled automatically, without the customers needing to browse the whole product catalog, and thus only relevant items will be displayed to the customers.

#49 Mobile app payment support: Beacons could be used to let customers pay in stores or at restaurants, either by charging their credit cards directly or by charging prepaid cards. Prepaid cards are for instance used in the Starbucks app. Using beacons would allow a customer to pay anywhere as long as he or she is within the beacon range, thus increasing flexibility in operations as well as concerning store layout and staff management for the company. This enables not only operational improvements but also improvements for the customers, since they can be greeted by name and do not need to bring out their wallets or phones at the checkout. According to Radar (2016) mobile payments are growing with around 30 % per year to represent 17 % of all digital payments. More and more customers will thus get used to and expect that convenient mobile payment solutions are available. This development is also recognized by the industry manager for retail at ConsultingCo:

“If it is possible to create a service with beacons that makes it convenient, simple and smooth to pay, it is just right in time” (Interviewee A7, 2016)

#52 Waiting time estimation: Beacons can be used to estimate the length of queues by measuring when people enter a queue and when they reach the front. In this case, all users do not need to opt in for the estimation to be good enough, but the accuracy is improved when the user base grows. Hence, the solution is characterized of strong network effects, at least to a certain threshold. This solution has already been successfully implemented in the amusement park Liseberg (NFC World, 2016). Closely related to this, Bluetooth solutions have previously been tested for estimating travel times in traffic environments (Interviewee B7, 2016).

#53 Smart city: The smart city concept is a very wide one and could consequently include several of the above mentioned ideas. In addition to already presented ideas, beacons could for example be used to create a city infrastructure that recognizes bikers and pedestrians, and give those a higher priority for green light. City lights could be turned off to save energy when no one is nearby and be turned on again when someone is approaching. Beacons could thus help to reduce climate impact. Given the trends of increase in population and urbanization addressed in 5.1.2, spatial challenges will also need to be tackled:

*“Cities grow, but have no room to expand. Therefore, the cities have to be used smarter.”
(Interviewee A3, 2016)*

One way to do so would be to create more dynamic parking rules. Today, parking on streets is not permitted for hours when cleaning is scheduled. Beacons could make it possible to alleviate this restriction as soon as the services have been done. For tourists, beacons could moreover provide guides and information about waiting times in museums etcetera.

5.3 ConsultingCo and Other Actors

This section focuses on providing an overview of what resources and capabilities ConsultingCo has with respect to beacons as well as a brief description of ConsultingCo's beacon platform. It also maps the competitive landscape and introduces some of the competitors' solutions.

5.3.1 ConsultingCo's Resources and Capabilities

ConsultingCo is part of a global organization having more than 50,000 employees and 400 offices in around 40 countries. In Sweden, ConsultingCo has offices in every region. This combination gives ConsultingCo access to an international network of expertise while remaining close to its clients and thereby understanding the specific needs of the local markets. Global reach and local presence are important strengths, in particular when considered together, and not every other company can offer that. The combination of global reach and client proximity is especially appealing for clients who are global themselves, but have local needs too. Such clients need a reliable partner that can support them on a global scale without compromising with the quality on the local level where more specific competence is needed.

As a consequence of the size of the organization, the ConsultingCo brand is well-recognized in large parts of the world. The brand has a good reputation in Sweden, as the company has proven itself to be capable of delivering products and services that are critical to the society. This links directly to client relationships. ConsultingCo has an established client base and is considered a trustworthy partner. Since client-supplier networks are socially complex and trust builds on historical events, this is difficult for competitors to replicate. A special case occurs when the client is bound by the public procurement act. Holders of framework agreements have in this situation a particularly powerful position as it entitles them to sell products and services directly to the clients, without having to go through an extensive negotiation and bidding process. ConsultingCo is in an advantageous position as it has framework agreements with large clients.

ConsultingCo has, in addition to its beacon platform, which will be described in the next section, own software solutions (IP) for the industries targeted. This is interesting from a beacon perspective too, as it may create opportunities for easy, yet value-adding, integration of beacons. Important to mention, regarding what the company wants to do around beacons, is that ConsultingCo wants to focus on proximity applications of beacons rather than precise localization applications, according to the area manager for Mobility Solutions. Precise localization requires algorithms that ConsultingCo does not possess today, and hence would need to acquire by developing them in-house, license-in or through a partnership.

The human capital is a critical asset for ConsultingCo, being a service provider. IT specialists and programmers are in high demand at the moment. While this is an advantage for ConsultingCo in the sense that competitors, who do not yet have the right competences, may struggle with attaining them. It is also a substantial risk that the employees get attractive offers from elsewhere. An overview of ConsultingCo's resources and capabilities is shown in Table 3.

	Valuable	Rare	Inimitable	Non-substitutable
Resources				
Global organization	X	X		
Local offices	X	X		
Beacon platform	X			
Own software solutions (IP)	X	X	X	(X)
Reputation/brand	X	X	X	
Framework agreements	X	X	X	X
Client relationships/network	X	X	X	X
Human capital	X	X		
Capabilities				
App development	X			
Business consulting	X			
IT consulting	X			
Provision of IT infrastructure services	X	X		

Table 3. ConsultingCo's resources and capabilities according to the VRIN framework.

ConsultingCo has extensive knowledge regarding the development of mobile applications, for both Android and iOS. This, in combination with the capabilities of providing business- and IT consulting services means that ConsultingCo is well-positioned for providing beacon applications tailored to specific businesses' needs.

That ConsultingCo has the necessary resources and capabilities to cater for clients' needs has been proven by earlier beacon implementations. However, to make a true impact with beacons requires alignment with a company's overall digital strategy. Westerman et al. (2014) stress the importance of a strong leadership and coordination of digital initiatives for success in digital transformation projects. Thus, access to people with top management positions and the associated power to put beacons on the clients' strategic agendas is imperative. This is one aspect where ConsultingCo could improve. Fundamental for realizing this is that ConsultingCo has a portfolio of successful projects to show as proof of concepts and that awareness about beacons is so widely spread internally that all employees engaged in discussions with such key people know what the company can do in relation to beacons.

5.3.1.1 ConsultingCo's Beacon Platform

ConsultingCo has developed a software platform for beacons consisting of components for the implementation of a beacon solution both client-side and server-side. According to Magnusson and Nilsson (2014), the main reason for employing a platform strategy is to cope with the trade-off between economies of scope and economies of scale. They argue that there are three main categories of platforms: product platforms, industry platforms and multi-sided platforms. ConsultingCo's software platform could be categorized as a product platform, if it is internally exploited. It could also be categorized as an industry platform, if it is opened up for external developers to build on, creating an industry of third-party applications. Since ConsultingCo seeks to exploit the platform internally, it is considered as a product platform.

Client-side, ConsultingCo has built a framework that handles the communication with the server, makes sure that the environment is scanned for beacons regularly, and triggers actions when beacons are discovered. The framework is available for implementation in apps for Android and iOS.

The server consists of a database where beacon events can be logged, a beacons manifesto, and a back-end that system owners can access. The beacons manifesto contains a list of triggers, in the form of beacon IDs or geographical fences (expressed as a latitude, longitude and radius). Thus, the platform supports not only beacons, but also GPS (and cellular network localization when applicable). The triggers are linked to different actions that are conditioned, i.e. the actions triggered are only run if certain criteria are fulfilled, e.g. a message with today's lunch menu should only be pushed to users around noon. There are different types of actions that can be run client-side, e.g. the action of showing the user a message or open a URL.

As of today, actions are run client-side only but in the future, server-side actions will be supported as well. Thus, information about that a beacon has been discovered can today be pushed to the server and get logged, without the server taking further actions. Every time that a client connects to the server, it checks for updates of the manifesto and pulls down the latest version if the local version is outdated. Hence, beacons and triggers can be added to an app without posting an updated version to the app store. By using a manifesto, most of the logic is kept by the client, implying that some beacon functionality can be available even if there is no Internet connection available.

The server has Application Programming Interfaces (APIs) for exporting beacon log data as Comma Separated Values (CSV) files. This is a widely supported standard that makes it easy to import the log data into existing BI-systems for further analysis.

5.3.2 Competing Platforms and Beacon Solutions

A first segmentation of companies in the beacon business should concern whether they are providing software or hardware. Even though beacon hardware providers in some cases provide software in the form of platforms and applications, the main focus of the following competitive walkthrough will be on pure software providers, although some beacon providers will be discussed as well, when relevant. The hardware per se is not interesting to discuss here. Instead, focus will be on how it is used; because of the standardized hardware and low cost with minor opportunities of differentiation, the hardware is considered a commodity.

Beacon software providers could be divided into two broad categories: large IT firms and beacon platform startup companies. The large IT firms category encompasses companies such as IBM, Microsoft, ConsultingCo and other companies providing software and services for enterprises and SMEs. It also encompasses Internet giants such as Facebook and Google, which provide products and services to both businesses and consumers. Internet giants are often concerned with the building and maintenance of multi-sided platforms. As will be seen, these companies might invest in beacons in order to drive users to their own products and services, whereas other categories of competing platforms seek to improve their clients' products and services. Beacon platform startup companies, making up the other of the two categories, are all companies that have built their whole business model around providing beacon-related services and software. The first beacons, as established earlier, were launched in 2013. Hence, this second category consists of quite young

companies that are highly specialized. Further, they operate from different parts of the world and sell their products and services online on the global market.

5.3.2.1 Large IT Firms

IBM MobileFirst: In July 2014, IBM and Apple together announced a partnership to bring IBM business software to Apple's iOS devices (New York Times, 2014). This could be seen as a sign of how corporate IT is transformed by consumer IT by being revamped with significantly more user-friendly Graphical User Interfaces (GUIs), as discussed by Magnusson and Nilsson (2014). Apple, being a strong consumer products company, brings to the table extensive knowledge of user-friendly design and a portfolio of products that have already gained traction on the enterprise market. IBM, with its focus on enterprise applications brings its knowledge of business data and analytics to the table. In this collaboration, IBM will develop more than a hundred different enterprise mobile applications (New York Times, 2014). As of today, IBM has developed the following applications with support for iBeacons (Apple, 2016):

- **Hospital MD, Hospital RN and Hospital Tech:** handles patient records and brings automatically up relevant records when the clinician, nurse or nurse technician approaches a patient's room.
- **Safe Site:** allows for documentation of unsafe conditions in a worksite and leverages beacons to map these and push alerts to workers in the vicinity.
- **Pick & Pack:** helps sales associates to find items in the store by localizing them on a map.
- **Sales Assist:** helps sales associates to find customers in the store, and make sure that all customers get assistance.

Microsoft: There have been multiple beacon initiatives carried out by Microsoft in collaboration with other companies. However, Microsoft has not created any beacon standard on its own and instead relies on existing standards. For example, Microsoft Retail Experience Center in Redmond showcased in August 2015 new solutions for integrating mobile apps with stores to avoid showrooming, which is when customers try out products in stores and then order them online from another business instead (Small Business Computing.com, 2015). These beacon solutions were brought forward in collaboration with a beacon startup company called Footmarks. Microsoft has also, together with an enterprise mobile applications company called Mubaloo, conducted a R&D project called Cities Unlocked (Mubaloo, 2015). This project used smartphones running Windows Phone OS together with beacons to help blind people navigate in urban areas. Even though Microsoft has been involved in beacon projects, the company does not seem to provide any kind of beacon platforms on its own.

Facebook: In early 2015, Facebook announced that it would begin trials of a beacon service that ties together the physical world with its mobile app and thereafter conducted trials together with 100 businesses in New York City (Wall Street Journal, 2015; BBC, 2015). In June 2015 Facebook announced that it would begin rolling out the service beyond the testing phase, to interested business owners all over the U.S. free of charge (Entrepreneur, 2015). The service is called Place Tips and allows local businesses to deploy one or more beacons that, when in beacon range, mounts a link to their Facebook page in the top of the users' News Feeds. Place Tips also works with geolocation services based on GPS and cellular networks to show information about landmarks in the vicinity, e.g. Central Park. These features are available free of charge as of now,

but Facebook's intention is to make it possible to sell more personalized advertisements in the future. Also, Facebook might be able to measure the effectiveness of their ads by recognizing when a consumer having been exposed to an ad on Facebook enters the corresponding physical store. Since Facebook had 934 million mobile daily active users as of December 2015 (Facebook, 2016), the company is in a position where it can leverage its large existing user base to accomplish a rapid adoption of its Place Tips feature.

Google: Google is involved in beacons in multiple ways. The company has developed the Eddystone standard and implemented support for it in its Android operating system. It also provides a platform for beacons, supporting Eddystone, iBeacon and AltBeacon beacons. Further, Google has developed what it calls the Physical Web, which is Eddystone beacons sending out URLs to the vicinity, as described in Chapter 2. By scanning for URLs, users can in a convenient way open a web app and hence circumvent the requirement of having a specific app installed, something that could be useful when for instance connecting to a vending machine to make a purchase.

5.3.2.2 Beacon Platform Startup Companies

There are numerous startup companies specializing in beacons, spread all over the world. A search, not claiming to be exhaustive, revealed 39 companies which can be found in Appendix III. Figure 5 shows the geographical location of these companies. Even though the beacon platform startup companies are targeting different industries with their platforms, they share some common characteristics. First, they use the Internet as a primary sales channel and sell their products and services all over the world. This means that the opportunities of them providing customers with help that requires physical presence is often rather limited. Further, not all companies provide apps or develop customer specific apps. In fact, often customers have to employ a third party to develop an app and integrate the beacon platform into it, or they need to do this themselves.



Figure 5. Overview of country of residence for beacon platform companies found.

Some of the platform startup companies found are of particular interest for this report, either because of them providing a noteworthy take on beacons or because of them being close to ConsultingCo geographically. In the following, some of these will be briefly introduced.

Estimote: Estimote, originating from Poland, is providing both beacon hardware and software and is one of the largest players in the beacon domain, having a global developer community of 45,000 developers (Estimote, 2016c). It provides three different types of beacons: adhesive stickers with a one-year battery life and a range of up to 15 meter, and two different larger beacons for proximity and positioning applications, respectively. These have a wider range and better battery life. Estimote provides a SDK for indoor proximity/positioning and cloud services for beacon management.

GoLoyal: Stockholm-based GoLoyal, founded in 2006, is specialized in retail solutions. The company states that its mission is to offer tools and services that intend to increase the retention rate and revenue per customer (GoLoyal, 2016). More specifically, the company works with advertising and communication, provides a platform and member database as well as a loyalty program. Quite recently, beacons were integrated in the loyalty program to enable communication with the customers when the customers are at the right place. Vällingby city, a shopping mall in Stockholm, was the first one to adopt this solution in October 2015 (Dagens Media, 2015).

