

## **ARE SMART PHONES REALLY SMART IN SUPPLY CHAIN AND LOGISTICS?**

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### **ABSTRACT**

Smart phones have become a valuable part of our everyday lives. Advances in smart phone technology over the past few years have been dramatic, and have integrated a range of different features to become the main point of communication and Internet browsing for many people. However, smart phones have also become a key part of different industries, from military uses through to retail, manufacturing, distribution and logistics.

**KEYWORDS:** Smart Phones, Barcode, Scanning

### **INTRODUCTION**

Smart phones are becoming ever more popular. If you go outside (especially when in a city) and you look around, you will without a doubt see somebody looking at the screen of their mobile. Maybe they are texting or looking up a number (how old school), but chances are high that they are busy browsing the web, doing their e-mail, updating their Facebook or tweeting. Smart phones are everywhere and companies tend to go to where the people are, so a lot of them went smart (read: mobile) as well. Since Apple launched the iPhone, Blackberry and Android phones are almost as commonplace. With the widespread popularity of these phones and tablets, these devices are garnering trial and experimentation in warehouses and distribution centers. So it would all seem to add up that smart phone and tablets may, indeed, be viable solutions to better manage material handling and logistics processes. The technology of the Smartphone is similar to that of a computer and tens of thousands of applications have been developed. But consumerization in the warehouse faces significant obstacles. [1]

### **RISE OF SMART PHONES**

Since the explosion of Smartphone usage, Apple pushed the boundaries of consumer electronics by introducing the iPad and since then other electronics companies have launched their tablet to compete. The iPad and the tablet equivalents are not built for shop floor applications, but that is where some companies have decided to use them. Markley Enterprises, a customer of the supply chain software company Red Prairie, modified its browser-based warehouse management system so that it could be used on an iPad mounted to its warehouse forklifts. The iPad is then covered in an industrialized casing to extend its lifespan and configured to run applications that support managing inventory and order picking. [2]

### **USES OF SMART PHONES**

Smart phones are similarly valuable to high risk data and automated systems, and have become a vital link in terms of providing end to end communication and interactivity between different industrial sectors. Some of the most distinctive uses of smart phones across different industries currently include:

#### **Military Uses**

Open source platforms and operating systems for smart phones have made them ideal for military uses. Smart

phones can be used in this way as communication devices, but also as a platform for remote apps. Raptor Identification Systems and other manufacturers have targeted customized smart phones as the future of military hardware, able to coordinate a range of different functions, while providing closed networks for communications. The potential for apps to provide better sighting in battle, and for information gathering and data analysis to be improved on a person to person level has also increased.

### **Retail Uses**

Major retail industries now rely on smart phones as part of changing barcode and unique product identification systems. Smart phones and tablets are becoming an alternative to handheld scanners, and are also being used to process orders and locate stock within warehouses. The development of new tagging and product codes means that smart phone technology is able to provide retailers with more detailed and up to date information on their businesses.

### **Warehouse Picking**

Smart phones are also being increasingly used as part of voice picking technologies within warehouses. Used as a communication device to improve in stock picking and linking up staff, smart phones can also be programmed to better monitor supply chain management. Smart phones can similarly be used to record employee data, and can help with biometric monitoring and security features through the use of proprietary apps and other features.

### **Logistics**

Smart phones are making a significant impact on logistics and supply chain management, or the process of creating end to end solutions for businesses and consumers. Phones can be used both to improve communication between drivers and businesses, but also to create GPS tracking and real time delivery monitoring. [3]

### **Data Systems and Monitoring**

The use of smart phones in major industries has also an increasing use of mobile devices as part of Mobile SCADA, or supervisory control and data acquisition systems. In this context, automated systems in manufacturing and distribution centers can be remotely monitored and optimized through software in smart phones, with engineers able to respond to alerts and identify faults without necessarily being on site.

Integration with different smart phones platforms make it easy to achieve these goals, and helps to reduce downtime in vital systems, while improving overall productivity. New tablet designs and smart phones consequently allow industries to develop a higher level of efficiency, while also ensuring that employees are connected in real time when carrying out tasks. [4, 5]

## **SMART PHONES IN SUPPLY CHAIN AND LOGISTICS WAREHOUSES**

Bar codes are everywhere since the successful adoptions of the Universal Product Code (UPC). While bar codes have become nearly ubiquitous, bar code scanning technology has, until recently, been limited to purpose-built devices used in business and enterprise settings. The introduction of digital imaging technology and the spread of smart phones has led to the use of these consumer devices in data capture. The availability of low-cost, relatively high resolution digital camera modules in mobile phones has essentially put a bar code scanner in the hands of anyone with a smart phone. Smart phones have made the transition from the backpack to the warehouse, providing insights into operations, performance, and traceability. Smart phones are becoming an extremely useful tool in the supply

chain also. In the sales and customer service operation Smart phones are being used by salespersons and technical service staff instead of laptops.

The Smartphone is a popular consumer item that has made its way into the supply chain and is becoming an invaluable tool for a wide range of processes including Customer Relationship Management (CRM) and ERP. The number of applications where Smart phones can be used in the supply chain is growing and along with the introduction of the tablet, mobile technology will be an everyday tool for supply chain personnel very soon. [6, 7]

## **BAR CODE IMAGERS vs SMART PHONES**

The bar code imaging technology used in commercial scanners is designed to scan large numbers of barcodes in rapid succession, often in the poorest of working conditions. Smartphone cameras, on the other hand, are encumbered by a number of technical limitations that make them unsuitable for most line-of-business applications

### **QR Code and UPC Code Scanning**

It's fairly easy to get a good scan of a large QR Code using a mobile phone, but trying to scan a high volume of normal sized UPC codes would be extremely frustrating using a smart phone camera.

