Smart Workspace Management System for Real Estate Cost Optimization

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Abstract—Occupancy profile is one of the driving factors in commercial real estate space management, the frequencies of occupants leaving their workspace and the corresponding duration of absences have significant impact on energy use and the operational costs of buildings. Analyzing corporate workspace utilization has been a challenge. Most of the companies monitor them manually by maintaining excel sheets which is very cumbersome and found to be inaccurate.In order to automate this occupancy profiling, sensors have been used to monitor the workspace in real-time. The data is collected and graphical reported which the user can directly take decision on.

Keywords—Occupancy Model, BLE Mesh, Gateway, IOT, Sensors.

I.   INTRODUCTION

Real estate is one which is constantly a growing market. But, the space around us is limited and this directly correlates to higher prices. Analytics in real estate is majorly focused on understanding how people use the space. Three basic key dimensions which is related between real estate and core business Financial asset: This states the economic value of the real estate which can be a fixed asset on company account balance sheet. Physical asset: This states to physical provision of land and buildings which resonates with the professional label of real estate management or property management. Operational asset: It is the space inside the buildings that has an operational value to an organization. Effectiveness can easily be measured by a fall in total occupancy cost. This in turn drives actions to reduce space per workstation, increase people per workstation and increase useable: total floor space ratio.
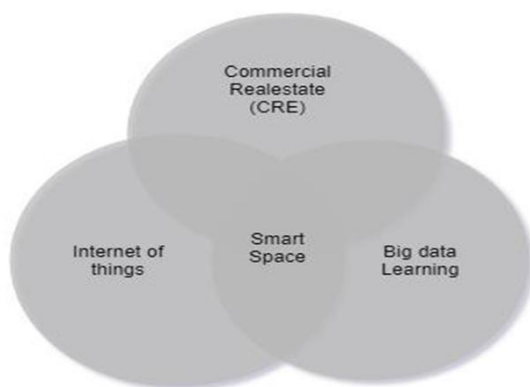

Figure 1.1Correlation between IoT, Big data and Real-estate to create Smart spaces.

Corporate real estate management evolved in the context of service provided to an organization whose core business is not real estate. One of the most important is occupant behavior in buildings, many studies demonstrate that building occupancy profiles have a significant impact on power consumption and the operational costs of buildings. The occupancy pattern defined in the present study is the frequency of an occupant leaving his/her cubicle and the corresponding duration of the absence. However, occupancy pattern can change significantly according to the season, weather, time and personality. The system is automated by using today's trends of electronic hardware like sensors, wireless signals and Internet of Things (IOT). These systems are managed by installing different physics concepts and electronic sensor devices and many innovations on activities of employee's workspaces, those are advantageous in utilization of hired hand in workspace or a workstation to full radius. The main idea of study is to analyze the data from the sensors which are in time series format and give out patterns and insights in the workspace utilization. This is achieved usingMapReduce to aggregate time series data into informative patterns which tells how the workspace is being used. Further these data can be linked with other meta-data such as different zones or business units to provide in detail usage of the zones, which help the user understand how each team/zone/business unit is performing. This helps people understand how effective workspace/floor/building is being utilized, using which they can take a call on how to realign their employees or workspace for effective utilization. The results of this study are based on real estate as it is largest budget line item for most business as these businesses have very little quantitative data as to how their space is being utilized. But with these sensors and big data analytics we can have accurate data about utilization of the workspace.

II.   RELATED WORK

Vergesense Optimize your workspace with AI powered utilization analytics. Room and desk utilization which is used to measure utilization rate across various facilities like, from conference rooms to private offices, to co-working areas. Sensors are accurate to the desk level activity. Connect your work environment with optimize work sense, turn office into digitally enabled, socially connected work environment with the IOT based

optimized work sense platform by rapal. Osram's Encelium light management system and lightelligence cloud offer an ideal platform for solutionsfor real estate initiatives.

III.   METHODOLOGY

Aggregating time series data to convert it into pattern insights, time series insights is built for storing, visualizing and querying large amount of data, such as that generated by IOT devices, in other words time series is a series of data points indexed in time order. Most commonly a time series is a sequence taken at successive equally spaced points in time.