Lighthouse.io: Lighthouse.io offers beacon solutions for the cleaning, security, logistics, health, events and tourism, and retail and advertising industries. The company, with offices in New York and Melbourne, provides a platform that consists of SDKs for mobile devices, a cloud API to handle triggers and actions, a web app for changing settings and analytical tools to process the gathered data (Lighthouse.io, 2016b). A mobile app is also provided for setting up of the system.

Senionlab: The company Senionlab was founded in Linköping, Sweden, 2010, by six researchers that had problems finding their colleagues' offices at the university (Senionlab, 2016b). Since then, the company has developed a beacon positioning system for indoor use that works by combining beacon and sensor data and from this triangulate the user's position. The company's offering is divided into four parts: wayfinding, geofencing for location-based messaging, real time tracking of friends or colleagues and analytics of user behavior. All solutions that are showed on the company webpage are centered around indoor maps. This means for instance that if areas for push messages should be defined, these messages do not need to pertain to certain beacons but can instead be drawn on the maps. Senionlab mentions three different segments as targets for its technology: retail, healthcare and manufacturing. For example, the company has provided Swiss Federal Railways with technology to measure forklift movement within its facilities. Also, Senionlab has conducted trials of navigation for visually impaired people at Linköping Central Station, together with the Swedish Transport Administration and SL (Interviewee B8, 2016). However, concerns were raised regarding the precision since there are high risks with blind people fully relying on the solution at platforms. The difficulties in using beacons for precise positioning, caused by variability in signal strength, is acknowledged by Apple (2014), claiming that the technology was never designed for this purpose.

ShopJoy: ShopJoy, established in Stockholm in 2013, provides a cloud-based content management system, including BI-tools for analytics, and SDKs for iOS and Android (ShopJoy, 2016). ShopJoy

primarily addresses the retail sector and has worked with H&M (Svenska Dagbladet, 2015b) as well as SJ (Breakit, 2015a).

TrueFlow: Trueflow is an indoor positioning startup company situated in Gothenburg, that develops applications based on Estimote beacons. Trueflow's solution was tested during the Göteborg Book Fair 2015 (Bokmässan, 2015). As one of 84 projects, Trueflow recently got 500,000 SEK in funding from the Swedish innovation agency Vinnova, for a project aiming to help people with physical or mental disabilities to navigate in indoor environments (Vinnova, 2016).

6. Analysis

This chapter explains how a few of the application ideas were selected for further development and provides more detailed functional descriptions. The final part of the chapter outlines business models for those.

6.1 Identification of the Most Interesting Applications

In order to find the most interesting application ideas, an evaluation matrix was established and employed. This took into account seven different factors that were graded individually with plus, zero or minus, corresponding to the authors' view of the idea with respect to the factor as positive, neutral or negative for Consulting Co. The factors were:

1. **Technology:** Would the beacon technology be perceived as better than other available technologies for the particular application idea?
2. **Competition:** Would ConsultingCo's offering be strong in comparison with competing solutions potentially offered by other companies?
3. **Value potential:** Would the project create value for the clients?
4. **Market size:** Would the market be of a sufficient size?
5. **Market readiness:** Would a typical client be open for the solution? Would there be important barriers to adoption to consider and overcome? Would the solution be dependent on existing systems in terms of integration?
6. **R&C match:** Would the project be a good fit with ConsultingCo's existing resources and capabilities?
7. **Wow factor:** Would a successful application generate positive attention for ConsultingCo?

After the ideas had been graded on each factor, weights were taken into account and total scores were computed. Technology, value potential and R&C match were seen as the most important factors to consider, why they were assigned the highest weight (three). The reason behind this was that the technology has to be competitive and have the ability to create value for the client in order to even be considered. This is further accentuated by the fact that the technology is relatively new and therefore still has to prove itself in many settings. Moreover, it is of great importance that the idea fits well with ConsultingCo's resources and capabilities so that ConsultingCo will be perceived as an alternative by the clients and later is able to deliver successfully. Still seen as important, but slightly less important, were market size and wow factor, consequently assigned the second highest weight (two). Market size is undeniably important in the long term in order to maximize returns. However, it was not considered as important as the technology or value potential since those two are crucial for customer satisfaction and thus may hinder adoption if the idea does not perform well enough in these respects. The wow factor was weighted the same way with the motivation that it is very important to generate awareness about the beacon technology and its possibilities, and likewise present ConsultingCo as a strong provider, at this stage. Competition and market readiness were seen as least important of the seven factors, therefore assigned the lowest weight (one). Since the market for beacons is relatively new and has untapped potential, and thereto presumably will be growing for a number of years ahead, the competition was not regarded as very significant, especially since no dominant player(s) had been found in the competitor search. Nevertheless, competition should never be neglected. The argumentation for market readiness

followed along the same lines. To a certain extent the new technology will always imply changes, but the responses can be assumed to vary between different settings and should therefore be considered.

Figure 6 below shows the highest ranked ideas according to the evaluation matrix. The 16 ideas on the left side received 11 points or higher. The complete results from the evaluation can be found in Appendix II. In some cases, the authors found that it would make sense to bundle the ideas, for technical or market reasons. Consequently, ideas have been combined resulting in eight different applications as can be seen below. Motivations for these are found in Appendix IV.

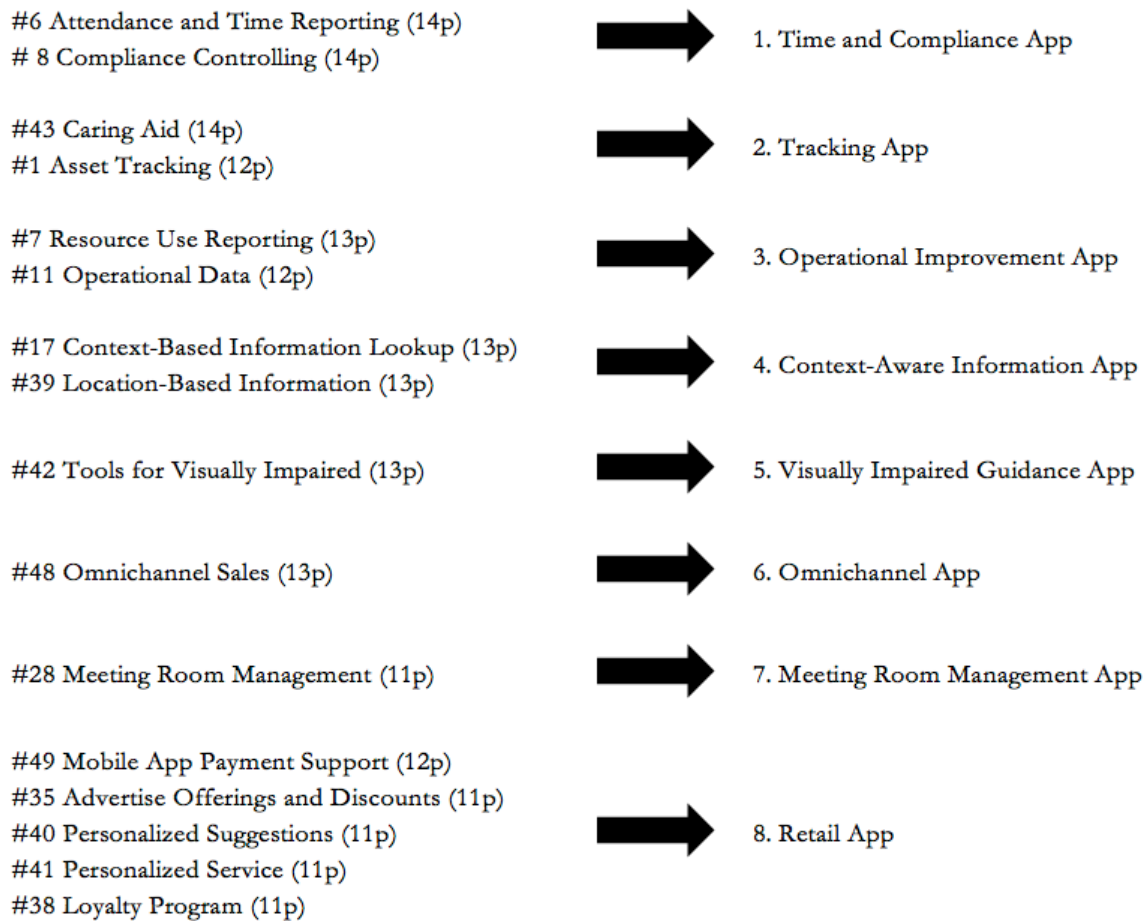


Figure 6. Highest ranked ideas and shortlisted applications to proceed with.

These applications will be further developed in Section 6.2 where the functionality and use cases are elaborated upon in more detail, and in Section 6.3 where business models are outlined. First, however, the eight different applications brought forward will be mapped to the industries considered in Section 5.1.

The proposed eight applications could be deployed in the different industries presented in Section 5.1 according to Table 4 below. As can be seen, there are two applications that are broad enough for selling to all industries: the Time and Compliance App and the Meeting Room App. Both applications are internal, and provide some basic infrastructure that companies within all industries can benefit from. External customer-facing applications are more narrow in their nature.

	Manufacturing, Transport & Logistics	Government	Health	Financial Services	Utilities	Retail & Consumer Services
1. Time and Compliance App	X	X	X	X	X	X
2. Tracking App	X	X	X			
3. Operational Improvement App	X		X			
4. Context-Aware Information App	X	X	X			
5. Visually Impaired Guidance App		X	X			X
6. Omnichannel App						X
7. Meeting Room App	X	X	X	X	X	X
8. Retail App						X

Table 4. The eight applications mapped to different industries served by ConsultingCo.

6.2 Shortlist of Applications

The following section will elaborate upon the functionality of the shortlisted applications in more detail, and provide some illustrative use case examples.

6.2.1 Time and Compliance App

The first proposed application uses beacons and smartphones to register when employees or students arrive and leave their workplaces or classrooms. At workplaces, this application can be used instead of traditional clock cards. The data obtained can thereafter either be transferred to a time reporting system automatically, or be available for the employee to report into the system on its own, depending on integrity constraints and preferences. At schools, teachers could use their smartphones as beacons during the lesson to automatically register the attendance of the students present and late arrival for those that show up during the lecture. This eliminates the need of having them manually enter the information in a reporting system. A third use case scenario for the application can be found in a work setting where it is important that employees comply to certain predefined criteria in terms of being at certain locations during their work day. One potential scenario is in home care where a compliance app could keep track of that all patients have been visited at the end of the day. Another example is to make sure that guards have patrolled all areas during their watch round. Also, cleaning services in larger facilities could use the compliance application to make sure that rooms, toilets etcetera are being cleaned at regular intervals.

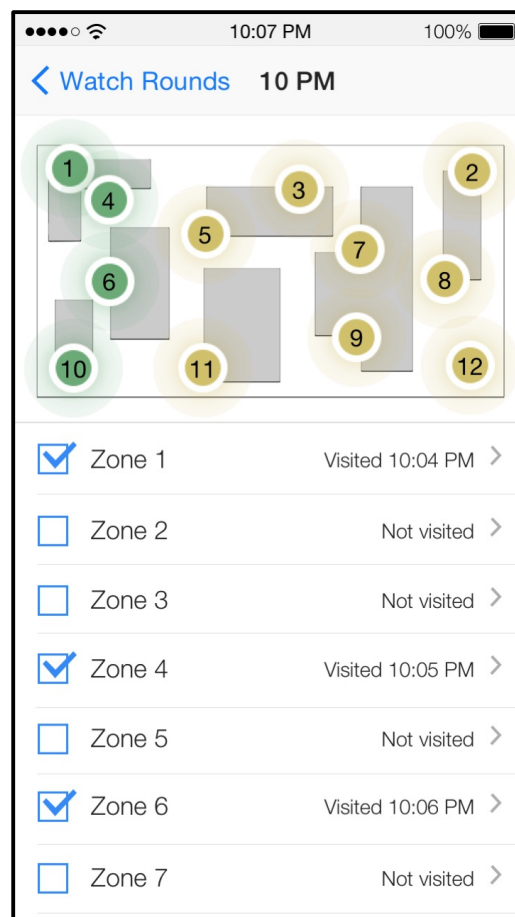


Figure 7. Example of a compliance app for guard rounds at a factory plant.

In workplaces, benefits are to be found for managers in increased reliability in that time reporting is done correctly but also for employees in that they do not need to manually register when they arrive and leave the workplace. Also, compliance tracking can reduce the number of non-conformance incidents in critical work tasks. In schools, benefits are to be found in the reduction of administrative activities undertaken by the teachers. The administrative workload is by many teachers perceived as too heavy, and all initiatives that reduce this allowing for more teaching activities should therefore be welcomed. In the case of attendance registration, it is, however, important to recognize that a manual procedure also can serve the purpose of making the students feel seen. This is not bound to the manual attendance reporting per se though, and could be created in other and perhaps even better ways, according to an operating manager of a private group owning pre-schools and schools in Sweden (Interviewee B10, 2016).

There are numerous separate time reporting systems available on the market, and most enterprise systems also support this. However, not many systems on the market support beacons. The authors found some, e.g. Calamari (2016) and AllHours (2016), both seemingly small companies selling their products online as subscription-based services priced on a per-user basis. Most organizations that would be relevant for ConsultingCo to target with a time and compliance app have systems in use already, meaning that it is more a question of app development and integration of the app and beacons into the existing reporting system.

Idea in Practice: Attendance Registration in Schools

Having a beacon with a power switch or simply using a smartphone as a beacon, the teacher activates it when the lesson starts and then keeps it activated during the lesson. Students' attendance is registered automatically given that they have the attendance app installed on their phones, tablets or laptops, which are used as learning tools in the education. This also means that students arriving late will get registered accurately without the teacher needing to keep track of exactly when they arrived.

Idea in Practice: Guard Patrol Rounds

As can be seen in Figure 7 above, a factory plant can through beacons be divided into a set of zones that should be visited during a guard patrol round. When the guard visits these zones, it is logged through an app installed on the guard's smartphone. This means that the guard can see that all duties are being fulfilled and a supervisor can monitor that the work is being conducted properly.

