

A Novel Approach for Mobile Bar Code Scanning

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Abstract

Most of the time there's a long queue for payment in supermarkets, and problems such as inadequate inventory, over stock occurred frequently, results in causing frustration to all the stakeholders involving in retail management such as to stock managers, billing operators, customers and store servers. Also In case of small retail stores there will be heavy rush which does not satisfy customer to purchase his products quickly and if dealt with large stores it requires to maintain too many counters and billing operators, that in turn involves in high maintenance cost and work force. Our paper involves a novel approach adopted for mobiles to automatically scan the barcode of various products/ items supplied to the stores by using android

1.6 version coding wherein the scan mechanism is embedded on normal camera capturing icon on mobile handset which reduces the cost for separately maintaining barcode scanner equipments. Additionally, our work facilitates even stock managers at effective inventory management using centralized cloud server instead of maintaining too many server counters and facilitates customer to scan the barcode of selected item just by clicking on camera on his android mobile. This can save cost and time as well as minimize possible problems occurred in manual operations and thus improve the work efficiency in collecting and inputting data of the goods for warehouse in and out management.

Keywords - *Mobile Barcode Scanning, Android, Cloud Computing, Software-as-a-Service, enhanced pos.*

1. Introduction

Emerging developments in the Smart phone industry are expected to bring about new trends for enterprise mobility management, with formerly popular business Smart phone options being replaced by new products from Google and Apple. RIMM's Blackberry ^[18] has been the only mobile offering taken seriously for sometime by corporate IT.

However, the "bring your own device" philosophy continues to be adopted by the enterprise due to major cost savings, the consumerization of corporate IT, and mobile business applications. Enterprise applications will need to evolve based on these factors, which provide a rich native user

experience to drive employee adoption of enterprise mobility.

A recent report from institutional securities firm Piper Jaffrey predicts^[11] Android Smart phones to occupy nearly

Half of the market share during the next five years, with an additional 20 to 30 percent market share taken up by Apple's iPhone. The firm made its prediction based upon the recent surge in growth for Smart phones, as the study shows Google's current 14.9 percent of market share in 2010 will grow to 23.2 percent by 2012. The prediction for Google overshadows the iPhone's expected progress, which the report forecasts will increase from 15.9 percent to 17.6 percent during the same time period^[18]



Figure 1. Conventional Mobile application

Naturally, the research leaves little room for the long time dominant Research In Motion and Nokia to continue to provide a significant amount of enterprises Smart phones .As a result, the report speculates that either company could eventually adopt the Android system in order to stay relevant, or may even move to Microsoft's Windows Phone^[6].“Over time, we do not see the benefit of RIM and Nokia continuing to push proprietary software that can't compete with the market and eventually expect one or both to capitulate and move to utilizing third-party software,” the report explains. For mobile application development, the trends toward user familiarity of mobile devices will bring pre-packaged mobile applications to the forefront. Organizations will need to adapt to the needs of their end-users, in this case their employees. The rapid deployment of cloud based pre-mobile applications, along with the scalability needed by the enterprise, makes these pre-packaged mobile solutions a preferable alternative to the resource intensive alternative to writing custom mobile applications in-house. As leaders in enterprise mobility, Smart soft Mobile Solutions is positioned to supply the enterprise with these pre-packaged mobile applications, thus allowing businesses to focus on their core competencies and optimize resources.

2. Existing System

Inventory management is an essential part of a wholesale, distribution, or retail business. While an increasing number of trade suppliers are turning towards computerized systems for inventory

management, some small businesses continue to use manual inventory management system (consisting of a pen and some registers). Small sized wholesalers or retailers prefer to use manual systems since they presume computerized systems are meant only for large businesses. However, there are other limitations of a computerized system, let's have a look at some of those manual interventions.



Figure 2. Traditional manual Inventory

Inventory management is necessary for every business that wants to maintain a stocking service for quick turnaround to ensure total customer satisfaction. Inventory is managed by analyzing the future requirements of the customer. Managing inventory manually is a huge task for management. How better you serve your customers depends on how efficient your inventory is managed.



