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IMPACT OF INTERNET OF THINGS (IOT) IN TERMS OF GUEST SERVICE SATISFACTION IN HOTEL INDUSTRY

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ABSTRACT

Internet of Things (IoT) is current talk of the town which is widely effecting hotel industry these days, it is very important to focus out its practical implementations. This study features the multidimensional tasking of hotel industry with the growth of IT enabled services. Hotel industry in current scenario is highly relying on computerized system for most of its operations and management reports. To remain competitive it is very much essential to achieve high guest satisfaction.

Technology enhanced hotel services in various manners starting from arrival to revisit of guest-Tracking guest satisfaction, optimizing perishable resources of hotel, global distribution system, automated energy saving facilities such as Energy Management System, synergistic approach through multi-processor environment etc. Hotel industry involves heavy duty machinery, equipments and end number of operating devices for bulk operations. IoT helps to optimize the devices, equipments and instruments for better yield, for example NFC technology for easy access of POS billing, mobile check-in application for registering complaints and to provide real time status updates.

KEYWORDS: Customer Relationship Managenement,guest loyality scale,Guestwares, mobile computing, Sales force automation, context-aware computation., multi-processor environment, robot butlers, departmental automations.

INTRODUCTION

This article covers the empowerment of IoT services in hospitality sector. Here the important tool to summarize role of IoT is tracking guest satisfation at various level of hotel services. IOT is commonly known as smart connection enabling objects to collect and exchange data. It makes things to communicate with the help of programmed internet features and unique identifier without human to human or human to computer interaction. In this competitive enviroment rendering a quality service is one the challenging task in hotel industry. The departments of operations in hotel runs 24x7x365 hrs in a year. Repeat business or re-vist by the guest and remarkable feedback is a key result of quality services. IT enabled services gradually increased the hotel personels efficiency and performance standard. Most of the tasks or assigned duty are technically featured, online accessed and wirelessly handled. With ease of these features as mentioned, hotel ensures timely services and guest satisfaction. This research article also explores system software included to achieve guest satisfaction and positive on quality services.

Digitalized F&B Menu Functionality: GXP's (GOOD X PRACTICES) rich content management system can be used to build out engaging F&B menus, allowing the guest to browse content in their native language. GXP also import the existing menu data and synchronies updates to prices, modifiers, names, descriptions etc. on an ad-hoc or scheduled basis. Digital hotel directory: Replaced hotel directory and gives guest direct access to hotel facilities including in-room dining, hotel services and local area information. Improve guest experience Guest can order room service and control their room environment through RMS/IPTV (Room Management System/Internet protocol Television) integration. Hotels can also tailoring of messages to the guest is a common application of PMS integration. Restaurant wireless Calling System: Customers press the call button, the table number will be shown on the receiver. Enable waiter to figure out which tables need service. (System, 2017).

Wi-Fi infrastructure: hotel guest who travel with devices such as phones, tablets and computers no longer see Wi-Fi as a perk, but as a must-have when they check in at a hotel. Guest expect to connect to the internet seamlessly without any interruptions, leading hotels to invest in better, faster Wi-Fi infrastructure so that people can do business and use their technology devices with ease when they book their stay .Hotels are also starting to move away from user pay models meant for WIFI need. In the past, hotels charge exorbitant rates informing guest to pay if they wanted to go online. Installing and maintaining a hotel-wide

wireless network may be coupled with costs, but many leading hotel groups have started to install high density Wi-Fi and started to offer in-building mobile phone coverage as Guest have come to expect these services during their stay (not only for themselves, but also for their Guest if they are hosting a conference or function at the hotel). It might not be financially feasible for hotels to completely abandon the user pay model, but many hotels are re-thinking their current infrastructure and pricing models.

Hotel Industry offers Digital conference facilities: Besides being able to offer high density Wi-Fi for conference and meetings, hotel also need to be able to offer access to audio-visual (AV) and digital facilities for conferences. While the amount of AV and digital equipment that goes into a typical conference room is fairly minimal, staging companies are often hired for various projects in order to equip the facility as required. CRM is (Customer Relationship Management) is a core to all businesses, essentially when it is about, selling good products or services of hotel industry. CRM solution is of combination of systems, people, process and strategy. CRM focus on selecting and managing customer, value and loyalty through a long-term relationship. CRM is not a single system but a comprehensive, application architecture consisting of several systems.