6.2.2 Tracking App

A tracking application can be used for tracking physical objects as well as humans in the following way. Normally, beacons are mounted at fixed positions and receivers are mobile, but it is possible to turn this logic around with a tracking application. In this new setup, receivers, often in form of small computers such as the Raspberry Pi, are placed at certain fixed positions and then listen for signals from beacons in the vicinity. This reversed setup is feasible for tracking of both assets and humans, to whom beacons have been attached. The tracking feature could then be reached through a mobile app or a web interface.

In the case of asset tracking, organizations can benefit from quickly being able to find tools and equipment that is constantly being moved around, e.g. at a hospital. These assets can then be deployed more effectively in the organization and support greater patient safety. In the case of tracking of humans, two use case scenarios are especially apparent: tracking kids at kindergartens and tracking elderly demented people, ensuring that they do not disappear from their home or a retirement home. The industry manager for health believes that this is a substantial problem as searches are expensive and therefore sees benefits from a tracking app, but also recognizes that there are legal issues related to tracking of people that do not apply to tracking of assets, which makes consent from either the tracked individuals, their relatives or comparable necessary (Interviewee A4, 2016). Given that there is a value in the service provided, opt-in is likely, the industry manager for government says (Interviewee A3, 2016).

Idea in Practice: Kindergartens

By deploying a set of receivers, kindergartens can create different zones inside and outside of the building. By giving each kid a beacon bracelet, the personnel will thereafter be able to quickly look up in an app where a certain kid is situated at the moment. Through the app, the employees can also quickly register when a child is picked up by its parent. This allows for the app to alert the employees if kids leave the kindergarten without prior authorization, something that increases safety for the kids and reduces worry for the parents. Figure 8 provides a mock-up of such an app.

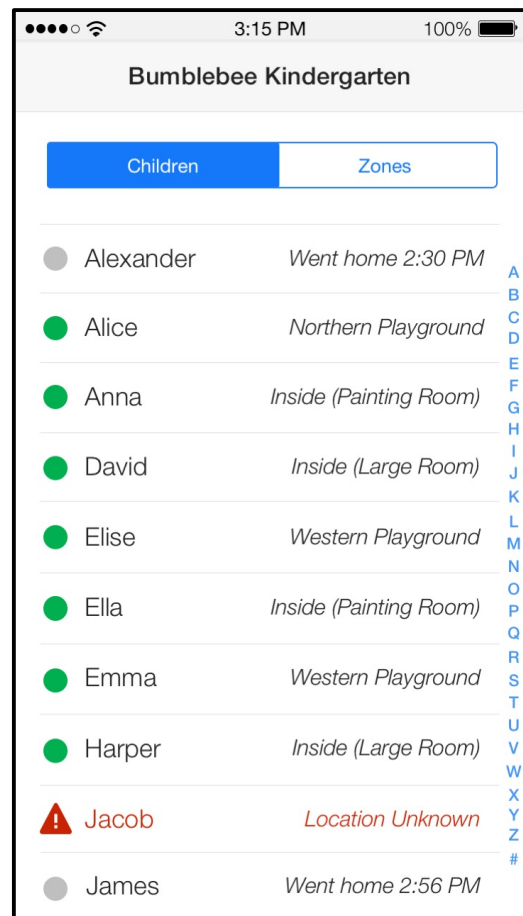


Figure 8. Example of a tracking app for kindergartens.

6.2.3 Operational Improvement App

An operational improvement app uses beacons to gather two types of data: resource use data and process flow data. Further, it could be deployed in two different ways. Either a permanent system is installed that feeds an enterprise system or business intelligence tool with data continuously, or a temporary system is set up to gather data for a limited period of time. The later deployment could be of great interest to operation management consultants since it allows them to quickly collect operational data from their clients' processes. For instance, they can hand out beacons to patients at a district healthcare center to quickly get an understanding of the waiting time (which is considered as waste) and the time with the doctor (considered as value-adding time). Other possible use cases include to record when forklifts and other resources are used and the extent to which they are used.

Figure 9 shows how an operational improvement app for temporary deployments could look. The app lets the user register a set of beacons and receivers in the Equipment tab. The user can then construct different setups of the system for measuring different things; in the System Setup tab, temporary system logic in form of actions and triggers, variables and measures is configured. The user can then start the data gathering in the Measure tab and view the results in the Log & Statistics tab. Here, the user can access information about a measurement and export the gathered data. The app deploys the reversed beacon logic, i.e. fixed receivers and mobile beacons, as has been described earlier. It can, if humans are considered as the flow units, be developed to support the traditional beacon setup with fixed beacons and smartphones as receivers, but in most cases this will not make sense since it requires people to download an app temporarily. Hence, it is easier to just hand out beacons.

Idea in Practice: District Healthcare Center

In order to get better decision support regarding how to staff a district healthcare center, processing time can be measured anonymously by handing out a beacon to people at the reception desk. Each room has a receiver spanning the areas, meaning that the rooms can be linked to different activities such as waiting or meeting a nurse or a doctor. The gathered operational data then shows total waiting time, time-to-nurse and time-to-doctor. Also, average treatment times can be calculated, not in order to reduce them, but to get a better understanding of at what hours more or less personnel is needed.

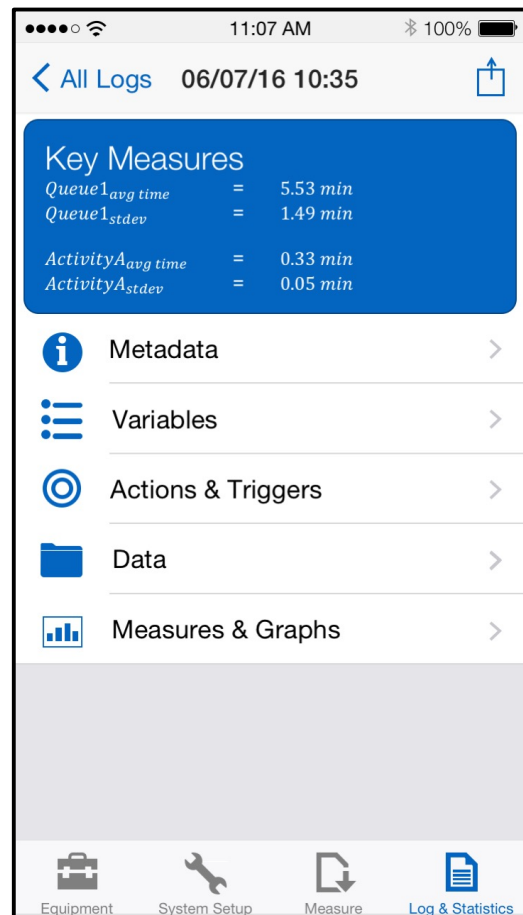


Figure 9. Example of an operational improvement app for temporary deployment.

6.2.4 Context-Aware Information App

Context-aware information apps can be used either internally by the clients for improving operational efficiency or externally for enhancing the customer experience. Internally, they can be used to look up relevant information faster, for instance to bring forward patient records when physicians are close to them. This functionality has, as discussed earlier, been implemented by IBM in its apps for hospitals. Externally, the information app can be used to provide more information about products, services or places.

There are already some examples of how this idea has been used in museums and cities. One of the museums where beacons have been used is the Solomon R. Guggenheim Museum (Guggenheim, 2015). Through the Near Me feature in the Guggenheim app, visitors can see audio, video and text related to what they are experiencing in the exhibition. The users are able to customize what is shown in the app by selecting language, special content for kids and families, or accessibility-oriented guides (ibid). Similarly, beacons are used at Wales' National Slate Museum to give the users access to multilingual material about the collections (Beaconstac, 2015). Beacons have also been used at a museum in Sweden to augment the exhibition by

providing text and audio-based information about it as well as to create more attention for the exhibition by enabling people to share their experience with friends in social media (Interviewee B1, 2016; Interviewee B4, 2016). For applications in a city environment, one example comes from Holland where beacons have been mounted along a 2 km route in Amsterdam to give pedestrians information about where they are and what they are passing along the way (Trendhunter, 2015). Beacons can moreover be used to inform citizens about planned construction projects, upcoming events or contact details to public services.

Benefits of using beacons to give context-based information include that the information can be changed more easily, adapted to different target groups and shown at a relevant place. Information can thereby be made more available and accessible. Beacons additionally open a new channel for communication with younger citizens, as called for in the Nordic Citizen Survey (CGI, 2016), and furthermore enable lifelong learning, which is one element of a smart city (Europeansmartcities 3.0, 2014), by providing information to people where they are.

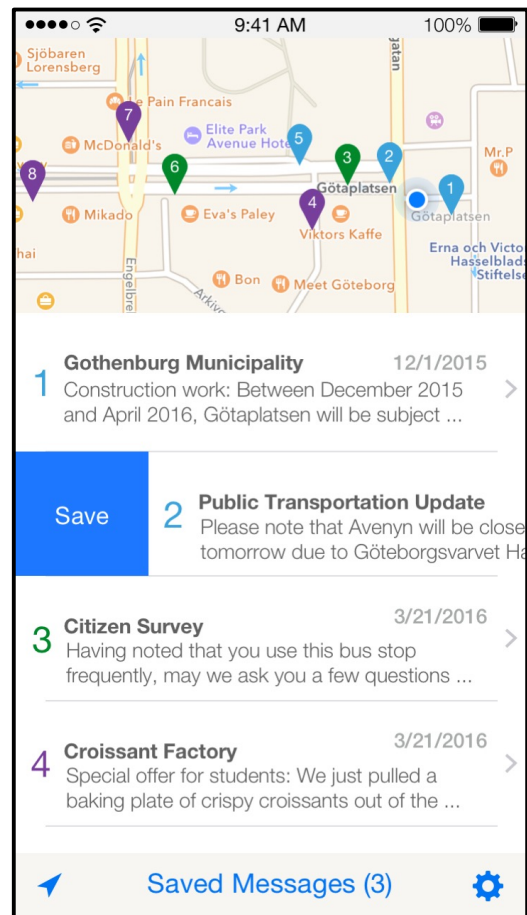


Figure 10. Example of a context-aware information app, combining information from municipalities and commercial actors.

Idea in Practice: What are they building on Kungsportsavenyn?

During the spring of 2016, a portion of the main boulevard in Gothenburg, Kungsportsavenyn, was closed due to construction of a water and light installation. Few people who walked in the area knew what was going on though. Beacons could have changed this. Deploying beacons (and/or geofences) in an area where a construction project is planned, ongoing or has finished recently, makes it possible to communicate the plans or changes to people who are passing by and logically will be affected. Unlike physical alternatives, beacons can easily deliver text or audio messages in different languages and formats, which makes the information more accessible. Beacons can furthermore be used to educate those who are interested about for example the history and meaning of the place where the project is going on.

To make it even more interesting, the above can be complemented with various activities. Beacons can for instance facilitate polls about the project or competitions. Another possibility is to enable fundraising on the spot. An interesting future scenario would also be to let citizens decide how a part of their tax money should be spent, by letting them decide between a number of projects and allocate money according to the perceived relevance and usefulness. Beacons can assist in this by informing about the projects where they are actually planned.

Figure 10 shows how the proposed information app could look, by blending information from e.g. the municipality council and other instances of the public sector such as the agency for public transportation, but also information from commercial actors. Note that citizens are able to opt-out from the latter in the settings tab, where they also can share some information about themselves in order to filter the information shown to increase relevancy. If the application is owned by the municipality and commercial actors are allowed to add messages to the platform given that a certain set of criteria is fulfilled, we think that the wider set of benefits available to the users will spur adoption.

6.2.5 Visually Impaired Guidance App

By deploying beacons in public places such as subway stations, shopping malls and airports, a smartphone app can help visually impaired people to get a better sense of the surroundings. Each beacon deployed corresponds to a certain message that is read out in the user's headphones when the user approaches the beacon. The implementation differs from a fully-fledged beacon positioning system in that it is seen as a complement to other aids rather than a substitute, i.e. a digital layer on top of existing physical accessibility tools. The authors find the proximity system solution superior to a positioning system solution because of the following. In interviews with external actors, concerns have been expressed regarding the exactness of navigating with a beacon positioning system (Interviewee B8, 2016). At train platforms, it is crucial that an exact navigation solution is completely reliable. Given the difficulties in achieving this, a proximity based solution that conveys information about the environment, and hence works as a complement, is considered as a better way of increasing accessibility for visually impaired.

In Sweden there are around 120 000 people with reduced vision, of which 15 % need accessibility tools of some kind to get by in their daily life (Synskadades Riksförbund, 2016). These people are aided by for instance embossed printing and text-to-speech applications on their computers and mobile phones. Beacons could help these people get a better sense of the environment around them and also make them more independent.

There have been several trials conducted using different technologies to guide visually impaired. For instance, a development project was carried out between 2006 and 2012 for The Swedish Post and Telecom Authority with the aim to investigate whether it was possible to develop a navigation solution for visually impaired people, however this was based on GPS and hence only aimed at outdoor use (PTS, 2012). A startup within indoor positioning called Senionlab recently conducted, together with representatives of Storstockholms Lokaltrafik and Trafikverket, a project at Linköpings station. Also, Microsoft took part in a collaboration project called Cities Unlocked, where beacon technology was used to provide audio feedback for visually impaired at certain locations (Cities Unlocked, 2016). Further, a Danish company called Living IT Lab has developed an app now available on the market, that is called Blinfo and sends audio feedback about the environment in a similar manner as Cities Unlocked's app (Blinfo, 2016).

There is also undergoing work regarding the creation of an open standard for audio-based navigation, by an organization called Wayfindr that has conducted user research on the topic (Wayfindr, 2016). According to the organization's website, the purpose of the standard is to provide design guidelines regarding the following:

- Design of audio instructions (e.g. length of audio instructions, and their detail)
- Context and relevance (what needs to consider for different contexts)
- Interaction design (how to craft interaction functionality)
- Reassurance and orientation (how to reassure visually impaired during their route and communicate orientation)

This standard could be used to reduce the amount of research needed and faster get a product on the market.

The most promising applications of a guidance app are to be found in larger, preferably public, places that could be tricky to navigate and that many visually impaired people visit. The following section elaborates upon how the solution could be employed at Gothenburg Central Station, but further potential deployments includes for example large shopping malls and hospitals.

Idea in Practice: Gothenburg Central Station

The central train station in Gothenburg is equipped with some directional tactile paving that makes it easier to navigate from entrance to entrance or railroad tracks. Further, the station provides a guide service, but this must be booked at least 24 hours in advance (Svenska Reseterminaler, 2016). Figure 11 below depicts the station.