As far the hardware part is concerned, the product hardware consists of processor and a communication module. Camera component which has a resolution of 5MP is used, the Field of View (FOV) being 72 degrees. Processing is done on a single board computer which has quad cores and clocked at 1.4 GHz communication is through a wireless module. The product shall be mounted on wall/ceiling depending on the requirement. It can cover an area of around 250 sq. ft. when it is mounted at a height of 8ft. The functionality of the above hardware is described as follows the product shall capture an image and process the image using Deep Neural Network (DNN) algorithms to count the number of people in the image. This information will be passed on the host through the Bluetooth interface. Data received to the host shall be pushed to the cloud server and will be used for analysis. It is to be noted that device does not store any image for privacy reasons.
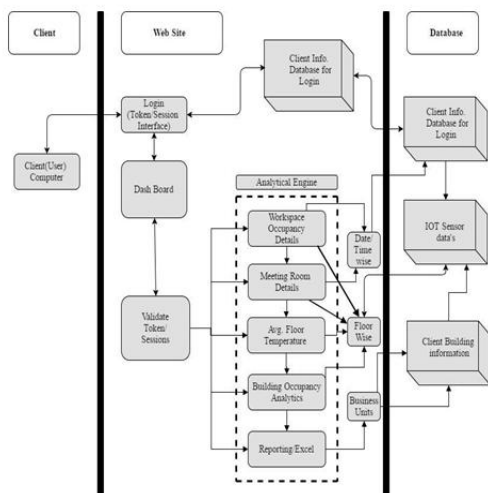

Figure 3.1System design for activities-based workspace management system.

Activities based for workspace management system is used to know where work space is unutilized and what time generally it is free and to produce various sort of charts like peak hour occupancy and hour-wise chart. On work area, table and floor or building where devices are

installed, by automating the management of whole building and step by step into floors, layouts, grouping of floors into different parts. Figure 2. Represents the system design activities which is divided in three parts that is clients, web site and database. The study is implemented using MEAN stack technology.

Figure 3.2. IOT Stack or Baseline solution

Real-time customized data with our patented sensor technology. Secure and independent of the city's IT network. Plug and play wireless mesh, easy to retrofit and fully managed service. Self-learning from data for smart control, predictions and recommendations. API that integrates easily with workspace systems.
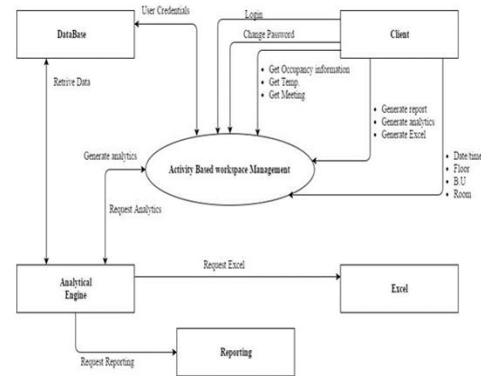

Figure 3.3. Context diagram for activities-based workspace management system.

IV.   RESULTS AND DISCUSSION

In today's workspace management activities, which consists of corporate areas is found to be very hectic job, so to optimize the same and to increase efficiency in maintain the real estate this study is implemented. This fundamentally tries to overcome these hurdles smartly and focus on achieving the best efficiency seat occupancy as much as possible. It should include important findings discussed briefly. Below is the example of rooms available in each floor and the statistics of floors available in each room is given. Figure 4.2. Represents the occupancy data of monthly data, where x-axis represents the time or days

and the y-axis represents the percentage of seats filled in the workspace. Figure 4.3. Displays the hourly occupancy pattern with the given datasets.
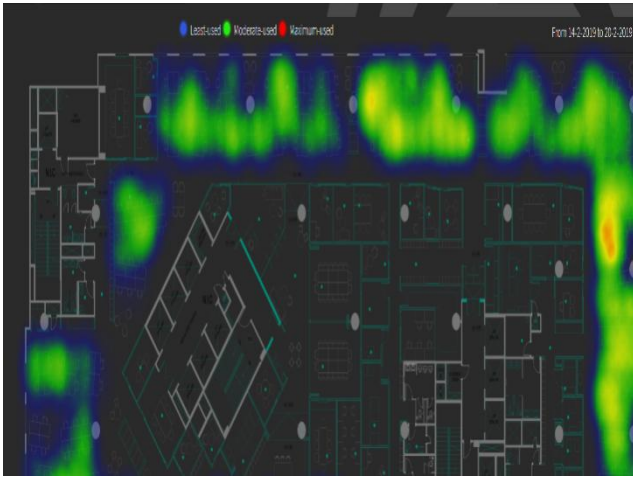