It makes sales team more effective by automating tedious repetitive tasks. With CRM, hotel professionals can automate a big chunk of, their daily tasks such as sending out emails, generating reports, organizing leads and so on. With CRM's Mobile access, hotelier has instant access to customer information when they need it, without being tethered to computers.

These are the application mostly involved in business: Software Customer Relationship Management, Customer Interaction Center, Customer Service, Document Production, E-Business Electronic Commerce Electronic Purchasing Executive Information System ,Help Desk Management Marketing Mobile Computing Online Auctions Portals Sales & Marketing Systems Sales Force Automation Supply Chain Automation Telemarketing / Telesales Value Chain Voice Over IP Web Collaboration, Chat, Email. (Rouse, 2013).

NFC-technology

Near field communication (NFC) technology is the next-generation short-range high frequency wireless communication technology that gives users the ability to exchange data between devices. Communication between NFC devices can transfer data up to 424

Kbits/second and the communication is enabled when two devices touch each other, which makes mobile payments (by touching the smart phone to a credit card) an instant, secure process. This technology is also ideal for self-check-ins by Guest at hotels as well as the next trend: smart room keys. Besides payments and an easier way to gain entry to hotel rooms, NFC technology can also be used to personalize a guest's experience at a hotel or resort. For example, advertising can be targeted based on gender and age (so if a child walks by a digital sign in the lobby, the advertisement can change to promote a local theme park or the hotel's kids club) and this technology could also be used to track loyalty points from a guest's use of the conference facilities or room service. This opens many doors for hotels who want to offer a more personalized experience at their establishment.

Robots infrared sensors: Some hotels are already offering more futuristic experiences, with robots delivering any items ordered through room service to a guest's door. A boutique hotel that is nestled between Apple's headquarters and other tech companies, called Aloft Cupertino, has a robot butler called Butler that is able to move between the various floors of the hotel in order to take items such as toothbrushes, chargers and snacks to Guest. These types of digital systems not only make it easy for hotel staff to deliver items to Guest, but it also offers a forward-facing digital experience to people who stay at the hotel. Infrared scanners are now also used to minimize disruptions relating to housekeeping (which is a common complaint from customers). Instead of hanging a 'Do Not Disturb' sign on doors or having cleaning staff wake up traveling Guest with knocks and phone calls, hotel staff can take a more innovative approach by using infrared scanners that will detect body heat within a room and tell cleaning staff that they should rather come back later if the room is currently occupied. (Robinson).

Smart room key: Hotels are increasingly installing smart room access systems that allow Guest to unlock their doors by simply swiping their phones across a keyless pad on the door. Starwood (owner of the Sheraton, Weston and "W" hotel chains) has already upgraded 30,000 room locks across 150 hotels with this system and Hilton will be implementing a similar system at 10 of their US properties this year. In 2016, they deployed the smart room key technology globally. This technology enables Loss and found control which means that Guest don't have to worry about picking up keys and front desk staff won't have to issue new keys in the event that a guest loses their room key. Another innovative way hotels are offering a keyless experience is through fingerprint-activated room entry systems and retina

scanning devices. Retina scanning is even more accurate and secure than fingerprint scans and hotels like the Nine Zero Hotel in Boston installed an iris scan system in place of key cards to control access to the hotel's presidential suite.

Entertainment-on-tap

According to a Smith Micro Software trend report entitled The Future of Hotel In-Room Entertainment; people are increasingly plugging in their own devices for in-room entertainment. The hotel room's television, radio and clock are taking a backseat as travelers use their own technology to keep themselves entertained. An earlier survey by Smith Micro Software showed that 81% of respondents wanted to access to mobile video content at hotel and 55% said that mobile content availability at a hotel influence guest to choose their stay. There is a need to monitor and update the Hotel Information System to meet guest expectation. (Robinson).