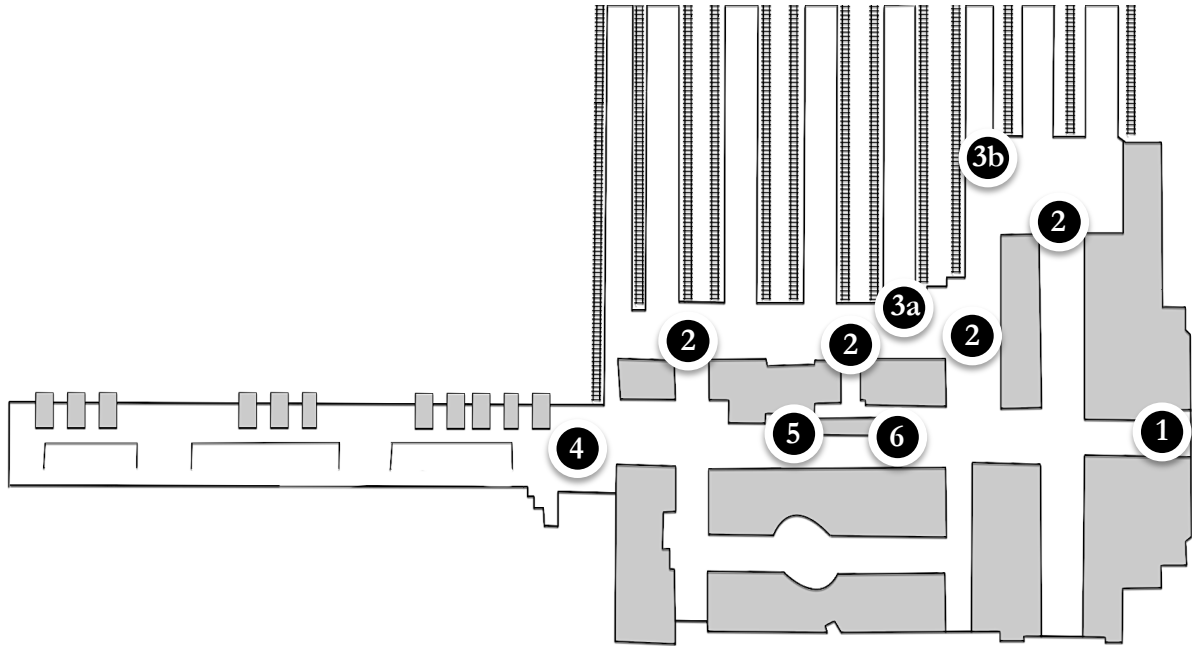


Figure 11. Gothenburg Central Station and examples on how guidance messages could be deployed.

As it has been pointed out earlier, the solution should not seek to substitute existing aids. Instead, it should complement these and enhance the sense of the environment by providing contextual info. The following messages are examples on what information could be read out to a visually impaired person to make the way through the central station easier:

- 1) "Welcome to Gothenburg Central Station. You are at the southern entrance. This station has 13 railroad tracks situated in the eastern part of the building. There are also 18 indoor gates and 11 outdoor gates for buses situated in the northern parts of the building. This station is equipped with a directional tactile paving, that leads from this entrance to the railroad tracks."
- 2) "You are now entering the train platform area. There are 16 railroad tracks here. The five closest upcoming departures from this station are: Gothenburg-Stockholm, 14:25, track five; Gothenburg-Herrljunga, 14:32, track nine; Gothenburg-Copenhagen, 14:37, track three, ..."
- 3) "Along this platform are tracks..."
 - a. "... nine and ten."
 - b. "... eleven and twelve."
- 4) "You are now entering the indoor bus terminal. There are 18 gates here, all along the same wall. If you continue past them, you reach the outdoor bus gates. The five closest upcoming departures from this station are: Gothenburg-Uddevalla, 14:39, gate 17; Gothenburg-Munkedal, 14:45, gate 22, ..."
- 5) "You are now near the staircase that leads to the restrooms. There are 25 steps."
- 6) "On your right is Pressbyrån and on your left is Espresso House."

The observant reader might here ask whether the last example actually is possible, since we are discussing a beacon proximity system that does not track the position of the users, hence not showing what direction the user is heading in. However, by putting two beacons along the route,

it is quite easy to calculate the direction of the user by comparing differences in signal strength for the two different beacons. In Figure 12 below, a person with increasing signal strength for beacon B and decreasing signal strength for beacon A will get the message "Pressbyrån is on your left" while the opposite, i.e. increasing signal strength for beacon A and decreasing signal strength for beacon B will trigger the message "Pressbyrån is on your right".

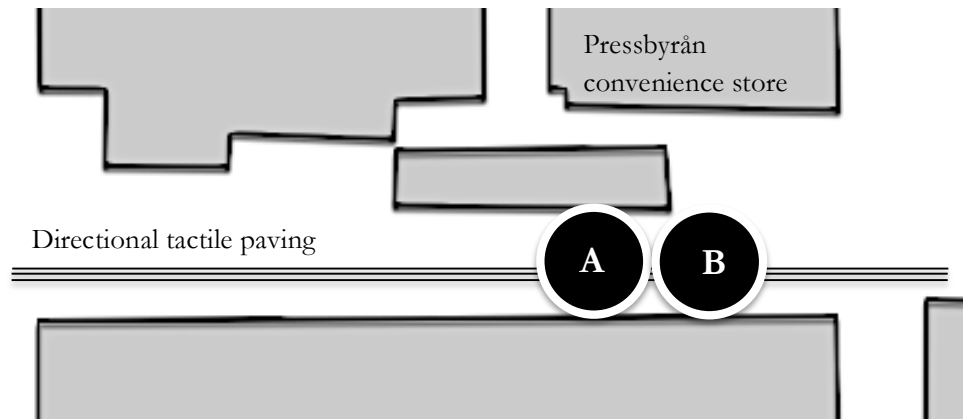


Figure 12. How to obtain information about direction without using exact positioning.

6.2.6 Omnichannel App

Physical stores' position as the customers' first, or maybe even only, choice has in recent years been challenged as online shopping has grown tremendously. Physical and digital channels have hitherto been perceived as rivaling, but initiatives carried out by for example Åhléns (Mynewsdesk, 2016) show that companies now seek to integrate the two and let their respective strengths complement each other instead. In this case, customers can conveniently purchase items from home and get them delivered directly there, to a post office or a physical store, and if they are not happy, return the items in any of the physical stores (Veckans Affärer, 2016).

Beacons can support closing the gap between offline and online in the physical store. One example of how this could be done is to let beacons act as a bridge between what a customer can see and feel in the physical store and the possibilities that the digital ditto has to offer in terms of a wider product selection and more convenient delivery methods. This can be realized by letting the beacon direct the customer to the relevant items in the online store to have the customer order and possibly check out there. Consequently, the raison d'être for this idea, which applies to settings ranging from retail stores to libraries, is to enhance the customer experience. It is, however, important to also recognize the that the idea may have operational implications that can justify it, too. By changing the design of the points of customer interaction to showrooms rather than stores, a design which implies that stock must be kept, it is possible use the store space more effectively and create a more centralized warehouse structure, through which cost savings can be generated.

Idea in Practice: Buying New Furniture

People looking to buy new furniture are inclined to visit a physical store with showrooms as they want to see how the pieces look and feel. However, to bring the products home after a purchase is often a hassle, especially for urban city dwellers without cars. For those, a delivery, as offered by the store's online channel, would be much appreciated. With beacons placed in the showrooms, it would be possible to display only the relevant products for the customers in an app and let them order the desired product from the online store directly there with delivery to their homes. Besides getting a home delivery, this would enable the customers to choose from a wider range of colors and materials, as also other stores' inventories could be used. Perhaps would it even be possible

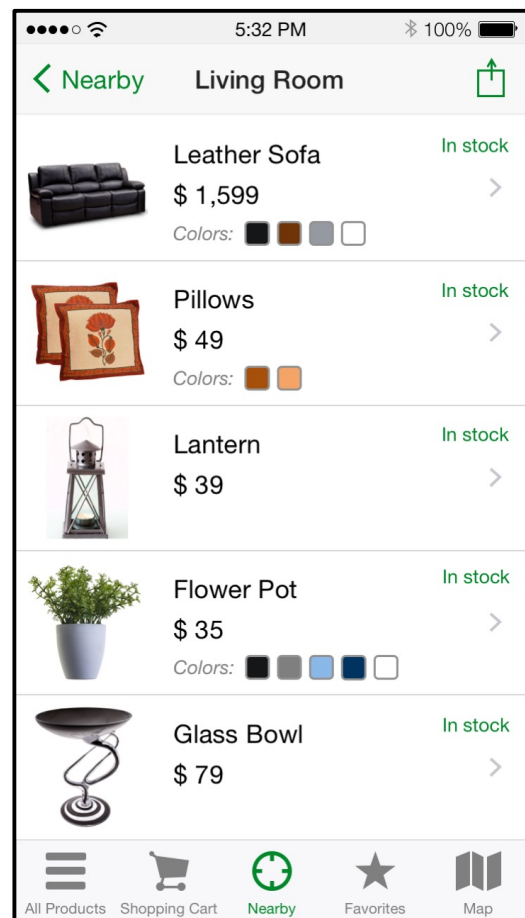


Figure 13. Example of an omnichannel app, showing customers products nearby and allowing them to order or reserve products in stock.

to let the customer order fully customized products with personal prints etcetera. An example of an omnichannel app is shown in Figure 13.

Idea in Practice: Library of Gothenburg

Some library visitors are looking for inspiration regarding what to read. This could for instance be achieved by providing information, with the aid of beacons, about what books are found in the different aisles and recommendations from librarians or other users. The recommendations would not have to be restricted to books, but could also include movies of the same genre, interesting interviews with authors in magazines or music from the same time period or geographic area. Alternatively, beacons could be placed in a “surprise me”-corner of the library where users could go to get randomized suggestions.

An important benefit with beacons in this case is that recommendations can be personalized, thanks to settings the user makes in the app. The user can moreover be taken directly to a webpage where a digital version of the book, magazine, movie or recording can be downloaded. This way availability will not be a problem, regardless of how many users are interested in the same item. The value of having the physical item in the library still persists though, as many visitors appreciate having a chance to examine it before deciding on whether they want to also borrow it.

6.2.7 Meeting Room Management App

A common problem with meeting rooms in offices, group rooms at university campuses and similar spaces is that the reservation status in the relevant system and the actual use of the room does not match. In other words, people forget, or frankly do not care, to cancel reservations when they will not use the room. Alternatively, they walk in and occupy the room without making reservations, something which may cause problems for others who rely on the reservation system.

The relevancy of this idea relies upon an assumption of this problem causing delays and being perceived as annoying by the users. Besides avoiding annoyance and interrupted meetings, this application would provide managers with reliable information about how the meeting rooms are used. This can be useful for decisions regarding facility optimization, if for example more space should be devoted to workspaces or meeting rooms. The beacon technology is also apt for this use case since it is relatively cheap, suitable for indoor use, works with consumer devices and is able to detect those without the user having to do anything. For ConsultingCo this would be an interesting opportunity as it is one technical

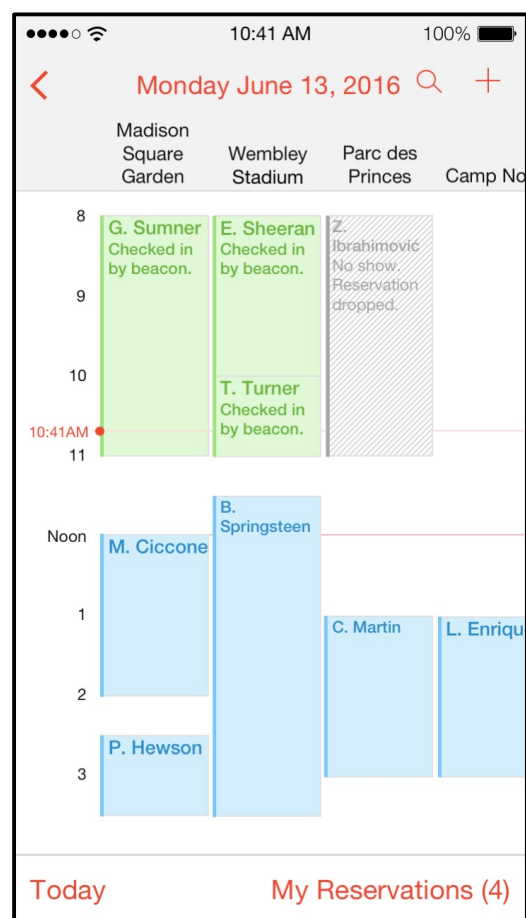


Figure 14. Example of a meeting room app.

solution that applies to all client industries, but still does not seem to have been commercially exploited in a large scale. Besides a few foreign startups, e.g. Robin (2016) and Smartway2 (2016), both offering specialized booking systems with beacon support, the authors have not found evidence for any providers of this solution. Bookitwise (2016), Denacode (2016), Meetio (2016) and Evoko (2016), to give some examples of companies selling booking systems in Sweden, do not mention beacons or iBeacons on their respective home pages.

Idea in practice:

With beacons strategically placed inside meeting rooms, it would be possible to have a system with real-time updates of how the meeting rooms are used as beacons can be used to register the presence of a smartphone. If the beacon signal has not been picked up by a smartphone during a pre-defined amount of time after the start of a scheduled reservation, the reservation should be cancelled. Conversely, if a beacon signal is picked up by a smartphone, it should be checked against the system to see if it matches the details of the reservation. If the signal is picked up by the right smartphone, the reservation may be confirmed. A signal picked up by the wrong smartphone should on the other hand trigger the system to alert the user that there is another reservation of the room, either ongoing (assumes that the pre-defined amount of time mentioned above has not yet expired) or starting soon. If there is no reservation, the system should, with minimal input required from the user, make a reservation. Figure 14 shows an example of a meeting room app.

6.2.8 Retail App

In the face of fierce competition, it becomes more important for retailers to differentiate themselves and/or advance the relationship with their customers. This can be achieved in many ways. One of the most commonly used ones is to create loyalty programs through which the customers get rewards and commercial messages based on their purchasing behavior and profile. Beacons offer the possibility to extend these loyalty programs to include rewards for new types of actions, enhance the communication and provide support for an additional feature in the form of mobile payment. The proposed application seeks to combine all of these things in order to provide a powerful customer relationship management tool for stores, shopping malls, cafes and restaurants among others.