Figure 3. Traditional Bar Code Equipments

DEFECTS OF EXISTING SYSTEM INCLUDE:

- A. Overlooking the overall operational costs.

- B. Lost or delayed orders and running out of stock.
- C. Delays or problems with supplier chain.
- D. Stressed staff trying to manage too much information
Dissatisfied customers
- E. Not using barcodes to manage your inventory.
- F. Human tendency to commit errors.
- G. Preparation and maintenance risks of large hand written documents or reports.
- H. Maintenance cost for the retail stores raises up to a mark as it uses additional hardware equipments for scanning barcode and other miscellaneous operator billing issues.

3. Proposed System Methodology

Our proposed system related work aims to Drive “retail growth” , “streamline operations” and “improve customer service” by integrating two booming technologies namely: ANDROID deployed by CLOUD COMPUTING. We implemented an android mobile with barcode scanning capability implicitly thereby all the retail stakeholders including server managers, stock managers, invoice operators, customers can just scan the barcode of their desired products and views all the minute details of that product within seconds, displayed on their mobile screens.

We hereby, define 2 major queries in the field of improving the existing retail management system:

(1)Why firms need a Mobile/Cloud strategy? :

Mobile/Cloud computing is about improving internal efficiencies and productivity and improving your sales and marketing channels and reach. There are two aspects to the mobile strategy which includes: (A) In-house mobility and cloud computing initiatives and (B) External use of Mobile and Cloud Computing.

(A) In house mobility and Cloud Computing:

- Reduce error and paper: Processes which have a lot of hand-offs, or paper flows need to be automated using mobile and cloud computing. Examples include: sales processes, logistics, delivery, field work, inventory management, paper management and multi-office/locations integration.
- Multi-plat formed work stations: Having applications available on multi-platforms including multi-mobile handhelds will drive digitization and reduce human errors. The apps can be enterprise wide or targeted at crucial areas [client management, order taking, inventory tracking, sales etc.] Starting small and working towards a larger enterprise idea is usually the best strategy.
- Centralized and scrubbed data: A cloud model will integrate the platforms, the various databases and make the info available on a private virtual cloud network. The data can and must be scrubbed, analyzed and kept pure.
- Workflow: From this centralized repository work-flows, alerts and better management practices can follow.
- Staying competitive: For medium sized firms and above, not having a Mobile-Cloud strategy means that they will become uncompetitive.

(B)External use of Mobile and Cloud Computing:

- Make business applications available to the pro-summer market: Create a useful app for your market. A Starbucks' mobile app for instance lets people make transactions directly with the wave of their smart phone, helping to drive sales.
- Location based services for retail firms. Mobile users become more inclined to sharing their whereabouts via mobile devices, since they are starting to receive ads, coupons and discounts which can drive sales.
- Mobile ads do work: Research indicates that mobile ads perform

about five times better than Internet ads. The most common mobile ads are simple text links and display ads that are sold based on cost per clicks, cost per acquisition and cost per thousand. A business can use mobile marketing solutions to drive participation at exhibitions or to drive traffic to online websites. In any event it is a good way to promote your business.

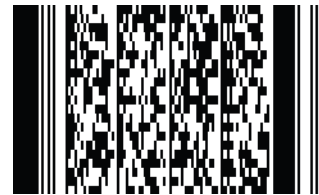
(2)How mobile Barcode Scanning facilitate various Retail Personnel?

Barcodes are part of every product that we buy and has become the “ubiquitous standard for identifying and tracking products”. Traditional bar coding is coupled with the Universal Product Code (UPC) and every day accounts for billions of scans all over the world. Mobile barcode scanning eventually eliminates the need risk of maintaining additional barcode scanner hardware equipments, reduces the cost in purchasing those toolkits. Just by scanning the barcode on the product it displays all the details including the user editable quantity fields, price related to it and offers that currently exists on particular product. Also, after the scan once the product is added to cart and valid payment is done by purchased customer then it can create direct receipts, labels, and invoices quickly and accurately, which can be used as proof of delivery for any future references. They use a variety of label formats, sizes in barcode printing and labeling, provides accurate information and appropriate labels distinctly.