Facilities and Operations: Smart sensors in connected devices such as 'smart' thermostats, drop-cams, coffee makers, connected mirrors, robot butlers and smart light bulbs works together to automatically personalize environmental conditions for Guest based on their proximity and movement patterns. Lighting and temperature can be automatically adjusted based on sensor data from IoT devices, it not only increases the efficiency but also eliminates waste. In the airline industry, gate agents can locate late passengers through NFC beacons, expediting departures.

Personalized Service Delivery: Travelers and Guest can experience dramatic improvements in service with the latest 'smart' innovations. Hotels can automatically send electronic key cards to their Guest' mobile devices, providing a comprehensive self-check-in and room key service. Smart locks with NFC readers can allow Guest to restricted access to facilities on demand for improved security. Moreover, for returning Guest, hotels can save room preferences and automatically load them at each visit, ensuring all Guest enjoy a consistent, customized experience.

Logistics and Security: One of the important factors which impact guest stay is security and logistics, the day-to-day business functions of travel and hotel businesses improved through the transport automation provided by IoT innovations. Hotels can track supply chains more efficiently through sensor-enabled shipments, allowing them to plan for any contingency and prevent service disruptions to Guest. Hotels and airlines can also easily and more cost-

effectively deploy security mechanisms in facilities and structures, with centralized management of these IoT-enabled cameras and proximity sensors possible from any desktop or mobile device.

All the abovesaid IoT solutions are available in hospitality market now. Future IoT products and innovations will no doubt bring even more dramatic transformations in the travel and hotel industry. Companies are preparing by incorporating IoT into their current initiatives to take advantage of future innovations when guest arrive. The travel industry and the hospitality sectors embraces this "technology" will ultimately aim to achieve revenue generation and retention.

LITERATURE SURVEY

"The Internet of Things is interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure". Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices is expected to usher in automation.

Source: Wikipedia

RFID-enabled devices are commonplace in today's world and it is applicable them in everyday applications, security tags, room keys and toll tags. The technology is very simple where it broadcast a simple identification number - a sort of unique Social Security number that identifies the tag. For the most part, the short-range capability to transmit an ID is all the RFID-tag does.

The basis of IoT is sort of an "RFID tag for the Internet-age". IoT enabled tags can transmit and receive data by exhibiting some degree of computing power based on the application the tag is intended for. Like RFID tags, IoT tags and devices have low power consumption requirements despite their ability to transmit and receive information using radio communications. But, the most important element of these IoT enabled tags is that they have a unique address that can be identified on the Internet. That makes IoT devices networkable where they can communicate with other Internet connected devices, including other IoT devices, tablets, smart phones, computers and network access points. (Tossell).

With all this capability, an IoT device can not only provide data to a requesting entity, it also accepts instructions and takes actions that it was designed for. For example, an IoT enabled light bulb, oven and refrigerator could report their power-consumption to a central server that, in turn, can transmit back to an app on a consumer's smart phone the hourly cost per that those devices are presently using. The consumer can then set up rules to optimize energy usage:

- Ensure the light bulb is turned off between midnight at 6 AM,
- If the oven is left on for more than 4 hours, send a text message to the owner's mobile phone,
- If there is a spike in power consumption on the refrigerator lasting more than 2 hours, send a text message to the owner's mobile phone.

The possibilities with IoT connected devices are seemingly endless and are especially exciting about how they could be applied in the hotel industry.

Impact of IoT in Hotel Operations: As Discussed earlier the Property Management System interfaces various sections of hotel and enables inter-departmental communication easier. While this study is all about tracking guest satisfaction IoT play pivotal role for hotel personals. Building automation and monitor Energy management services is the first achievement for hotel industry where energy, water and fuel is most consumable resources.

- An IoT enabled power socket could report power usage to the front desk / housekeeping when a power outlet has exceeded a set limit for power consumption over a period of time. This would enable maintenance or housekeeping to go investigate whether there is a problem with something that is plugged in to that outlet.
- An IoT enabled light bulb with a motion sensor and ambient light sensor could be programmed to go into a low power setting when light conditions are bright enough that light is not required. Furthermore, this could be adapted for a nighttime setting that would dim the light until motion is detected and then turn on to the higher power setting to provide additional light.