The benefits associated with this idea apply to the stores, shopping malls, cafes and restaurants as well as their customers. The retailers can use the application to increase revenues by improving the customer engagement and experience. Given that beacons enable location-based and personalized communication, this idea can be used to influence the customers at a time when they are susceptible. Since it is also possible to see how customers respond to different types of commercial messages, such as discount coupons, it becomes possible to learn about the customers over time to adapt the marketing effort in order to maximize the outcome. The idea thus provides

a means of differentiation and a competitive advantage, which becomes more difficult to imitate as time passes and the knowledge about the customers gets refined.

Furthermore, data about the visitors' behavior, like how they move at the venue, can be derived as a bonus. It may seem contradictory that it is brought up as a benefit here, when the idea about using beacons for gathering data about visitors was discarded earlier, but we argue that it is not. Our opinion is that beacons should not be installed primarily for data gathering purposes, as it is still hard to get sufficient amounts of data to justify the installation of a beacon network solely for this. But when the network is already there, why not take full advantage of it? If only the mentioned kind of data is sought, Wi-Fi is still seen as more relevant because more people use it habitually and no extra app is required, although it can be argued that the integrity concerns are more acute. Furthermore, many users value access to Wi-Fi. This opinion was also brought forward by Interviewee B5 (2016), marketing manager in the retail sector.

The guests correspondingly benefit from the ideas as they can obtain offers and discounts with a higher relevancy and enjoy the convenience of mobile payment. For some customer groups, the freedom of not having to bring a wallet might be of great value and, as mentioned earlier, mobile payment is expected to grow strongly in the years to come and might therefore soon become the de facto standard.

As discussed earlier, many of the first examples of how beacons could be and have been used are found in the retail sector. Consequently, there are a number of companies specialized in beacon applications for this sector, but with somewhat different approaches. In Sweden, ShopJoy is probably the most well-known actor. ShopJoy's most prominent project has been with H&M (Breakit, 2015b), but exactly what it entails is unclear as both parties have been very secretive about it. According to ShopJoy's homepage, the company focuses on contextual marketing, with tools for campaign management and analytics, which could give a clue about the scope of the project. In comparison with the here described idea, it could thus be more narrow. Another example is GoLoyal, which on the contrary focuses on loyalty programs and accordingly is more similar to this idea. GoLoyal is presently used in Vällingby City, a shopping mall in Stockholm. GoLoyal's solution features rewards and personalized communication features. However, it lacks the mobile payment component. The Finnish company Sponda offers a loyalty program too, which also traces how the customers move around in the shopping center, resembling of cookies in the digital world. Sponda's solution does not use beacons though - instead the customers have to carry around

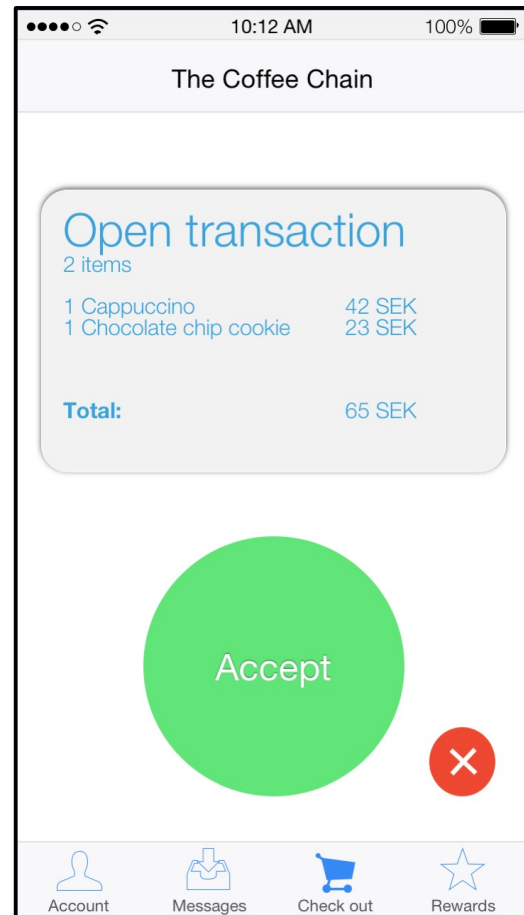


Figure 15. Example of a retail app, deployed at a café.

RFID-tags on their keychains (RFID Journal, 2015). This also means that the customers cannot receive any push notifications about discounts in their phones.

Idea in practice: Store

Whereas a traditional loyalty program only can reward purchases, a loyalty program with beacon integration may reward other behaviors as well. When a customer with the relevant app and Bluetooth enabled enters the store, this can be registered and saved as a visit for the customer, resulting in points that later can be converted to discounts or gifts. The management team can also use the same function to steer the customers towards a specific part of the store in order to make them discover new products or take advantage of earlier shown interest that has not yet resulted in a purchase. If a customer stays in the same area for a long time, it would also be possible to ask that person if he or she wants help and if so call for assistance directly through the app.

Idea in practice: Cafe

In a cafe setting, customers could receive suggestions on menus or single products while they are waiting in line or to place an order. Moreover, the customers could be tempted to stay longer, and thus spend more during one visit, if beacons were programmed to send vouchers for additional purchases after a certain period of time. Beacons could moreover facilitate the payment procedure and thus make the purchasing experience more pleasant for the customer. With the aid of beacons, a waiter or cashier could see the customer's picture, name or ID on a screen and debit the customer's prepaid card with just a tap. Figure 15 above shows an example of a retail app in a cafe setting.

6.3 Business Models for Shortlisted Applications

The business models for the different shortlisted applications contain both generic parts and parts specific to the different applications. This chapter describes the most interesting building blocks of the business model canvas for the presented application ideas. A tentative canvas is presented for each one in Appendix V.

Cost Structure

The most important costs related to beacon applications are:

- platform development and maintenance costs
- app development and maintenance costs
- hardware costs
- installation costs

The costs of platform development and maintenance are infrastructure costs that are common for all applications. The majority of the development costs have already been taken as the platform is ready for commercial application, but more costs may arise in the future when extra functionality is added in response to new technical opportunities or client needs. Furthermore, maintenance costs for ensuring the platform's uninterrupted availability as well as server hosting costs apply. Since all applications use the platform the costs should be split between the clients.

The app development and maintenance costs are unique for each application and are determined by factors such as generalizability and integration dependency. Generalizability describes the extent

to which the same app can be sold to different clients. This depends on two main factors. First, the app must be constructed to support non-company-specific processes, e.g. time reporting or showing information. However, the app does not necessarily need to target internal processes. Customer-facing apps could also be quite generic, if the underlying app logic is the same and only some graphical elements need to be changed. Second, client acceptance must be considered. In some cases, it is feasible to sell a similar solution to multiple clients from a technical point-of-view, but the same reasoning does not hold from a business point-of-view. A distinction should be made between apps that drive competitive advantage and apps that do not. Given that an app does not directly drive competitive advantage, or is sold to clients in different industries, the app can be sold to multiple clients. The lower the degree of generalizability the higher the costs as the application has to be tailor-made, with few or no shared elements.

The integration dependency refers to the extent of investments and efforts needed for integrating the solution with an existing infrastructure. In some cases, integration simply implies submitting data batches at regular intervals to BI-tools for analysis. These tools are geared at data import and hence one can expect this kind of integration to be much easier than integration with for instance old legacy systems. A high degree of integration dependencies leads to higher development and maintenance costs regarding both the app and the platform, since updates of the clients' other systems may require changes in ConsultingCo's solutions.

The hardware costs depend on the hardware chosen, which is determined by application- and project-specific requirements. As ConsultingCo does not manufacture its own hardware, the only way the company can affect these costs is by leveraging its combined buying power from multiple projects. Finally, the installation costs are unique for every project, depending on scale and scope.

Revenue Streams

The above mentioned costs establish a baseline for the minimum revenue that has to be generated from beacon solutions and thus the price ConsultingCo can sell for in order to break even. There are three main ways of pricing the beacon solutions. First, ConsultingCo could use a cost-based pricing method, meaning that the mentioned baseline is calculated whereafter a profit margin is added. Second, ConsultingCo could use a comparables-based method, meaning that competitors' prices are assessed to find the right price level. However, this method might be hard to put into practice given that the small startup companies presented earlier in the report have a different business model in which sales are conducted online and their solutions are more standardized. Also, although interesting, it is difficult to find data about large companies' pricing without being a customer and having a real case at hand. The third method, which is value-based pricing, is probably the best method since it seeks to reflect the actual value created for the client. Clients appreciate when there is predictability and a strong connection between the value created and the price they pay (Interviewee A7, 2016), but establishing a clear link between those two can be a challenge. There are multiple options of proxies for created value to use and examples are, but not limited to:

- Number of beacons deployed
- Number of app users
- Number of messages sent or number of actions triggered
- Server usage

- Changes in revenue (in the case of coupons and offers, however difficult to measure)
- Time, i.e. monthly payments of equal sums

It should be noted that a price based on the number of beacons deployed could result in clients trying to keep this at a minimum and by this risk not unleashing the full potential of their beacon system, ultimately having a negative effect on value created.

Value can be appropriated through a continuum of alternatives ranging from one single payment to periodic payments only, as illustrated in Figure 16. How to best approach the value appropriation, in terms of how the payments should be structured, depends both on ConsultingCo's clients' preferences and its own strategic objectives regarding financial cash flows and risk. For example, if the client is in the public sector it has a yearly budget of grants to take into consideration, with the implication that if not all grants have been allocated at the end of the year, its budget might be reduced for the following year. Also, it might be easier to get extra grants for investments rather than operating expenditures. Consequently, products and services sold as one-off transactions might be more in demand for the public sector than similar products and services sold as subscriptions. For other sectors and companies, particularly smaller ones, periodic payments might be better though and lower their threshold to adoption. This would for example be the preferred choice for cafes according to Interviewee A7 (2016). The choice of payment structure is, however, also a strategic matter for ConsultingCo; large one-off transactions can enable important investments in growth opportunities, while monthly payments provide a more stable cash flow making the business more resistant to market fluctuations.

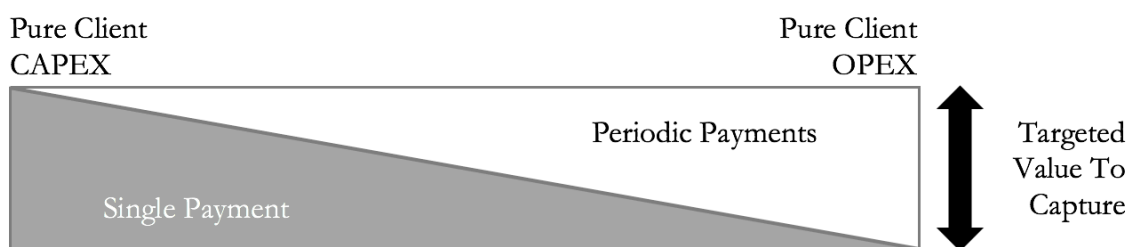


Figure 16. The continuum of revenue models.

Besides being a matter related to the financial strategy, the payment structure has behavioral implications. As articulated by a manager at ConsultingCo, by charging for things immediately rather than providing free consulting services initially, one almost always gets better commitment from the clients (Interviewee A6, 2016). Since client commitment is key for projects to succeed, an initial investigation fee is preferable, where ConsultingCo together with the client looks broadly at how beacons, as well as other technologies could be deployed in the client organization. Later, if necessary, part of the investigation fee could be offered as a deduction from a start fee to incentivize the client to go with the investigated solution, given that the deal as a whole is still perceived as profitable. The start fee mentioned should ideally cover hardware costs and the installation of the system.

Client Relationships and Channels

ConsultingCo sells all services through a sales force and the different beacon solutions should be sold this way as well, for several reasons. First, even though some of the applications are of a quite

generic character, they still need to be adopted to work with existing systems, e.g. the Meeting Room App might require integration with Outlook to allow for the management of bookings from computers as well. Secondly, beacon projects can and should be used to open up for larger projects in the future, since they allow for establishing new client relations and trust. Thirdly, if projects were sold in a way by which ConsultingCo was more distanced from its clients, such as through the web, there would be an evident risk of failing to deliver, which would hurt the company's reputation. Also, since ConsultingCo has a strong local presence, it is important to tap into the potential with tailored solutions that leverages the ability of working closely together with the client.

Key Activities and Key Resources

It is a given that the beacon platform is a key resource in the applications and also that a key activity is to develop apps from it. In some cases, framework agreements could be a valuable resource when selling the solution. Also, ConsultingCo's existing solutions, e.g. HR management systems, could in some cases be integrated with the beacon solution, keeping integration efforts at a minimum and allowing for bundling of features rather than selling beacon systems on their own.

Key Partnerships

There are a number of partners that could be important in realizing the solutions. Many of these will have economic interests in the solutions, but not all. For the Context-Aware Information App applied to municipalities, partners could for example be political science scholars or anthropologists whose research could benefit from working with the interaction design. An important partner for the Visually Impaired Guidance App is the Swedish Association of the Visually Impaired, and this organization has other objectives than financial ones. When it comes to enterprise systems and business intelligence, ConsultingCo provides solutions from some of the world's most recognized brands such as Microsoft and SAP. Interviewee A7 (2016) believes that it is important with strong partnerships and that discussions between service providers should set out to create to compelling concepts jointly, as opposed to only ensuring compatibility between their respective services.

7. Conclusions and Recommendations

This thesis set out to fulfill the following purpose:

The purpose of this thesis is to identify and evaluate opportunities for ConsultingCo to create and appropriate value from the emergence of Bluetooth enabled beacon technology.

Following the purpose were three research questions, which have been implicitly answered in the report. These questions are explicitly answered below.

What are possible applications of the beacon technology in the industries where ConsultingCo is present?

From asset tracking and compliance controlling in any industry to contactless payments and omnichannel applications in retail – the possible applications for beacons, in the industries ConsultingCo targets, are plentiful. A longlist of application ideas can be found in Appendix II.

In addition to the application ideas generated and compiled by the authors, ConsultingCo is encouraged to initiate discussions with clients regarding how beacons can create value specifically for their organizations. The categorization matrix provided in this report serves as an excellent starting point for such discussions. The matrix, shown in Figure 17, encourages clients to consider beacons from different perspectives, by taking into account beacons' operating modes, that are action-oriented or data-oriented, as well as their user group, that could be internal or external for the client.

