Research Methodology

Which of the following describe your industry of work?

Which of the following describes your job profile?

Describing IoT and its impact on asset management?
   a) IoT Description
   b) Significant benefits of IoT
   c) Most effect of IoT on Asset Maintenance Management
   d) Factors accelerating IoT benefits

IoT implementation by organisations

Decision making responsibility for IoT in the projects

Responsibility for IoT implementation in projects

IoT implementation possibility in commercial buildings

Return on Investment for IoT procurement by the organisation

Skills to be learnt by team or person

IoT data breach possibility

Benefits and Suggestions
   a) Benefits of IoT for end user
   b) Suggestions to students and professionals

Summary

Key References
Asset Maintenance Management in Commercial Buildings plays a vital role in optimizing the asset life cycle and performance enhancement of equipment. Present day asset maintenance procedures can only statistically register the asset information where it can neither provide the dynamic data nor the timely data for the life cycle assessment, this leads to a gap and thought process regarding the need for asset management systems to have intellectualized and automated way of managing.

It is seen that the process of Asset Maintenance Management is becoming obsolete with the planned and reactive maintenance strategies. The risk involved in their implementation procedures are causing the breakdown of equipment and higher costs incurred in labour and spare parts maintaining for the commercial building Facility Managers and for the owners in the capital and operation expenditures budgeting.

To overcome the gaps and achieve successful Maintenance Management, a better design of information management of the system is to be considered which does not only handle the data archiving and recovery, but also helps as a better data analysis tool. This can be carried out by Internet of Things(IoT) within Commercial Buildings as they can lead to the innovatively development of more efficient systems which aim to increase operating life, cost effectiveness, optimization and higher performance of the assets.

Asset maintenance through Internet of Things makes the process of device information intelligent, establishes the signal sample and knowledge database, running status of complex equipment, provides analysis, fault diagnosis and prediction of assets to avoid an extended equipment maintenance cycle.

Building management systems(BMS) or Building Information Modelling(BIM) is supported by Internet of Things to improve the performance of the smallest part of building facility/asset using protocols to connect all the sensors and devices in the facility to exchange, analyse the information by sending to cloud computing and through data analytics.

IoT can create vast opportunities to integrate different systems/assets to form intelligent commercial buildings which can operate more efficiently with a low level of risk, reduce costs and increased service delivery for occupant enhanced experience.
A detailed and comprehensive study is carried out to determine how the Internet of Things can be used in commercial buildings for the enhanced asset maintenance management and the impact Internet of Things will have in the asset maintenance management. This research is the holistic approach which has taken feedback by considering the responses of different individuals working in various sectors of the physical asset management field.

The responses show that most of the professionals, experts feel and believe in Internet of Things will have a good influence in asset availability and maintenance management with reduced costs for labour, energy and spares. These results indicate that the vision to adapt new technology for improved asset management and for the organisations to transform themselves to sustain in a competitive market.

RESEARCH METHODOLOGY

Asset maintenance management with Internet of Things in commercial buildings is very much subject to the levels of performance, efficiency, energy savings and optimization of the equipment used in the facility, also the organisations are catching up with its implementation; an approach with the professionals working for it or applying it in their organisations are kept in mind to know the reality of the levels established.

A self-administered online survey questionnaire was carried out among the professionals working in Facilities Management and fields whichever relates to Management of Assets (Property Management, Real Estate, Workplace Solutions). Here the Survey Questionnaire showed the statistics to formulate ideas for the applicability condition of the research topic. This strategy is not only the perception of the reality, but also increases the reliability of the results.

The data from the survey is collected in the closed question format, which encourages short answer. This included the non-mandatory question of name and respondent organisation (allowing the confidentiality of personal anonymity). Then the questions are pushed with multiple choices and ‘if other please specify’ options; an opportunity for individuals to avoid the constraint of rigidly answering only within the specified options and of selecting multiple options too. Lastly, two open ended questions are asked to respondents on IoT implementation and learning skills to know perceptions and knowledge gaining insights from their opinions.

In total 51 participants responded to the survey questionnaire.
WHICH OF THE FOLLOWING DESCRIBE YOUR INDUSTRY OF WORK?

- Facilities Management
- Real Estate
- Property Development/Management
- Education
- Security Services
- Energy and Sustainability
- Catering and Hospitality
- Health care and FM consulting

WHICH OF THE FOLLOWING DESCRIBES YOUR JOB PROFILE?

- Technical Director
- Operations Manager
- Projects Engineer
- Chief Executive Officer
- Managing Director
- Senior BID Manager
- Head of Facilities Management
- General Manager
- Masters Course Director
- Chairman
- Directors
- Consultants
- Non Management
DESCRIBING IOT AND ITS IMPACT ON ASSET MANAGEMENT?

a) IoT Description

11 (21.6%) respondents believed IoT as the Operations Technology, 6 (11.5%) considered it as the Information management tool, 29 (56.9%) considered it as both (i.e. Operations technology and Information management tool) and others considered it as the phenomenon that devices are connected, Integrating tool, Disruption of conventional sector process, Interconnection, Integrated technology infrastructure.

b) Significant benefits of IoT

Most of the respondents considered multiple options, among them 38 strongly believed that it has the major benefit of the Improved data and information, 12 considered it for the Costs savings potential, 14 considered Sustainability and 27 as Efficiency, others considered it by stating the benefits for More effectiveness, Holism, Mandatory to control the Facility, Trusted Benchmarking and Predictability of activity.
c) Most effect of IoT on Asset Maintenance Management

With the multiple option selection, 33 respondents considered IoT had the most effect on Asset usage optimization, 28 considered to take a Real time decision, whilst 23 Human intervention and others responded by selecting option 'other' with the more possibilities to achieve maintenance, Better alignment of building with human, Better informed decisions, Improved quality of service delivery.

d) Factors accelerating IoT benefits

25 believed that Interoperability is the factor which would mostly accelerate the benefits of IoT for managing assets, then followed by the numbers 19 with Energy saving potential, 19 Lowering barriers of operations, 17 for Networking then rest of individuals by choosing option 'other' specified it as; Having a vision for Intelligent use, Predictive Maintenance capability/life, Coherence and Low cost of field devices.
IOT IMPLEMENTATION BY ORGANISATIONS

For Organisations implementation of IoT in their projects; 28(54.9%) respondents replied with 'yes', 18(35.3%) with 'no' and 5(9.8%) considered 'not sure'.

