



Barcode Enabled Event Management System for Logistics and Consumables Management

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Abstract - Event management has a complex set of processes which involve registration, secured venue access, real time stock taking of consumables and crowd-management. A system that integrates all these requirements is scarce. Hence, there is a dire need to build an automated system which can cater to the needs of any event management. In this paper, we propose the use of an integrated barcode system for event management to ensure smooth and quick registrations of participants, real time stock-taking of consumables and providing exclusive secured venue-access.

Keywords - Barcode, Event management, Automation, Real Time Information System, Secured Access, Consumables monitoring system

I. INTRODUCTION

Events that are organized across the globe often attract large crowds. As the number of people attending any event increases, the complexity associated with handling registrations & venue access at various entry and check-in points also increases. More often than not, the number of people attending the events far outweighs the number of personnel assisting in registrations and event management resulting in long queues at registration counters. This is usually because of the use of incompetent technology solutions, manual data entry and sometimes paper based entries as well. Such an approach is often ambiguous and hence results in problems such as data inconsistency, loss of data, redundancy, duplication, insecurity of data, and unavailability of data across different verticals. Another important issue is that these models are not scalable.

Therefore, to enable scalability, there is a dire need to embrace appropriate technology solutions, eliminate the queue system, thereby automating and securing venue-access. We propose the use of an integrated barcode system for event management to ensure smooth and quick registrations of participants, stock-taking of consumables and providing exclusive venue-access. This would be an effective solution as each barcode provides a unique identity and is a faster, more efficient and secure solution. Also, barcode readers are inexpensive, easy-to-use, handy equipment as compared to bulky sheets of paper. In addition, this system would help by providing real time data logging and interpretation, thereby increasing visibility of information to the event management personnel enabling them to make the right decisions at the right time.

II. REVIEW OF LITERATURE

Radio Frequency Identification (RFID)-based quality management system functions as a platform for gathering, filtering and managing, monitoring and sharing quality data. The integration of promising information technologies such as RFID technology, mobile devices (PDAs) and web portals can help enhance the effectiveness and flexibility of information flow in material test management (Lu Chang Wang, 2008). The RFID technology and its data management challenges have been reviewed. There are research problems faced in data capture layer and business process layer under the RFID data management layer and there is a need to propose the inference rule materialization in order to achieve better query response time and also use lineage tracing process to trace back the history of inference rules in order to find the source of uncertainties (Roozbeh Derakhshan, 2007). There are various advantages and disadvantages of using Barcode in Supply Chain Management (SCM). Based on a comparative study (L. McCathie and K. Michael, 2005), barcodes play an important role in SCM by streamlining inventory management practices. Barcodes eliminate the need of manual data entry, thereby providing automation throughout the supply chain, wherein the information collection and its processing is greatly simplified and hence the speed and efficiency is amplified. Data can be recorded in real-time and accuracy is maintained. Barcodes also help improve effectiveness of labour and therefore contribute to cost-cutting. Based on a study of a large number of manufacturing plants (Paul M Swamidass, 1998), organizations who are users of barcode in their manufacturing plant process showed greater profitability as against non-users of barcode. In addition, using barcode



technology helps in manufacturing cost reduction, quality improvement and cycle-time reduction. This however varied based on the skill levels of various barcode users. Barcode systems have been used before by employing wristbands in order to improve patient safety in hospitals (Zebra Technologies, 2013). They reported that use of barcodes guarantees accuracy in patient information and keeps system error free. The barcode contained two forms of information to identify patients: patient name and identification number. Applications can be used to perform tasks like identification, data collection and tracking purely based on the barcode data. They inferred that due to time savings and accuracy of barcodes, use of barcodes in any environment is a beneficial option and fosters productivity. The decisions to be made before creating the barcode ids and ensuring its uniqueness are also highlighted in this paper. They are: the kind and type of information to be included on the ID, and the kind of barcode to be used for encoding the information, e.g.: 1D or 2D barcodes. The use of Auto-ID system such as 2D-barcode and Radio Frequency Identification (RFID) system may be used for a conference (Kullaprapa Navanugraha, 2010). These systems are used to manage the conference sessions, observe the participant behavior, and record their interests. The authors also portray the advantages in using “RFID in UHF band” than 2D-barcode where former would need no personnel while the latter would need personnel to control the barcode reader.