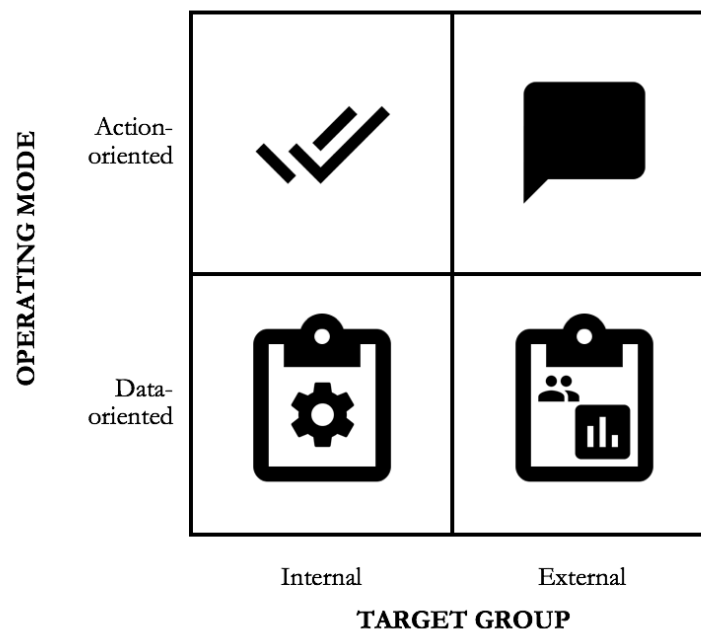


Figure 17. Categorization of beacon applications revisited.

In relation to the categorization matrix, it should be mentioned that some ideas may address several quadrants, reflecting IT's multifaceted nature. Beacons can make internal operations more efficient, while at the same time enable differentiation and hence address the external side. Consequently, beacons can both reduce costs and increase revenues. The ability to support the

two simultaneously, rather than having to sacrifice one for the other, may render Porter's (1985) generic strategies as well as Treacy and Wiersema's (1993) customer disciplines obsolete.

What are the most interesting opportunities related to the beacon technology for ConsultingCo going forward?

Based on ratings of seven criteria, 16 application ideas were seen as more interesting and consequently developed further. Those were combined into eight applications. An overview of these is given in Table 5 below.

Internal Beacon Deployments	External Beacon Deployments
Time and Compliance App	Context-Aware Information App
Tracking App	Visually Impaired Guidance App
Operational Improvement App	Omnichannel App
Meeting Room Management App	Retail App

Table 5. The eight application ideas that were developed further in Chapter 6.

Although all eight of these applications are interesting to investigate further, there are two that the authors would like to emphasize. Firstly, the Tracking App is applicable in many industries and should be easy for clients to accept since other technologies have already paved the road for this use case. Beacons offer the important advantages of a low price, adjustable range and possibility to leverage consumer devices. Tracking of people is legally more complex than tracking of physical objects. Nevertheless, it is an interesting use case since the value potential is high if it can help avoiding incidents and ensuring people's safety. Secondly, the Visually Impaired Guidance App targets a clear user segment where the individuals have strong incentives to download an app and enable Bluetooth. Lobby groups have expressed interest in beacons for this purpose and even conducted preliminary trials. Given this, which was something the authors learned about after the first rating, the application idea became even more interesting as the thesis progressed. From ConsultingCo's point of view, it would be an attractive case to look further into as accessibility is a priority issue in several different settings and the same technical solution could be applied in all of them with only minor adjustments. Furthermore, an open standard for how the communication and user interaction should be designed is available, which serves as a great starting point for development. Since seamlessness between different settings is desired, i.e. that a user should not have to notice any interruptions or changes when moving between facilities with different owners, there are attractive first mover advantages to gain.

Generally speaking, the higher degree of control offered in enterprise settings makes internal use cases more attractive for ConsultingCo from an adoption point-of-view. When beacons are used inside a company it should be possible to force adoption of the application, whereas this is much more challenging for applications targeting consumers. It should also be mentioned here that it is advisable for ConsultingCo to keep its focus on beacon proximity systems rather than beacon positioning systems for at least two reasons. Firstly, beacon proximity systems provide sufficient precision for almost all use cases considered in this thesis. For example, in order to find a colleague

in the office it is enough to know which room he or she is in. Secondly, the beacon technology is not designed for providing precise positioning, as stated by Apple (2014). Hence, there is an evident risk that the technology falls short and cannot produce the expected results in positioning applications.

How could these opportunities be exploited?

ConsultingCo should take advantage of its existing networks, relationships, framework agreements and own software solutions (IP) going forward. The company must, however, also be flexible regarding pricing models in order to be an attractive alternative for clients.

Existing client relationships and networks create some of ConsultingCo's most important competitive advantages as these are particularly hard for competitors to copy. Small startups will likely have a hard time to build up to the same knowledge and levels of trust that ConsultingCo already has, and may therefore experience difficulties in getting access to the key influencers in the client organizations that have the power to put beacons on the strategic agendas. Having top management attention, and putting a bit of pride or prestige from personal accountability at stake, is important to get access to resources, and make beacon initiatives part of the bigger picture. This reconciles with Westerman et al.'s (2014) view of strong leadership and coordination of digital initiatives as critical success factors for digital transformation projects.

The possible integration between beacons and other software solutions (IP) is another source of strength for ConsultingCo. There are, as shown, numerous different beacon platforms available on the market, why the platform ConsultingCo has developed might not be competitive on its own. Bundled with IP and beacon competence, both in terms of business consulting and technical implementation, it creates a more compelling customer offer and naturally generates additional business for ConsultingCo.

ConsultingCo should furthermore use its deep knowledge about the clients to offer pricing models that fit with their preferences. The pricing models can be decisive for whether the clients choose to go with a beacon project or not, and has to align with the possibilities that their financial positions and policies offer. Evidently, one size does not fit them all. ConsultingCo therefore has to be flexible in terms of what pricing models are offered, yet have a clarity in what the pricing models are for different clients or solutions, as the sales force must be consistent in its communication.

As immediate next steps, ConsultingCo should, however, investigate the beacon technology further, taking one specific setting or one application idea as a starting point, and work closely together with the right clients. It is paramount that ConsultingCo is selective regarding whom to work with, since clients' stories about beacon projects - successful or not - spread to other potential clients. Right clients are such who are willing to collaborate, have a genuine interest in and realistic expectations on this new technology.

8. Discussion

This report started with describing digital transformation as changes in a company's operating model and value proposition, induced or enabled by digital technologies. The numerous use cases and application ideas for the Bluetooth beacon technology that were later presented entail improvement of operations as well as enhancement of the product offerings and customer experience. Thus, this report has hopefully clarified how beacons could be an integral part of digital transformation and provided illustrative examples.

The way this report set out to contribute was to present a wide array of application ideas and that has been achieved. The research underlying the presented findings has been extensive and it is therefore unlikely that any important opportunities related to the technology in its current form or potential use cases have been overlooked.

Since the thesis work was conducted in collaboration with ConsultingCo, the authors have had access to valuable information about beacons as well as experience and insights from implementations throughout the entire process. The connection with ConsultingCo has furthermore given the authors access to a network of industry expertise. These factors have all strengthened the quality of the report. It is also important to mention here that ConsultingCo has allowed the authors to work independently by not restricting their search in any way, apart from excluding two industries that were not seen as relevant. This freedom has likewise contributed to a better report that can be helpful for others too.

Although the report has many strengths, it is important to acknowledge that it has limitations as well. Firstly, the wide scope of the thesis meant that it was not possible to explore the application ideas in depth and therefore the results regarding which of the application ideas that are the most interesting should only be seen as indicative. Further investigations, taking one application or industry as their starting points, are necessary to give a better picture and determine the viability of application ideas correctly. Secondly, the choice of going from a longlist to a shortlist of application ideas inevitably labeled some ideas as less interesting, which turned out not to be optimal. Although these discarded ideas were not seen as strong enough on their own, it was later found that some of them, in their entirety or by parts, would nicely support and enhance the ideas that were selected in the end and hence the presented ideas could possibly have been stronger. Consequently, it is recommended to, in the quest for real use cases, combine ideas and integrate elements of them to fit with specific situations, rather than comparing ideas against each other. The longlist provided should in other words be treated as a smorgasbord to pick pieces from in order to create strong, tailored offerings.

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Oral Sources

ConsultingCo

- A1. (Beacon Platform Developer). March 1, 2016.
- A2. (Manager for Transportation, Post and Logistics, Manufacturing). March 2, 2016.
- A3. (Manager for Government). March 9, 2016.
- A4. (Manager for Health). March 9, 2016.
- A5. (Manager for Utilities). March 11, 2016.
- A6. (Innovation Expert). April 6, 2016.
- A7. (Manager for Financial Services). May 4, 2016.

External Actors

- B1. (Museum Curator in Gothenburg). March 2, 2016.
- B2. (Digital Product Owner in the retail sector). March 3, 2016.
- B3. (Producer at a museum in Stockholm). March 3, 2016.
- B4. (Art Director at a creative agency). March 3, 2016.
- B5. (Marketing Manager in the retail sector). March 11, 2016.
- B6. (Influencer and administrator at the Swedish Association of the Visually Impaired). March 18, 2016.
- B7. (Project Manager at the Swedish Transport Administration). March 30, 2016.
- B8. (Responsible for accessibility at a real estate company). March 31, 2016.
- B9. (Product marketer at a restaurant chain). April 1, 2016.

B10. (Operating manager of a private group owning pre-schools and schools in Sweden). May 4, 2016.

Appendix I: Interview Template

Opening questions:

- How long have you had this position?
- What does your role entail?

Clients:

- How are the clients segmented? (strategic, invest etcetera)
 - Characteristics of each segment
 - How many in each segment?
 - Examples of clients
 - What is ConsultingCo's market share in each segment?
- Key trends for the segments
- How mature are the clients in the mobility area? (e.g. do personnel have access to smartphones/tablets?)
- What are the most important challenges in the industry in the next...
 - year?
 - 5-10 years?
- What issues are Clients raising, concerning their own operations, in meetings?

Products:

- What solutions are currently offered? (Beacons/similar technologies)
- How are the products packaged and sold? (SaaS, licenses, one-off transactions...)

Competition:

- Who are the closest competitors with respect to beacons?
- How are these competitors different?
 - What are they doing that ConsultingCo does not? (Best practices)

Company:

- Key strengths
 - USP:s, reasons for being the client's choice
 - General and beacon-specific
- Weaknesses
 - Reasons for client choosing competitor

Own ideas regarding beacons:

- Where do you see opportunities for beacons within your industry?
 - Where could beacons replace other technologies (e.g. RFID)?

Rounding off:

- Who else would you recommend us to talk to regarding beacon related business opportunities?
- If we have further questions, may we contact you again?

Appendix II: Longlist of Application Ideas

The table below shows all identified application ideas for the beacon technology. Please note that the category numbers refer to the four categories in the categorization matrix according to the following key:

- Category 1: Data-Internal
- Category 2: Action-Internal
- Category 3: Data-External
- Category 4: Action-External

#	CATEGORY	DESCRIPTION	USE CASE EXAMPLE	WEIGHTS						TECHNOLOGY	COMPETITION	VALUE POTENTIAL			MARKET SIZE	MARKET READINESS	R&C MATCH	WOW FACTOR	WEIGHTED SCORE
				3	1	3	2	1	3			1	3	2					
1	1	Asset tracking	Valuable tools and equipment	+	0	+	+	+	+	+	+	+	+	0	0	12			
2	1	Item tracking, e.g. in inventories or production	Inventory or production items	+	0	0	+	+	+	+	+	+	+	0	0	9			
3	1	Finding colleagues or specific competence	Find a colleague in activity-based office spaces (each individual can be identified), or find the right employees for critical repairs or check-ins at airport more quickly	0	+	0	+	0	+	+	+	0	+	+	+	8			

4	1	Monitoring employees (individuals cannot be identified)	To see where employees uphold in order to avoid accidents and more (individuals cannot be identified)	0	-	0	0	+	+	+	0	3
5	1	Location-based accident/incident/problem reporting	Information about where a problem has occurred can be automatically added to a problem description in a reporting tool	+	-	0	+	+	+	+	0	8
6	1	Attendance and time reporting	Students present in class rooms, punch clock in factories	+	0	+	+	+	+	+	+	14
7	1	Resource use reporting	Record when forklifts are used, how offices spaces etcetera are used	+	+	+	+	+	+	+	0	13
8	1	Compliance controlling	Mandatory safety controls	+	0	+	+	+	+	+	+	14
9	1	Occupancy monitoring	In e.g. universities, an app could show people which places are crowded	0	0	0	+	0	+	+	0	5
10	1	Scenario assessment	How people react during fire alarms in buildings	+	0	+	-	0	0	0	0	4
11	1	Operational data	Queue and working times, digital stamps of who has worked on something	+	0	+	+	+	+	+	0	12
12	2	Digital indoor map	Guide people inside buildings, e.g. large hospitals	+	-	+	+	+	+	0	+	10
13	2	Location based warnings	Warn personnel that are about to enter hazardous zones	+	0	-	0	-	0	+	+	1
14	2	Intelligent reminders	Notification when passing bin on Thursday morning, the day when the bin is emptied (INTERNAL OPERATIONS VERSION); http://www.beaconsandwich.com/scenarios/	+	-	+	+	+	0	+	0	10

15	2	Assembly instructions	Bring up relevant information for operators	+	0	+	0	0	0	0	+	8
16	2	Nearby items	Relevant products listed/displayed in stocktaking situations	0	+	-	+	+	+	+	0	4
17	2	Context-based information lookup	Clinicians and nurses can easily find records of patients nearby	+	0	+	+	0	+	+	+	13
18	2	Localize customers	Shop assistants making sure all customers have been addressed, waiters finding the right table	+	0	+	0	-	0	0	0	5
19	2	Self-service	Interactive guides enable customers to do more on their own	+	0	+	-	-	0	0	0	3
20	2	Job learning	Create interactive job learning applications that makes sure the personnel are following all steps	+	0	+	0	+	0	+	+	9
21	2	Health initiatives	Guide employees to a healthier work style, e.g. by providing advice or gamification	+	+	+	0	+	0	0	0	8
22	2	Location based application access	Certain applications can or can not be run depending on the location	-	0	+	-	0	0	0	0	-2
23	2	Access management	Authorizing access to cars, buildings and more	0	+	+	+	0	0	0	+	8
24	2	Proximity-based activation	Open doors when forklifts are approaching them, light lamps when approaching or staying in a room	+	+	0	0	+	+	+	0	8
25	2	Personalize the environment	Work space adjusted to personal preferences	0	+	-	0	+	0	0	0	-1