(Tossell)

Hilton Group experienced IT enabled services as a key to the sale of hotel bed-nights. Reservation systems, depending on the software and sophistication, contain information and generate various reports on room availability, cancellations, etc. In addition, the database can generate forecasts on expected arrivals, departures and rooms sold. Information contained in,

and generated by, hotel reservation systems is an invaluable source of marketing information and can generate mailing lists, client profiles and preferences. It also monitors Hilton hotel performance through the development and processing of guest questionnaires. Reservation systems also allow hotels to carry out travel-agency and tour-operator analyses in order to determine which agencies and operators consistently generate business for the hotels. It is anticipated that eventually GDSs will take advantage of the openness of the World Wide Web (WWW) and develop suitable interfaces for consumers and the industry. Sabre has already launched Travelocity, an electronic travel agency, while other GDSs have announced similar actions or cooperation with travel providers on the Internet. These include World span with Expedia and Amadeus with the Internet Travel Network. (Group, 2017).

The incorporations of sensors, devices, and data into one system gives rise to context-aware computation and enables the environment to respond instantly to change, be it in temperature, light, movement or other factors. This not only brings numerous new opportunities, but also significant cost savings, music to the ears of today's business leaders. Digitalization of information and the impact it is having on traditional businesses. The IoT can enhance the personal experience of customers, who are mobile, connected, and eagerness to have more access and intelligence surrounding them. Hospitality is an industry that can greatly benefit from the coming together of IoT and digital transformation. This includes national brand hotels, luxury resorts, and boutique hotels. If a customer has a bad experience, everyone knows about it. However, if the customer has a unique and differentiated experience, that also spreads like wild fire. (Kerravala, 2015).

Despite these promising applications, the real excitement about the IoT lies in the unknown – in its potential. With this current generation and differentiate it is important to understand between facts and fiction about IOT potential IoT is going to be nothing short of a revolution in the way the world's computing entities work, it's not entirely new technology. In fact, companies have been using it for years. Some connected devices have even been around for far longer than the internet itself, like the television remote!

To truly appreciate the value of something, it is needed to understand it first otherwise it is easy to get carried away by the hype. A number of leading IT organizations have come out with massive projections for the future of the IoT in terms of financial savings and the number of connected devices – unrealistic projections can distort expectations and make it difficult for consumers to comprehend the true potential of this brilliant technology.

As IPv6 deployment continues to rise and more devices are assigned unique IP addresses, the resulting interactions between these devices will forge an environment in which all connected devices can share information and build new connections. This 'neutral' mapping between devices will replicate the network established between websites in the structure of the internet, or on a more intimate level, the human brain.

It is this collective gathering of devices, connections, and the environment in which they reside that form the foundation of what the IoT really is – a world of devices, controlled by devices (with some human input during the early stages).

This is what makes the IoT so exciting for hoteliers. Every single industry in existence will soon be simplifying operations by employing connected devices. This will extend the reach of hospitality businesses far beyond any current technology lets them. Hotels will be able to tie-up with industries as diverse as agriculture & education, simplifying interactions between companies. Connected devices outside and within hospitality would also be capable of synchronizing and working together to streamline Guest' journeys within a cross-industry ecosystem.

Hospitality sector experience 2016 as a year of   exciting technology that makes its mark on global hospitality. It also provides huge energy saving system through its automated features and IoT connected user friendly devices. This survey is about transformation of typical hospitality industry into tech savvy industry. (Sunny, 2016).

IoT connects a chain of places-people-things.