Within the Auto-ID family, a new two-dimensional system of bar coding has evolved which allows barcodes to hold more data than the traditional method. Figures 1 and 2 show the differences Between one and two-dimensional barcodes:



Conventional 1D bar code (Code 39)
Figure 4.Traditional one-dimensional



2D Barcode

Figure 5. Two-dimensional barcode

4. Additional Contributions

A. Apart from scanning traditional bar codes on products, our research supports the scan ability of various other types of bar codes as a result any type of product can be easily scanned just with android handset.

Supported Barcodes: (built-in camera)	EAN-8, EAN-13, UPC-A, UPC-E,	Code 39, Code 93, Code 128, ISBN,	Interleaved 2of5, GS1 Data bar, QRCode (2D-Barcode).
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Table 1.Types of Barcodes

We dealt with the implementation of QR Code which is a difficult task as to enable 2Dimensional data coding. It is abbreviated from Quick Response Code, the trademark for a type of matrix barcode, first designed for the automotive industry. More recently, the system has become popular outside the industry due to its fast readability and large storage capacity compared to standard UPC barcodes. The code consists of black modules (square dots) arranged in a square pattern on a white background. The information encoded can be made up of four standardized kinds ("modes") of data (numeric, alphanumeric, byte/binary, Kanji), or through supported extensions, virtually any kind of data. Its representation is unique pattern as shown below:



Figure 6. QR Bar Code Representation.

Unlike the old bar code that was designed to be mechanically scanned by a narrow beam of light, the QR code is detected as a 2-dimensional digital image by a semiconductor image sensor and is then digitally analyzed by a programmed processor. The processor locates the three distinctive squares at the corners of the image, and normalizes image size, orientation, and angle of viewing, with the aid of a smaller square near the fourth corner. The small dots are then converted to binary numbers and validity checked with an error-correcting code. We implemented android coding to the latest version of QR Code that supports large amount of data to be stored.

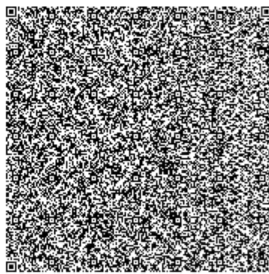


Figure 7. "Version 40" QR Code can contain up to 1852 characters.

B. Encryption using android code:

An Android ^[16] application manages encoding and decoding of QR codes using DES algorithm ^[16] (56 bits). Four-bit indicators are used to select the encoding mode and convey other information. Encoding modes can be mixed as needed within the type of bar code symbol as:

Indicator	Meaning
0001	Numeric encoding (10 bits per 3 digits)
0010	Alphanumeric encoding (11 bits per 2 characters)
0100	Byte encoding (8 bits per character)
1000	Kanji encoding (13 bits per character)
0011	Structured append (used to split a message across multiple QR symbols)
0111	Extended Channel Interpretation (select alternate character set or encoding)
0101	FNC1 in first position
1001	FNC1 in second position
0000	End of message

Table 2. Encryption 4-bit codes

C. Dynamic mapping of stores: We extended the application to facilitate the customers to map various nearby stores dynamically from the location where he stays. When the customer clicks on map button, instantly he is directed to view various stores with their complete details along with all their supportable products within the store.

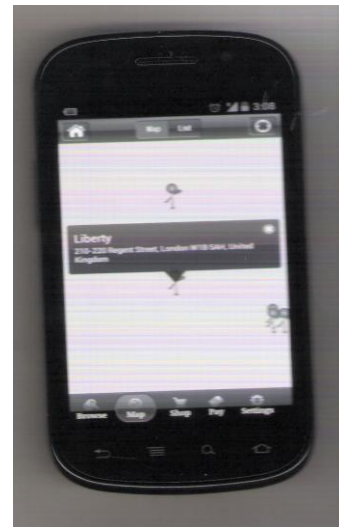


Figure 8. Display mapping of various stores.