26	2	Priority handling	Give way for relevant people or items in a production setting, identifying passengers stuck in airport security with risk of missing connecting flights	+	+	0	+	-	0	0	5
27	2	Check-in	Could be deployed at hotels, ferry quays, bridges etcetera	+	+	0	+	0	0	+	8
28	2	Meeting room management	Change the status of meeting rooms to occupied when used even if no booking has been made or cancel booking if there is a no-show	+	0	0	+	+	+	+	11
29	2	Levelling of flows	Spreading passengers more evenly over the security checkpoints	-	0	+	0	-	+	+	4
30	2	Contactless payment	Customers can pay anywhere in the beacon range, similar to NFC payments	0	-	0	+	+	0	+	4
31	3	Instant feedback	Short survey upon store or facility exit	+	0	+	-	0	+	0	7
32	3	Track and visualize customer flow patterns	By smartphones, or by attaching beacons to shopping carts, eliminating the need to opt-in on the smartphone. Tracking could be anonymous or paired with loyalty card at check-out to map customer movement patterns to specific customers.	0	-	+	+	+	+	+	10
33	4	Content delivery	Presentation notes, magazines or games to relevant audience	0	0	0	0	+	+	0	4
34	4	Notify customers	Let the customers know when a table opens up	0	0	0	-	0	+	0	1
35	4	Advertise offerings and discounts	Send coupons to customers	+	-	+	+	+	+	0	11
36	4	Bulletin board	Announce public information and enable people to share information	+	+	-	0	0	+	+	6

37	4	Extended product information	Show ratings and suggestions	0	+	+	+	0	+	+	0	+	0	8
38	4	Loyalty program	Points for visits, purchases or actions	+	0	+	+	+	+	0	+	0	+	11
39	4	Location-based information	Information about nearest doctor, police, lifeguard, drugstore, easily available information about products, pieces in a museum or ski slope conditions	+	0	+	+	+	0	+	+	0	+	13
40	4	Personalized suggestions	Suggest products for a customer based on purchasing history or personal profile, suggest relevant tours in a museum setting	+	0	+	+	+	+	0	+	0	+	11
41	4	Personalized service	Let shop assistant know when returning customers enter the store, and what they were looking at the last time they were there	+	0	+	+	+	+	0	+	0	+	11
42	4	Tools for visually impaired	Provide accurate guidance in indoor and outdoor environments	+	+	+	+	0	+	+	+	+	+	13
43	4	Caring aid	Beacons could monitor where elderly people are and if they have beacons with built-in accelerometers as a bracelet, it might be possible to track if they fall. Could also be used at a kindergarten to make sure that children do not escape.	+	+	+	+	+	0	+	0	+	+	14
44	4	Automated service	Automated check-in at hotels	+	+	+	0	+	0	+	0	0	+	8
45	4	Gamification	Scavenger hunts and similar activities, could be deployed at ski resorts, in museums etcetera	+	+	0	+	0	+	+	0	0	+	9
46	4	Independence	Instructions, self-guided tours etc.	-	0	+	+	+	0	0	0	0	+	4

47	4	Parking meter	Lets user start and stop an app-embedded parking meter when entering a parking domain, could also monitor where there are free parking spots and help the driver find the car again	-	0	+	+	+	-	+	0	0	4
48	4	Omnichannel sales	E.g. when buying furniture, customers could go to a store and experience the products, but order on-line via an app that automatically shows the products in the physical vicinity based on the customers' location in store	+	0	+	+	+	0	+	+	+	13
49	4	Mobile app payment support	Customers can charge prepaid cards in a certain store chain app, and pay as long as they are in the beacon range	+	-	+	+	+	0	+	+	+	12
50	4	Physical delivery	Order food via smartphone and let the waiter pinpoint your location in the restaurant to deliver it to you (no numbered tables!) or just pick it up upon arrival	+	+	0	0	0	0	+	+	+	9
51	4	Automatic queue ticket system	Just enter a beacon domain to automatically get placed in a queue. Could for instance be used at care centers	+	+	0	0	0	0	+	+	0	7
52	4	Waiting time estimation	Measure the length of physical queues	+	+	0	0	0	-	+	+	0	6
53	4	Smart city	City infrastructure that for example recognizes bikers and pedestrians and turn traffic lights green	-	0	+	+	+	-	+	+	+	6

Appendix III: Beacon Platforms

Name/Provider	Situated in	Primary Beacon Applications	Link
Aislelabs	US	Offers marketing and analytics solutions for shopping malls, airports, retail chains and venues	http://www.aislelabs.com/
Beacon Inside	Germany	Offers marketing and analytics solutions	http://www.beaconinside.com/
Beaconstac	US, India	Exact offer unclear, but provides examples of use cases with retail and events, museums and stadiums, hotels and airports, restaurants, and IoT on the website	http://www.beaconstac.com/platform
BKON	US	Offers beacons	https://bkon.com/
Blesh	Turkey & US	Offers a beacon platform for different use cases in stores, banks, airports, museums, payments and supermarkets	https://www.blesh.com
BlueCats	Australia & US	Sells hardware. Provides developer resources.	http://bluecats.com/beacons.html
Easibeacon	Spain	Offers beacons and a platform for marketing, retail, museums and exhibitions, hotels and restaurants, security and control, sports and music events	http://www.easibeacon.com/
Estimote	US & Poland	Offers beacons and developer resources	http://estimote.com/
Footmarks	US	Offers solutions for retail and advertising, venues, work place and partner enablement	http://www.footmarks.com/
GeLo	US	Offers beacons, a cloud platform and SDK:s	http://www.getgelo.com/
Gimbal	US	Offers a platform and solutions for venues, brands & retailers, agencies and advertisers, solution providers, out of home networks and financial services	https://www.gimbal.com/complete-gimbal-platform/
Glimr	UK & Sweden	Offers an advertisement SDK	http://www.glimr.io/
GoLoyal	Sweden	Offers a loyalty programs for retailers focusing on communication, content, a	http://goloyal.se/

member database and statistics. The loyalty programs can use beacons.

Indoo.rs	Austria & US	Offers an indoor navigation system.	http://indoo.rs/
inMarket	US	Offers solutions for the retail sector	http://www.inmarket.com/mobiletomortar/
Kontakt.io	Germany, US, Mexico, Poland and China [at least...]	Offers beacons, APIs and SDKs	https://kontakt.io/
Lighthouse.io	US & Australia	Offers solutions for compliance check for cleaning, security systems, logistics, health, events and tourism, and retail and advertising.	http://lighthouse.io/
Locatify	Iceland	Offers a platform that can be used to publish location aware content for museums, municipalities and tourism, as well as education	https://locatify.com
Netclearance	US & UK	Offers solutions mobile payments, business intelligence, customer engagement and real-time tracking solutions for retail, advertising agencies, healthcare, logistics, hospitality and workforce management	http://www.netclearance.com/
NewAer	US	Offers a proximity platform that discovers all nearby wireless devices in addition to iBeacons: another mobile device, a wifi access point, a connected printer, smart tags or wearables. In addition to this, the company offers three apps for sharing files, advertising and tagging.	https://newaer.com
Onyx Beacon	Romania	Offers beacons, a CMS-system and solutions for retail, logistics and asset tracking, smart public transportation, events, hospitality, education, healthcare, industrial production appliances, building and facility management and smart cities	http://www.onyxbeacon.com
Piper	US	Offers beacons and a platform for proximity communication. Solutions for auto, airports, education, media, real estate, retail, transit, storage, tourism, museum, golf, entertainment, safety, hospitality, QSR	https://www.piper.ly/

Proxidyne	US	Offers beacons and solutions for retail	http://www.proxidyne.com
Proximity5	US	Offers a hardware agnostic beacon platform.	http://proximity5.com/
Pushmote	US	Offers in-app marketing and push notifications	https://pushmote.com/
Quuppa Intelligent Locating System	Finland	Offers a locating system	http://quuppa.com/
Radius Networks	US	Offers hardware, software and proximity services	http://www.radiusnetworks.com/
Robin	US	Offers a meeting room booking system	https://robinpowered.com/
Roverlabs	US & Canada	Offers a proximity marketing platform	http://www.roverlabs.co/
Roximity	US	Offers beacons and a platform for merchants, advertisers and publishers	http://roximity.com/
Senionlab	Sweden, US	Offers an indoor positioning system that is based on beacons, targets multiple industries such as retail and health and its solutions are centered around maps	https://senionlab.com/
Sensorberg	Germany	Offers a beacon platform and solutions for proximity services, mobile advertising, data analytics	https://www.sensorberg.com/#
Sensoro	US & China	Offers beacons, developer resources and a cloud platform	http://www.sensoro.com/
ShopJoy	Sweden	Offers beacons, a cloud-based CMS system (incl. analytics), SDKs for iOS and Android. Focused on the retail sector.	http://www.shopjoy.se/
shopkick	Germany & US	Offers beacons and customer loyalty systems	https://www.shopkick.com/shopbeacon
Signal360	US	Offers beacons, SDK, content and targeting engine and analytics for retail	www.signal360.com
Trackblue	US	Offers tools for monitoring asset location, asset movement and the environmental conditions surrounding the assets	http://www.trackblue.com/

TrueFlow	Sweden	Offers tools for indoor navigation and customer flow data analysis	http://www.trueflow.io/
Ubudu	France	Offers SDKs for enhancing the customer experience in venues	http://www.ubudu.com/

Appendix IV: Motivations for the Highest Ranked Ideas

This appendix provides a more in depth analysis of the highest ranked ideas and their ratings on the different assessment factors.

1. Time and Compliance App

The Attendance and Time Reporting and Compliance Controlling ideas were both given 14 points, with the same score on every factor. The beacon technology was seen as competitive in both cases as it, unlike RFID, does not require any specific readers, offers a better range and may be run in the background, thus never interrupting work. Competition exists, but is based outside of Sweden and thus not perceived as an imminent threat. The value from the ideas comes from automating and simplifying procedures and providing better means of governance, which was regarded as potentially important for certain clients. The market size was also viewed in a positive light as the solutions could be applied in all industries. The market readiness was likewise given positive ratings since smartphones, tablets or similar devices are omnipresent and the installation of a specific app and Bluetooth activation can be required in the discussed settings. Since ConsultingCo already offers solutions for human resource management and these ideas would be a natural extension, they were regarded to fit well with the company's resources and capabilities. Furthermore, the ideas were assessed as adequate for generating positive attention to the beacon technology and ConsultingCo as they would automate a tedious task and integrate nicely with ConsultingCo's existing products to create an edge against competitors. The two ideas will from now on be discussed as one since they, from a technical point of view, have obvious similarities in that they register when a user passes a checkpoint. In many instances time spent in an area and compliance are also the same.

	Attendance and Time Reporting	Compliance Controlling
Technology	■ ■ ■	■ ■ ■
Competition	□	□
Value Potential	■ ■ ■	■ ■ ■
Market Size	■ ■	■ ■
Market Readiness	■	■
R&C Match	■ ■ ■	■ ■ ■
Wow factor	■ ■	■ ■
	Total: 14 p	Total: 14 p

Figure A. Idea scores from the evaluation matrix: Time and Compliance App.

2. Tracking App

The Caring Aid and Asset Tracking ideas were given 14 and 12 points respectively, differing on competition, market readiness and wow factor. The beacon technology was regarded as suitable for both ideas. Besides being a good option from a cost perspective, beacons offer several advantages over other technologies. It has for example better range than RFID and better precision than GSM/GPS. In comparison with GSM/GPS it has moreover the advantage of indoor usability. Competitors focused on asset tracking were found, however foreign and therefore not necessarily relevant for the Swedish market. No competitors were found in tracking for caretaking purposes, why the Caring Aid idea got a better result for this factor. Since the first

idea is centered on increasing human safety, a clear value potential was established. It was similarly argued that also the second idea has a high value potential, as it enables finding assets faster. The market size was considered to favor both ideas - the first idea being relevant in numerous settings where people have to be taken care of and the second one being applicable in all industries. The market readiness for the first idea was judged as uncertain based on doubts with respect to whether the technology would be perceived as violating the integrity or not, which was a concern for all ideas relating to tracking people. Consequently, the idea got a neutral rating. The same concerns did not apply to the second idea, why it got a higher rating. Since the ideas emphasize technical knowledge, both were considered as fitting well with ConsultingCo's resources and capabilities. Thereto ConsultingCo offers several information systems for healthcare management, which the Caring Aid idea could be integrated with. None of the ideas were by contrast seen as radiant for a general audience. Although they are useful, most would probably not regard them as exciting. Henceforth, these ideas will be described jointly since the technical setup is the same.

	Caring Aid	Asset Tracking
Technology	■ ■ ■	■ ■ ■
Competition	■	□
Value Potential	■ ■ ■	■ ■ ■
Market Size	■ ■	■ ■
Market Readiness	□	■
R&C Match	■ ■ ■	■ ■ ■
Wow factor	■ ■	□ □
	Total: 14 p	Total: 12 p

Figure B. Idea scores from the evaluation matrix: Tracking App.

3. Operational Improvement App

The Resource Use Reporting and Operational Data ideas received 13 and 12 points respectively, with the only difference in the rating of the two being found in the competitive situation. Compared to other technologies, beacons offer the advantages of being cheap, portable and able to use indoors. No direct competitors were found for the first idea, but Senionlab, a startup based in Linköping, features a solution for manufacturing on its website that was perceived as being a potential competitor to the second idea. Given that ConsultingCo has advantages from its size and existing client relationships, the threat was not perceived as acute enough to justify a deduction, why a neutral rating was chosen in the end. The ideas can be applied in many settings, where the most natural ones are found in the manufacturing industry. This industry is substantial in Sweden and constitutes a market of

reasonable size, which accordingly led to a positive rating for this factor. The market was also perceived as ready since the similar RFID technology is accepted. Like the Tracking App, these ideas demand technical competence in the setup, which clearly draws on one of ConsultingCo's signature strengths, but likely fall short when it comes to creating excitement. In the remaining parts of this report, the ideas will be discussed together as the Operational Improvement App since they are technically more or less the same and target the same audience.

4. Context-Aware Information App

The ideas named Context-Based Information Lookup and Location-Based Information were both awarded with 13 points. From a technical perspective, beacons were seen as competitive for these applications as they work outdoors as well as indoors and create a more seamless experience for the users than for example QR-codes. The competitive situation speaks neither for nor against the ideas, e.g. IBM offers this kind of app(s) in healthcare, but no local alternatives have been found. The value provided by the ideas naturally reflects the value of the information brought forward, with the important difference of increased relevancy from the context. The ideas can be put into practice in most industries, either for internal or external use. Hence, the market size received a positive rating. In some industries, e.g. healthcare, privacy and security could be obstacles.