If a hotel is running through a large network there must be probability for a nightmare while monitoring the wealth of assets that involves into this network. Whether it's the televisions, the air-conditioners, the Wi-Fi network, or even the electricity connection – all need to be actively monitored and controlled. This is where Internet of Things (IoT) technology comes into picture. Sensors placed on each of these devices send out regular information about the device as well as receive information and adjust the behavior of the device or appliance accordingly. This technology can be used to monitor and figure out which properties face Internet connectivity or bandwidth issues, enabling the company to take corrective action before it interferes with guest experience. It is observed that in future the tech-savvy chains will also be able to use this technology to check fraud by connecting the electricity supply of

rooms to the property management system such that no one can switch on the lights in a room unless the room is shown checked in on the system. (Kadam Jeet Jain, 2017).

Proposed Methodologies

Methodology includes the qualitative phase of the study on IoT Services. Data collection and analysis for this study were taken from June2015 until May 2016. Data for this qualitative study was gathered using interviews with 15 participants of the Hotel IHG Crown plaza Bangalore. Participants are mostly includes regular visit guest and long staying guest for better understanding and cooperation. The satisfactory level of guest (respondent in the study) is been analyzed for the purpose of conclusion and results of article. The hotel is located in the center of city. The 12-floor Crown Plaza located in Electronics City offer a high range of services and facilities. This downtown hotel designed to meet the comprehensive corporate requirements, IT enabled services and technological featured business. The USP of IHG Crown Plaza is meetings programme to ensure a seamless planning process and exceptional meeting experience. This is made possible through a dedicated Crown Meeting software, Decision Support System , a two-hour response guarantee Meetings Center and more than 6000 square feet of meeting space through a selection of banquets and outdoor spaces.

Crown Plaza Hotels & Resorts participates in IHG's guest loyalty programme, Priority Club® Rewards. The industry's first and largest guest loyalty program with 48 million members. Priority Club Rewards membership is free and Guest can enroll by logging on at priorityclub.com. Involvement of Customer Relationship Management is common practice for tracking guest satisfaction.

Guest loyalty and guest satisfaction were measured using Linkert- type scale, ranging from dissatisfied, neutral and satisfied. The analyzing parameter of IoT impacts on guest satisfaction and services comprise of: IoT services, departmental automations, self-vending devices/guest operated devices and downtime errors as satisfaction elements. A pool of potential interview participants has been generated; firstly contacting hotel's front office personal about in-house guest and long staying guest. The sample for study is guest-in-house and long staying. Incorporating interview questionnaire along with guest comment card, a guest is approached and asked whether they would be willing to participate in the study.For the interview, the participants were asked to illustrate technology enrichment in term of services and also their expectations from the hotels. This information sheet.

Table 1: Description of the Respondents.

Guest	Numbers	Respond %
Female	8	53.00
Male	7	46.00
Age:		
30 or less	3	20.00
31 – 40	7	46.66
41 – 50	2	13.33
71 or more	2	13.33
Visited hotel before:		
Yes	5	33.33
Long staying guest	8	53.00
No	2	13.33
Primarily purpose of stay:		
Business	5	33.33
Leisure	2	13.33
Both business/leisure	2	13.33
Conference	4	26.66
Personal	2	13.33
Nationality:		
Italy	2	13.33
United Kingdom	3	20.00
Indian	8	53.00
US	2	13.33

Profile outlining the Guest details required

Table 1 contains contact information, demographic information, the use of the hotel (e.g., frequency of stays, length of relationship, factors considered in making a reservation, and type of traveler), as well as responses on service satisfaction and loyalty scales Responses were based on a 3-point scale ranging from "dissatisfied" to "satisfied".

Table 2 Following was the measurement of guest satisfaction with the department of reception, food and beverage, guestroom and services. The research conducted an inductive thematic analysis using participant's interview transcripts. The in-depth interview transcripts were read repeatedly until three categories emerged from the data. These three categories formed the basis from which this study is retrieved.

Table 2: Satisfaction Ratings from the Guest Survey (Measurement of Satisfaction Scales).