Customer can now view and map all related stores and when selected a particular store, it displays whether the network provider is active/passive depending on the time zone when the customer had requested. And if it is active state, he can select all the desired products and purchase his order through mobile payment options provided by our code.

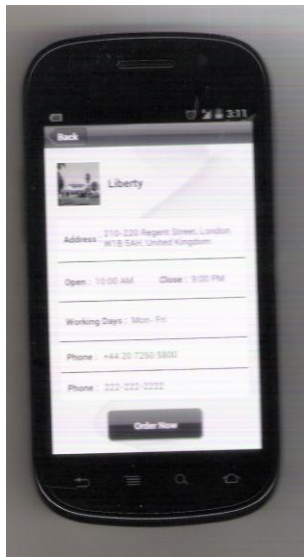


Figure 9. Display the store details when targeted by customer.

5. Results

(1) We provide real time information for the order such as, when the order is placed and when to dispatch it. This helps in managing business efficiently and improving customer service by providing on time delivery.

(2) Complete retail transactions are supported by our product.^[7]



(3) Developed Android code^[17] which supports all different formats of barcode and if found any mismatch, while scanning barcode, it displays ITEM NOT FOUND, exception statement



(4) Customer enjoys easy purchase and payment through mobile handset without involving any electronic transactions and in turn receives an invoice receipt on his mobile screen and can even save a copy of it by sending to his mail.^[6]



(5) Customer can just map to his nearby stores available at point of browsing and if wishes to purchase products from that store instantly get connected to store server and his details are displayed on server mobile. If he is authorized to that particular store, server permits to purchase products and proceed to payment services, everything done just through mobile handset itself eliminates overhead involved through electronic transactions.

(6) Payment of bill can be done by all types of pay cards, smart cards supported by Android application.

(7) Provide unique way of selling:

With the help of our cloud solutions, companies have invented unique ways of selling products to consumers and different businesses. Previously there was a phenomenon of people buying from people but now cloud has changed this phenomenon, people are moving towards online transactions. Cloud will facilitate the retailers to put

their offerings online and also offer free online versions to the customers to develop a closer understanding of customers. Through this technique retailers can expect that customers using free online version will eventually shift to paid versions with more features.

6. Conclusion

Our proposed work had resulted in the development of new android software which integrates mobile/cloud strategy and barcode scanning are very useful especially in the competitive global business environment, which is using technology as a driver. The work, which is done manually with huge effort, can easily be done now using mobile barcode implemented with accuracy. As a whole, using this application enhances the productivity by recording and presenting accurate inventory information. The cost for not engaging in Mobile and Cloud computing can be quite high, including the threat of extinction as market actors which embrace technology to drive productivity and reduce cost structures, improve their chances at taking market share and adapting to market changes. This product when deployed by cloud server promises to give you what you actually want in stores. Sometimes, a product is short listed on internet but when it has been searched in stores, it is found that stores do not keep these products because they are website bound, but with the help of cloud one can purchase products with the stores who are connected to web browsers.

We conclude the impact of our product scale to meet business growth with a flexible platform that helps you adapt efficiently to mid-market business requirements and drive a lower total cost of ownership. Respond quickly to customer needs with efficient, personalized service, get immediate access to prices, availability and stock location with a customizable POS screen to handle multiple tenders and partial payments at checkout, quickly create and process returns, back orders, sales quotes, work orders. Deployment of our android product chain-wide and keep the same retail management software and systems as your business grows into multiple stores and retail channels. As you add customers and products to the system, flexible SQL LITE Server database technologies can store and manage virtually unlimited amounts of information. Customize data fields to track information you want to see about customers,

inventory and suppliers. Track item movement and supplier histories, quickly generate purchase orders and add items on the fly just by optimizing our novel mobile barcode scan technology.

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