III. OVERVIEW OF SYSTEM ARCHITECTURE

The system architecture proposed, as depicted in Fig. 1, features the following: Barcode ID Tags, Barcode Reading Devices, Staff Interface, Administrator Interface, Registration Interface, Registration System, Venue Access Authentication System, Seat Allocation System, and Consumables Monitoring System, Servers, a Database Server and a Data Logging system that logs all activities. A backup is periodically taken and stored in a Replica Database Server.

Anonymous users register for the event using the registration interface where they share their personal information and other information that may be deemed necessary for the

event. This data is stored in the Database Server through the internet using the Registration System over the internet. A seat allocation system intelligently allocates seats based on the categories of delegates, speakers and other attendees depending on the availability of seat in that particular category. In case of unavailability, this system tries to accommodate the seat in a higher category. If this is also unavailable, then the priority seats in the delegate category are automatically allocated.

The staff interface provides a medium with which the barcode data is collected from the ID tags using barcode readers and is forwarded to the servers for further processing across the internet. Staff and other team personnel deployed at these counters may either validate venue access using the Venue access system or manage consumable stocking and deployment using the consumables Monitoring System. A reply is received to confirm whether the delegate is authorized for that activity. This reply has been facilitated using AJAX to ensure quick response and not reload the whole website, thereby reducing data usage for each transaction.

An admin interface interprets the data being collected to the administrator and key personnel and provides real-time information to this team helping them make timely decisions.

IV. SYSTEM FUNCTIONING

The system functioning may be divided into three parts that comprise of a client side, a medium and a Server cum Storage unit. Clients to this system may be either anonymous users, administrators, counter-staff or any individual who makes a request to the server.

This request travels over the network and accesses the process modules that are hosted on the server. These include Registration process module, barcode generation process module, ID card generation module, Venue access module, Seat allocation module, Consumable module and Data logging module. Data associated with the functioning of these modules are constantly fetched and stored in the Database Server.