Figure 4.1. Heat Map of Floor Occupancy

As per the knowledge, companies don't have any reports about utilization of workspace management. So, plans for using advanced reports to be focused on areas like workspace is underutilized. By making more intelligent workspace, where work area is constantly ready to put the names down the desk as they require and are not left vacant, users can cut down the required space up to 30%. Using mongo DB aggregation which uses map reduce for processing the data which consists of large volumes of data into useful aggregate results. The workspace uses the hybrid architecture where all hosts sends the sensor data.
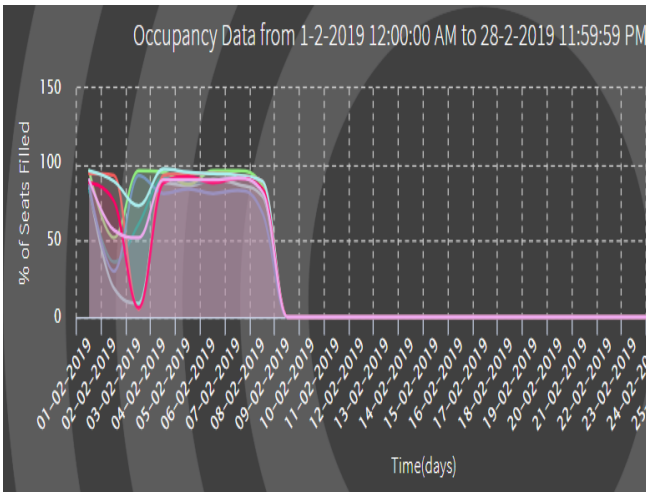

Figure 4.2. Occupancy pattern for monthly data.

Space conflicts can be cleared by detailing, who are occupied and exact time they use of that work space. This agree to users to know when they are finished the work and to free the space. Figure displays the occupancy pattern for weekly monthly and custom data where the chart displays the number of seats filled versus time data. The mountable database and in-built administration tools allow to adjust the activities-based workspace management

software to the changing demand of corporate on business and making sure that investment is safe.
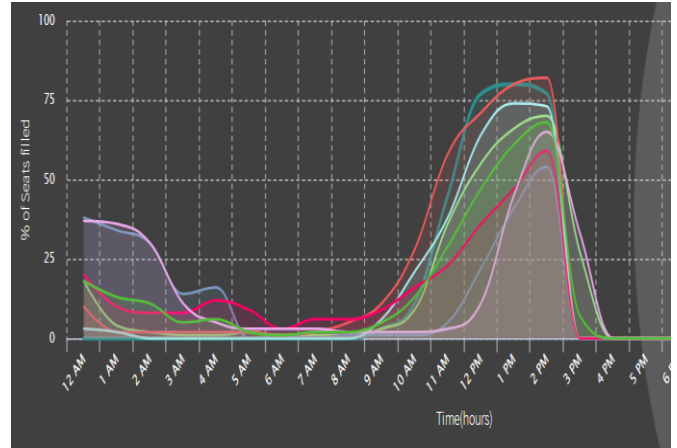

Figure 4.3. Displays the hourly occupancy pattern with prediction.

V. CONCLUSION AND FUTURE SCOPE

The study is focused on using real-time analysis to improve real estate efficiencies and reduce operating expenditures for real estate managers. Hence based on analytics and insights provided the usage of the space can be optimized and thus reducing the real estate cost of the company. As limitations is concerned the progressive growth of hardware space has created solution which help personalize the space around them. But this needs change in local regulatory laws to define physical tracking of humans. The future scope is to collect data in these systems which will eventually define how future cities and buildings are built. The use of real time occupant tracking will change the course of urban cities, with advent of mixed reality occupants now experience things in real time globally.

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