	Resource Use Reporting	Operational Data
Technology	■ ■ ■	■ ■ ■
Competition	■	□
Value Potential	■ ■ ■	■ ■ ■
Market Size	■ ■	■ ■
Market Readiness	■	■
R&C Match	■ ■ ■	■ ■ ■
Wow factor	□ □	□ □
	Total: 13 p	Total: 12 p

Figure C. Idea scores from the evaluation matrix: Operational Improvement App.

	Context-Based Information Lookup	Location-Based Information
Technology	■ ■ ■	■ ■ ■
Competition	□	□
Value Potential	■ ■ ■	■ ■ ■
Market Size	■ ■	■ ■
Market Readiness	□	□
R&C Match	■ ■ ■	■ ■ ■
Wow factor	■ ■	■ ■
	Total: 13 p	Total: 13 p

Figure D. Idea scores from the evaluation matrix: Context-Aware Information App.

Therefore, the market readiness got a neutral rating. Speaking in favor of ConsultingCo in this respect is, however, that the company is a trusted partner already and that it, as mentioned above, offers information systems that could integrate the idea. It was moreover established that many could view it as cool to get relevant information depending on where they are without having to do anything. Thus, the idea was assessed as possessing a wow factor.

5. Visually Impaired Guidance App

Tools for Visually Impaired got 13 points in the idea evaluation.

As mentioned before, the beacon technology's capability to work in outdoor as well as indoor settings is advantageous. In addition to that, its capability to trigger actions without any user interference makes it competitive. While some research initiatives have been undertaken, no finished product using beacons for the same purpose as this idea has been seen on the Swedish market yet. The value potential is very clear - providing guidance to visually impaired by utilizing new technology may reduce costs for escort services, and more importantly it can make life easier for and increase the independence of the individuals belonging to the addressed target group. The group of people with visual impairment is however limited in size, but since the solution could be adapted to fit practically any setting that should be easily accessible also for those, the market size was rated as neutral. Partly weighing up for that is that the market is judged as ready. Smartphones are widely adopted and for those who do not yet have, they are cheap in comparison with other tools. Potentially accelerating the adoption is of

course the strong incentives that increased accessibility and independence constitute. The fit with the resources and capabilities of ConsultingCo was seen as good. Again, the company has strong technical knowledge and for the parts relating to how to design the communication, the organization Wayfindr (2016) has announced that it will provide an open standard of guidelines for free shortly. If done right, it is assumed that the idea can generate much positive attention.

	Tools for Visually Impaired
Technology	■ ■ ■
Competition	■
Value Potential	■ ■ ■
Market Size	□ □
Market Readiness	■
R&C Match	■ ■ ■
Wow factor	■ ■
Total: 13 p	

Figure E. Idea scores from the evaluation matrix: Visually Impaired Guidance App.

6. Omnichannel App

The idea called Omnichannel Sales was given a total of 13 points. The superior strength of the beacon technology in relation to available alternatives resides here in its capability to communicate with consumer devices and that on longer distance than NFC and without requiring action from the user as is the case with QR-codes. Primarily targeting retail, the idea aims at the sector where most activity around beacons has been seen so far, why competition got a neutral rating. The value potential was by contrast seen as promising since the idea can first and foremost enhance the customer experience and thus drive revenue, but also enable a higher efficiency in operations. The market size was likewise considered as sufficient, while doubts were raised concerning the market readiness, resulting in a neutral rating. The match with ConsultingCo's resources and capabilities was on the other hand seen as good since the company delivers mobile e-commerce solutions as well as systems for supply chain management, and consequently provides the fundamental building blocks for helping the clients run the idea. The idea can, put into practice, enhance the customer experience and transform the customer journey, which both are capable of generating an interest from others.

	Omnichannel Sales
Technology	■ ■ ■
Competition	□
Value Potential	■ ■ ■
Market Size	■ ■
Market Readiness	□
R&C Match	■ ■ ■
Wow factor	■ ■
	Total: 13 p

Figure F. Idea scores from the evaluation matrix: Omnichannel App.

7. Meeting Room Management App

The Meeting Room Management idea received 11 points. The beacon technology was seen as apt given that it works for indoor applications and without any user input, which minimizes interruptions and forgetful mistakes concerning status updates. There are several other systems for the same purpose available on the market, but only one known to use beacons and the company providing that is not based in Sweden. All this taken together resulted in a neutral rating. Also the value potential was considered neutral. While the idea can save time and frustration as well as give better data on actual utilization rates, it does most likely not entail any major operational improvements. The potential market is however large as there are numerous offices, which could all use the same system, and was consequently given a positive rating. It was moreover assumed that the degree of readiness on the market is high since smartphones are already used in most organizations by now, and installed apps and settings could be controlled through mobile device management. The idea was considered to fit well with ConsultingCo's resources and capabilities as it draws on technical strengths. Moreover, the idea was judged to have the potential

	Meeting Room Management
Technology	■ ■ ■
Competition	□
Value Potential	□ □ □
Market Size	■ ■
Market Readiness	■
R&C Match	■ ■ ■
Wow factor	■ ■
	Total: 11 p

Figure G. Idea scores from the evaluation matrix: Meeting Room Management App.

to generate positive attention since users do not have to check or do anything manually and thus creates a seamless integration between online and offline.

8. Retail App

The five other ideas directed towards a retail setting were Mobile App Payment Support, Advertise Offerings and Discounts, Personalized Suggestions, Personalized Service, and Loyalty Program. The first idea got 12 points, whereas the other ones got 11 points. The beacon technology was considered as an excellent option in all instances because of its range, precision and automatic characteristics. Regarding the competitive situation, it was recognized that there are a number of companies focusing on mobile payment solutions as well as beacons as a means to send out offerings and discounts via push notifications, why these two ideas got a negative rating. As the situation looked slightly better for the other ideas, they got neutral ratings instead. All five ideas were seen as having good value potential - ranging from increasing the convenience for the customer in the moment to enhancing the relationship for a longer term. Since the ideas apply to the retail sector, exhibiting strong and consistent growth, the market size was judged as positive. The market readiness was likewise seen as positive except for the Mobile App Payment Support. This idea got a neutral rating based on the hesitation towards mobile payment solutions that has been seen with for examples SEQR. Mobile App Payment Support and Advertise Offerings and Discounts were however both regarded as fitting well with ConsultingCo's resources and capabilities, while further investigation concerning content creation was considered as necessary for the remaining three. With Advertise Offerings and Discounts as the only exception, the ideas got a positive rating on their ability to generate attention. Henceforth, the ideas will be discussed together under the name Retail App. The decision to bundle the ideas was based on the fact that they target the same sector and complement each other to create a more compelling offer. A loyalty program provides an incentive for customers to connect and keep the communication channel open. Moreover, letting the customer apply for a membership provides as a legitimate reason for asking about personal data. How to make the communication relevant was perceived as a key challenge by Interviewee B2 (2016). Using personal data could be a good starting point for this. It would furthermore support the ideas of personalized suggestions and service, which in turn would strengthen the loyalty program. Integrating support for mobile payment in the app could thereto enhance the customer experience by making the transaction more convenient. Given the growth of mobile payment, this might also be something that customers expect as a standard soon.

	Mobile App Payment Support	Advertise Offerings and Discounts	Personalized Suggestions	Personalized Service	Loyalty Program
Technology	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Competition	▨	▨	□	□	□
Value Potential	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Market Size	■ ■	■ ■	■ ■	■ ■	■ ■
Market Readiness	□	■	■	■	■
R&C Match	■ ■ ■	■ ■ ■	□ □ □	□ □ □	□ □ □
Wow factor	■ ■	□ □	■ ■	■ ■	■ ■
	Total: 12 p	Total: 11 p	Total: 11 p	Total: 11 p	Total: 11 p

Figure H. Idea scores from the evaluation matrix: Retail App.

Appendix V: App-Specific Business Models

This section shows business model canvases for each of the eight proposed applications. Some of the parts in the business models are the same for all applications. These are written in italic. The section also contains ratings of the apps along the two dimensions app generalizability and app integrability.

1. Time and Compliance App

<u>Key Partners</u> A) Providers of existing time reporting and control systems, e.g. SAP B) Providers of existing attendance systems, e.g. Novasoftware	<u>Key Activities</u> - <i>Development of app</i> - Integration with clients' existing reporting systems	<u>Value Propositions</u> A) More accurate time reporting and reliable compliance control B) More time for teachers to teach by reducing administrative workload	<u>Client Relationships</u> - <i>Personal assistance</i>	<u>Client Segments</u> A) Workplaces B) Schools
	<u>Key Resources</u> - <i>Beacon platform</i> - Own HR system(s) - Framework agreements		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development (fixed) - App integration (per client)			<u>Revenue Streams</u> 1) One-off transaction 2) Start fee + subscription fee (based on number of users)	

2. Tracking App

<u>Key Partners</u> B) Companies specialized in care products for elderly	<u>Key Activities</u> <i>- Development of app</i>	<u>Value Propositions</u> A) Better asset control, enabling resource optimization B) Increased personal safety by better controlling tools with ability to alert staff	<u>Client Relationships</u> <i>- Personal assistance</i>	<u>Client Segments</u> A) Companies with physical assets B) Nursery homes and kindergartens
	<u>Key Resources</u> <i>- Beacon platform</i> <i>- Framework agreements</i>		<u>Channels</u> <i>- Sales force</i>	
<u>Cost Structure</u> <i>- Beacon server costs (semi-fixed)</i> <i>- Hardware procurement and installation (per client)</i> <i>- App development (fixed or per client)</i>			<u>Revenue Streams</u> 1) Subscription fee (based on number of users or assets and numbers of scanners)	

3. Operational Improvement App

<u>Key Partners</u> - Providers of BI systems	<u>Key Activities</u> - <i>Development of app</i> - Integration of collected data with BI systems	<u>Value Propositions</u> A) Real-time operational data for optimization and continuous improvement B) Swift and easy data gathering on-the-go	<u>Client Relationships</u> - <i>Personal assistance</i>	<u>Client Segments</u> A) Operations departments B) Operation management consultants
	<u>Key Resources</u> - <i>Beacon platform</i>		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development (fixed) - App integration (per client)			<u>Revenue Streams</u> 1) One-off transaction 2) Start fee + subscription fee (based on number of scanners)	

4. Context-Aware Information App

<u>Key Partners</u> B) Political science scholars or other actors that can help craft communication strategies	<u>Key Activities</u> - <i>Development of app</i> B) Marketing of the new communication channel	<u>Value Propositions</u> Ability to push relevant information in specific locations: A) Higher medical staff efficiency by always having the right medical records at hand B) Better information to citizens and new ways of engaging them in an open conversation about city development	<u>Client Relationships</u> - <i>Personal assistance</i> B) Co-creation	<u>Client Segments</u> A) Hospitals B) Municipalities
	<u>Key Resources</u> - <i>Beacon platform</i> - Framework agreements		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development and integration (per client)			<u>Revenue Streams</u> 1) One-off transaction 2) Start fee + subscription fee (based on number of beacons)	

5. Visually Impaired Guidance App

<u>Key Partners</u> - The Swedish Association of the Visually Impaired	<u>Key Activities</u> - <i>Development of app</i> - Establish communication format	<u>Value Propositions</u> - Better accessibility for visually impaired by providing audio feedback regarding the physical environment around them - Potentially better conformity to rules and regulations - Goodwill	<u>Client Relationships</u> - <i>Personal assistance</i>	<u>Client Segments</u> - Municipalities - Swedish transport administration - Jernhusen, owner of railway station houses - Shopping malls - Hospitals
	<u>Key Resources</u> - <i>Beacon platform</i> - Framework agreements		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development (Fixed) - App integration (Per client)			<u>Revenue Streams</u> 1) Subscription fee from facility owners (flat) 2) Subscription fee from municipality (flat) 3) Subscription fee from the users (flat) - Additional revenue streams could be derived from the beacon infrastructure if deployed with other apps for people that are not visually impaired	

6. Omnichannel App

<u>Key Partners</u> - Marketing consulting firm	<u>Key Activities</u> - <i>Development of app</i> - Integration with existing online sales channel	<u>Value Propositions</u> - Closed gap between physical and digital shopping which increases the physical stores’ competitiveness through extended product ranges and better customer experiences	<u>Client Relationships</u> - <i>Personal assistance</i> - Co-creation	<u>Client Segments</u> - Retail stores - Libraries
	<u>Key Resources</u> - <i>Beacon platform</i>		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development and integration (per client)			<u>Revenue Streams</u> 1) One-off transaction 2) Start fee + subscription fee (based on number of beacons)	

7. Meeting Room Management App

<u>Key Partners</u>	<u>Key Activities</u> <i>- Development of app</i>	<u>Value Propositions</u> - Better productivity and facility management through real-time updates and accurate data about how rooms are used	<u>Client Relationships</u> <i>- Personal assistance</i>	<u>Client Segments</u> - Medium and large enterprises - Schools/universities
	<u>Key Resources</u> <i>- Beacon platform</i>		<u>Channels</u> <i>- Sales force</i>	
<u>Cost Structure</u> <i>- Beacon server costs (semi-fixed)</i> <i>- Hardware procurement and installation (per client)</i> <i>- App development (fixed)</i>		<u>Revenue Streams</u> Start fee + subscription fee (based on number of meeting rooms)		

8. Retail App

<u>Key Partners</u> - Marketing consulting firm	<u>Key Activities</u> - <i>Development of app</i> - Integration of payment solution - Integration of collected data with BI systems	<u>Value Propositions</u> - Increased customer engagement through well-crafted customer loyalty programs - Valuable customer insights from gathered operational data - Operational improvements, e.g. faster checkout	<u>Client Relationships</u> - <i>Personal assistance</i> - Co-creation	<u>Client Segments</u> - Stores - Restaurants and cafes
	<u>Key Resources</u> - <i>Beacon platform</i>		<u>Channels</u> - <i>Sales force</i>	
<u>Cost Structure</u> - <i>Beacon server costs (semi-fixed)</i> - <i>Hardware procurement and installation (per client)</i> - App development and integration (per client)			<u>Revenue Streams</u> 1) One-off transaction 2) Start fee + subscription fee (based on number of beacons, users or stores)	