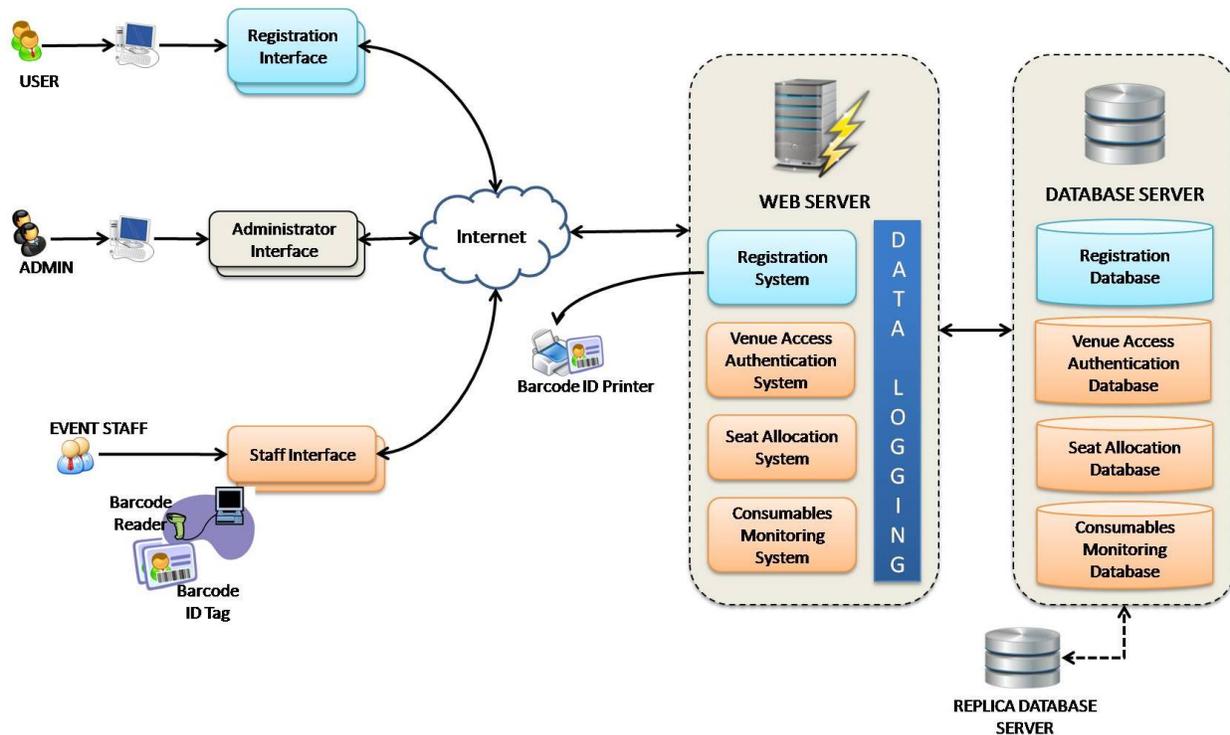


Fig. 1. Overview of System Architecture

A. Registration Process

The registration process is initiated when the person registers online by providing his/her personal information along with a photograph that may be used to generate the photo-barcode identity card. This personal information would include user's personal data, preferred venue or speakers and consumables data such as merchandise and food preference data. People requiring housing or accommodation provide their requirements during registration. The accommodation process automatically allots room based on the delegate level and the payment made. The registration data is securely stored in our Database Server using md5 algorithm [1]. After submission, an automated confirmation email containing a link and a unique id is sent to the registered individual. On clicking the confirmation link, the unique ID that is stored in the database is deactivated and a unique registration ID is generated, indicating the end of registration process.

B. Barcode Generation Process

The registration ID generated during the registration process is encrypted using playfair cipher encryption technique [2]. We use this encrypted ID as the barcode data and the barcode is generated using a server side script.

C. ID Card Generation Process

A template for the ID card is created using server side scripts. Using the registration ID as input, we retrieve the profile details and photograph from the user database. This data which includes text and photograph is automatically resized to a specified value and placed at the appropriate coordinates on the ID card template. After this, we export the ID card template as an image file for easy printing.

D. Venue Access Process

The venue access authentication system is to check whether the user is permitted to enter the assigned venue. Personnel present at strategic locations equipped with barcode readers are responsible for verifying the authenticity of the users. In addition, it checks and permits access based on pre-defined levels of personnel clearance. This enables certain areas to be restricted only to select category of staff or personnel.

The venue related data consists of the venues allotted to the event, seat availability in each of these venues, number of entry or exit points at the venue and event personnel allocated to manage the venue. The station operator logs in to the event management system using his/her credentials to start the process of venue access authentication. When an individual approaches a security check point, the station operator uses a barcode scanner that has been interfaced with the event management system, to scan the barcode present



on the individual's ID card. The event management system searches the registration ID retrieved from the scanned barcode data in the user database. If the registration ID is matched, the station operator clears venue access for the newly authenticated individual and the system automatically records the time of entry.

E. Seat Allocation System

The seat allocation system is to check the seat availability in the event venues based on its capacity and also to accommodate the users based on their category such as speakers who may need to be seated in the first few rows, followed by media personnel or in any customizable order deemed fit by the event management personnel. In case of unavailability, the system automatically upgrades the seat category and rechecks for availability recursively until a vacancy is found and allocated. In case no vacancy is available even after recurring upgrades, a recursive attempt to allocate priority seats of the downgraded category is made until a vacancy is found and allocated.

F. Consumables Monitoring System

The consumables monitoring system is used for monitoring distribution to authenticated users only and analyzing the availability of consumables at various counters. The consumables data consists of real-time merchandise availability, food venues, caterer details, the number of food counters, real-time logging of quantity of food available at each counter and user related consumable data such as T-shirt size distribution that may need to be ordered. This process involves station operators to scan the barcode present on the individual's ID card. This is to check three major things – to check whether the individual is an authorized user or not; to limit the authorized individual from accessing the counter more than once; and to enable generation of real-time information of number of people that the counter has catered to and thereby derive other parameters such as availability from this information.

G. Data Logging System

The data logging system is used for analyzing the registration process, vacancies, food distribution, average time of queue, personnel accesses, data update, deletion of data, modification of data and also works with the venue access authentication system, seat allocation system and consumables monitoring system to log and store data in comprehensive format in the Database Server.

V. RESULTS AND DISCUSSION

We were able to deploy the event management system for a fest titled 'India Emerge Youth Summit 2012'

(<http://www.indiaemerge.com>) at VIT University, Vellore. We gathered real world data. Data collected from the event was analyzed and the following observations were noted. The system was used for generating and scanning IDs of over 470 participants.

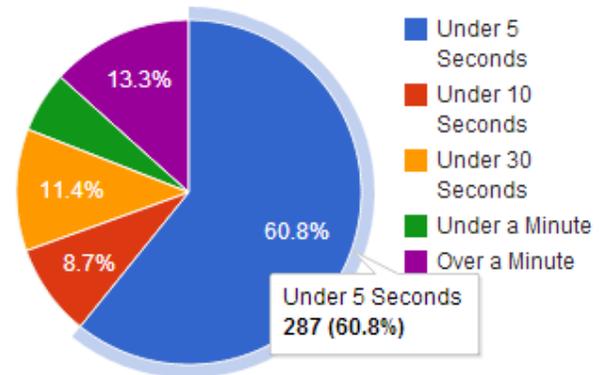


Fig. 2. Average time per user

The average queue time of nearly 70% of our participants were found to be less than 10 seconds with 60% being catered to in less than 5 seconds.