Satisfaction Elements	Dissatisfaction %	Neutral %	Satisfied %
Front desk / Reception Q1. Online Reservation system/Global Distribution system/Property Management system	0.00	33.33	66.67
Q2. Modern Billing Machine for accuracy /Self Check-in System	0.00	13.33	86.67
Q3. Real time information support system	0.00	13.33	86.67
Guestroom Q4. Scheduled EMS (Energy Management System)	0.00	33.33	66.67
Q5. Guest wares used: Mobile communication, automate staff tasking	6.66	26.66	73.34
Restaurant & Bar Q6. Table wise PDA System	0.00	6.67	93.33
Q7.Kitchen Display Unit-enables guest to eyen on their orders	20.00	6.67	73.33
Q8. RFID Billing system	0.00	13.33	86.67
Service Quality Q9. Preference of Internet based services/ Automated self-services system over other hotels	0.00	6.67	93.33
Guest satisfaction Q10. Overall, how satisfied are you with the hotel?	0.00	13.33	86.67
Q11. How satisfied are you for the value you paid for services?	0.00	6.67	93.33

The basic unit of analysis was a quote commented by participants on the level of satisfaction or a statement made by a participant that expressed a single feeling or idea about hotel's service system design elements.

Analysis of the guest survey: Table 2 summarizes the key satisfaction measures from the guest survey. In areas of operations which deal with IoT and IT enabled services are listed with the guest satisfaction and dissatisfaction of respondents. The guest details of Table.1 clearly denote that the guest is mostly visited for the purpose of business. The nationality is taken under consideration for guest survey which enables to read the Indian markets and growth in terms of hospitality and technology. IHG crown plaza mostly targets the corporate and international profile guest in optimizing the available resources.
(Dinakaran, 2017).

RESULTS AND DISCUSSION

Findings from Table.2 suggest guest satisfaction in relation to core competency areas of hotel; front office depicts the satisfaction (66.67) for its reservation and room booking

system, first point of contact. The IoT connected devices bring in features of Real-time status update of arrivals, complaints and services.

Consequently, hotel Guest perceive satisfaction with the room category and room comfort to be more important than satisfaction with other hotel elements; although the most dissatisfaction was shown to be with Guest ware used in the various section such as in-room entertainment system, Mobile communication and feedback respond system. This means that guest operated devices needs to more accurate and updated for the purpose of filling gaps of service satisfaction.

The findings from this study at IHG Crown Plaza suggest guest satisfaction and IoT (Internet of Things) is parallel proportion to each other which means the more technology based services, context-aware computation, multiprocessor environment and guest operated devices the more satisfied customers. It serves as the measuring unit for tracking guest satisfaction. The hotel service system which involves IoT elements and customer satisfaction with respect to reception, guestroom, food and beverage services and other areas of operations attract business customers. However, the customer's decision to re-visit hotel business is only based on this guest belief of high quality goods and services on best available rates.

The study also showed that percentage of dissatisfied guest is the result of technical nag of IoT services and devices. It is thus concluded that though IoT applications are the best for delivering accurate and automated services there still exist dissatisfactory issues once systems arises with technical nag or downtime devices.

Future Direction

The intentional focus of this article is to understand customer experiences on IoT based services. This involved case study analysis at the IHG Crown Plaza Bangalore. Although the respond rate was low the analyzed data acknowledges automated function provided IoT connected devices. This hotel comes under business clientele downtown hotel. Considering guest participants who had neutral or positive experiences it is observe that staff assisted services are taking a backseat in certain scenario as business and corporate travelers are into technology based services.

Additionally, response survey of dissatisfied guest directs the challenges to the hotel industry to provide highly effective IoT network and devices.

A key characteristic of tomorrow's successful hotels will be the ability to master and accommodate a rapidly evolving range of technology interfaces coming into our hotels in the hands of Guest and staff. As discussed earlier about how augmented reality is blurring the boundaries between the physical and the digital world. At the same time, the hotel lounge of the future will be home to voice recognition, gesture interfaces, heads-up displays, projection screens, 3D displays, touchable holograms and an ever-widening array of interfaces through which we'll display and interact with our computers, phones and data. (Talwar, 2012).

The feedback of survey used in this case study might be used to improve guest experience in future. This survey only studied guest views towards IoT assisted services. The transferability of the survey and findings could be further strengthened by surveying and interviewing hotel professionals and staff members to gain a more comprehensive understanding of the same titled article.

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