### **Color vs. Black-and-White Imaging**

Bar code imagers are black-and-white devices. The camera in a smart phone is a color imager. While these cameras provide high resolution images, the relative small size of the pixels in the images means that each pixel is less sensitive than in the case of a traditional bar code imager.

### **Depth-of-Field**

The depth-of-field is the distance between the maximum and minimum plane in which a reader is capable of reading a bar code symbol. It is dependent on how the camera focuses and the amount of light being gathered to create the image. Purpose-built bar code scanners typically have a very long depth-of-field, so that codes can be scanned accurately from a range of distances without the need to focus the imager. Depending on whether the camera in the phone is fixed or auto-focus, there are a number of obstacles to achieving the necessary depth-of-field. Autofocus cameras allow users to collect more light, but can only focus on a relatively small area at one time. Autofocus cameras in phones take time to focus on the right area, and provide a relatively small depth-of-field. This creates problems when trying to scan a bar code at an angle. In order to have a larger depth-of-field, the camera would have to have a smaller aperture, which is the case with a fixed-focus camera. A fixed-focus camera provides a long depth-of-field, but a smaller aperture the camera would collect less light. Light gathering matters because it determines how fast a code can be scanned, and how still the camera has to be in order to capture a good image of the code. With less light, the image can be marred by motion blur. Dedicated bar code imagers are based on global shutter technology; all of the pixels capture light at the same moment. Phone cameras use what is known as rolling shutter technology, meaning every row in the image is exposed one at a time in a sweeping motion. That's what creates motion blur artifacts in the images captured by these phones. Blurring or slanting the image will impact the ability of the device to scan and interpret the bar code. Bar code imagers provide a long depth-of-field, while simultaneously providing sufficient illumination to eliminate motion blur.

### **Illumination**

Motion blur can be corrected when using artificial illumination. Most camera phones take images using

ambient light, which affects exposure times. Bar code imagers use LED pulse lighting. A bright, short pulse of light illuminates the code, allowing the scanner to capture the image without any motion blur. The flashes used on consumer cameras, on the other hand, often produce over-exposed images that wash out the picture and could impact scanning accuracy. Bar code imagers also include targeting beams that help ensure the correct scan in applications where the scanner may encounter several codes in the same field-of-view. Combined with bright illumination, this guarantees fast, accurate scanning.

### **Decoding Bar Code Data**

Bar code reading and decoding is a complex process, requiring significant processing power from the handheld scanner involved. Dedicated bar code scanners and mobile computers include all of the application software necessary to use the bar code data whereas a smart phone used in these applications would need to be outfitted with specialized software that may or may not be available for that particular platform.

### **Specific Applications and Ergonomics**

Bar code scanners are equipped with complex algorithms that make it possible to read damaged, torn or otherwise incomplete bar codes. In the harsh conditions of most line-of-business applications, this functionality is critical because the bar codes themselves are not always in optimal condition for scanning.

Ergonomics is another issue. The types of rugged mobile computers and scanners used in Warehouse Management, Logistics and Field Service applications have been designed so that end users can point, scan, and in some cases key-enter data in a way that reduces the risk of repetitive motion disorders and general discomfort. Trying to scan hundreds of bar codes over the course of a shift using a smart phone would, at best, result in a sore wrist and a cramped hand.

### **Low-Frequency Scanning Applications**

There is potentially a case to be made for using Smart phones in applications where bar codes are scanned infrequently or intermittently. Management-level employees or supervisors, for instance, may occasionally need to scan a bar code in a warehouse or maintenance environment, and a smart phone could conceivably be used for that purpose. However, even in Field Service, Asset Tracking or Maintenance applications, where bar code scanning is of the low-volume variety, a purpose built device has significant advantages. In most of these applications, the bar codes being scanned are on installed equipment - air conditioning units, printers, computers and other assets. Often these codes are very small and located in dark, hard-to reach areas. The scan process in these applications would be too sensitive to blurring and lighting conditions to use a smart phone. Even though technicians would be scanning a relatively low volume of bar codes, working conditions would dictate the use of a professional-grade imaging scanner.

- Less trained employees on smart phone technologies, thus increasing the cost of WMS (warehouse management solution).
- More chances of damage to Smart Phones as compared to rugged Bar Code Imagers.

### **NEXT STEPS**

By seeing all the comparisons, it can be concluded that smart phones as standalone scanners are not successful enough. However they can be used to replace desktops, laptops and handheld mobile scanners. As now days, either we buy low costs scanner and connect it to the network through the computer or we purchase costly handheld mobile

scanners with wireless connectivity. Smart phones are very common and are available with everyone these days. So very low cost scanners can be designed which can be connected to the smart phones through Wire/Bluetooth and can send data on network. Using the solution suggested, the following advantages can be achieved:

- Development of a very low cost solution for all business scanning needs.
- No requirement of dedicated computers.
- No Wireless network setup.
- Cost saving in purchasing of costly mobile scanners with connectivity

## CONCLUSIONS

Although smart phones are capable of scanning and decoding bar codes, the underlying camera technology in these devices would make it nearly impossible to utilize them in any kind of high volume, high-velocity, poor lighting or small bar code scanning application because of the challenges in properly focusing, illuminating and reading bar codes in a timely manner. Purpose-built bar code scanners or scanner-equipped mobile computers can quickly and accurately read hundreds of bar codes per shift. They are ergonomically designed with this type of repetitive work in mind and are rugged enough to withstand the harsh conditions of most data collection applications. They include displays that are both rugged and easy to read in all lighting conditions, provide longer battery life and are equipped with the processing horsepower and applications to utilize the scanned data in enterprise applications. While smart phones are suitable for many areas of the enterprise, the front line of most data collection applications is not one of them.

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