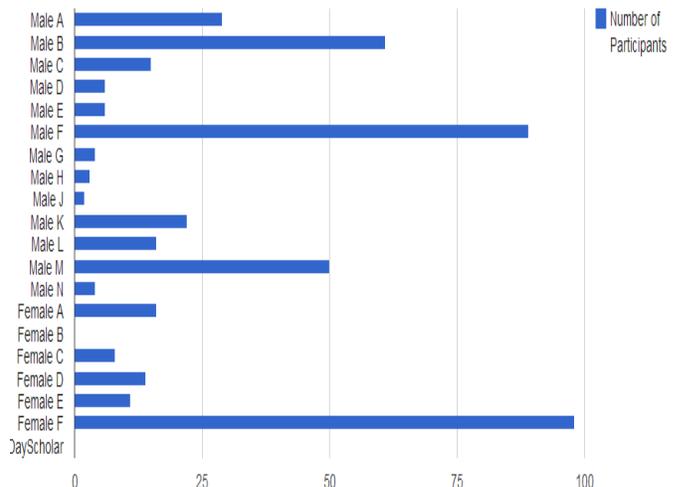


Fig.3. Hostel-wise registration chart

Dorm-wise statistics were accumulated. This helped us understand registration distribution across the campus and helped the team focus marketing and other awareness building activities on those blocks where registration was low. On a larger scale, this may be used to identify awareness of the program from different parts of the locality, city or country as may be deemed fit.

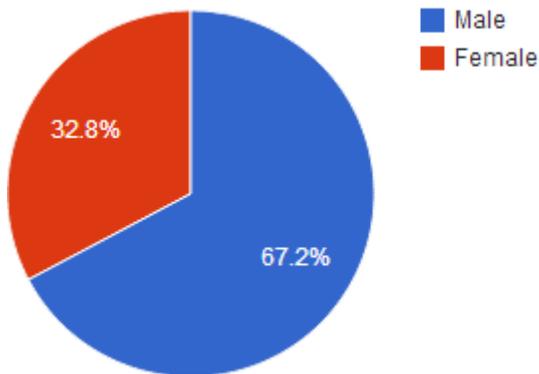


Fig. 4. Male-Female ratio of participants

A male-female ratio comparison helped us understand the distribution of the audience that attended the program and acted as a parameter to analyze the interest level of the candidates and the impact that it had on them.

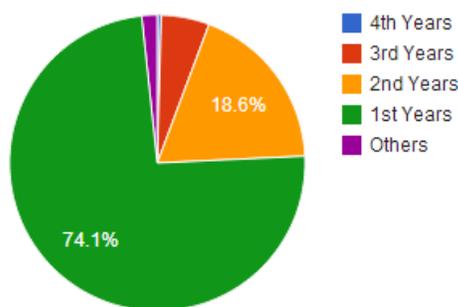


Fig.5. Year-wise distribution of participants

A year-wise distribution of participants gave a fair idea on the age-group of the individuals who attended the summit. This data helped us understand which age-group related with the topic discussed at the summit and helped focus our marketing and awareness building activities targeted at that age group.

VI. CONCLUSION

This paper discusses the importance of using barcode based authentication mechanism for event management. Having implemented this in a real-world setup for a large mass, the event management system successfully helped the organizers and system operators to efficiently manage large

crowds. This system facilitated faster user authentication and hence resulted in reduced waiting time.

This was beneficial in two folds – One, it helped in retaining delegate enthusiasm due to smaller waiting queues and second, it meant that a smaller area needed to be assigned to the venue-access personnel. Unauthorized people were denied access as their data was not found in the central repository or photo verification failed. With the help of barcodes in event management, manual data entry can be eliminated as barcodes help automate the process, use of barcodes ensure speed, efficiency and accuracy; and such a technology solution eliminates paper-work. Data collection is done in real-time; number of personnel required is reduced; training of personnel using the barcode system is easy, thereby resulting in a holistic inexpensive system.

This system may further be scaled up using cloud services for data storage and infrastructure services to avoid single point hardware failures. We shall also work in providing security by using stronger encryption techniques and access polices for protecting the system from any attacks.

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