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<th>Yes</th>
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<td>54.9%</td>
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DECISION MAKING RESPONSIBILITY FOR IOT IN THE PROJECTS

For decision making responsibility in the case of organisations using IoT in their projects; multiple options are considered by respondents; 27 opted Higher management, 17 Middle management, 11 On site and a few others by selecting option 'other' considered it as the responsibility by the Researchers, depending upon the specifications of Bill of quantities, Assigning responsible for internal team.

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RESPONSIBILITY FOR IOT IMPLEMENTATION IN PROJECTS

For the responsibility of implementation of IoT in the projects, multiple option responses are received; 37 considered, it is the responsibility Facilities Management team, 19 by the IT team, 2 respondents chose both, by selecting option 'other' individuals considered it as by the Real Estate and Management Department, depending upon the project, considered partners in combination with a Facilities Management team, Client/Consultant and Technical support department.

IOT IMPLEMENTATION POSSIBILITY IN COMMERCIAL BUILDINGS

For the possibility of IoT implementation in Commercial Buildings by the organisations, 45(88.2%) considered it as 'yes', 3(5.9%) as 'no' and 3(5.9%) as 'maybe'.

Yes 88.2% No Maybe
RETURN ON INVESTMENT FOR IOT PROCUREMENT BY THE ORGANISATION

For the possibility of return on investment for the costs incurred in procuring IoT by the Organisation; 39(76.5%) considered it as ‘yes’, 10(19.6%) as ‘maybe’ and 2(3.9%) considered ‘no’.

SKILLS TO BE LEARNT BY TEAM OR PERSON

Multiple options have been chosen by the respondents for the skills to be learned by the team or person in successful implementation of IoT for Asset Maintenance Management; 15 respondents considered Data analytics, 14 Information management/technology, 11 considered Facilities and Operations management, 27 all the three (Data analytics, IT/management and Facilities and Operations management), and by selecting option ‘other’ 1 responded as Engineering or Technical understanding and 1 ideally all the options.
IOT DATA BREACH POSSIBILITY

For the data breach possibility in IoT of the assets, 34(66.7%) considered it as 'yes', 4(7.8%) as 'no' and 13(25.5%) considered it as may be.

Yes 66.7
No 25.5
Maybe 6.7

BENEFITS AND SUGGESTIONS

a) Benefits of IoT for end user

Respondents are asked with the open end question of IoT benefits for the end user. 36 responses are received, the prioritized options among them are; Greater ability to control the work environment, Makes the management informed about the asset condition, Better integration gives the optimised operational performance, Real time data availability, can monitor the assets and take necessary actions which drives efficiency and profitability, Costs saving by reducing Maintenance activities with predictive actions, for the best customer experience.

b) Suggestions to students and professionals

32 respondents suggested for the professionals or students who are interested in IoT must focus much on IoT real time operations, applicability and holistic approach (with life cycle), to look beyond the technological point of view for workplace solutions and customer satisfaction, Learn the capabilities of BIM, CAFM, CMMS integration with IoT by attending seminars, webinars, conferences and internships.
Summary

The research concludes that in the Commercial Buildings a gap is created between assets and their performance, which is causing the traditional maintenance strategies to fail.

From the reviews, it is seen that the Internet of Things usage for Assets Maintenance Management can pre-empt predictive maintenance schedules to reduce regular maintenance and can reduce the downtime for better uptime and availability of equipment. By leveraging IoT, regular maintenance can be transformed into an equipment driven strategy with real time data availability and analytics. Here, smarter assessments of the service needs can be easily done with IoT, the data available will allow the user to know the health condition of the asset and what is happening with it. This also enhances the continuous monitoring of the assets for maintenance with accurate forecasts of issues which may arise.

The core business activity of any Commercial Building is to generate profits by customer satisfaction and to have business continuity, IoT makes the buildings, intelligent to reduce energy costs and boosting the efficiency of assets for increased life span which indirectly saves costs and improves performance supporting the core activity. This is making the Commercial Building owners and Facilities Organisations to adopt IoT which enables the BMS to track the asset maintenance information from the new building by the sensors or from the historical data stored to enhance the occupant comfort and experience to allow the facility to be maintained pro-actively.

It could be a tremendous opportunity for the Commercial Buildings Facility Managers to have better control of end devices, communication and rich ecosystem for continuous monitoring and analysis of the systems.

However, there is still a dilemma about cloud-based analytics implementation platforms suitability with the asset data and IoT Data protection is still skeptical, even by providing secured platforms; the data breach possibilities are getting more priority based upon the happenings in the world of hacking and breach in major IT and social networking industries. There must be an exhaustive study to be carried out by the professionals for the assets data protection and confidentiality.
It is clearly understood and accepted that the failure of asset maintenance leads to downtime, this can be only avoided by research and analysis of assets historical performance including the study of availability, failures of equipment. The successful implementation of strategies to improve the performance and efficiency is only possible when the facilities and personnel are ready to adapt the changes in the technology.

**KEY REFERENCES**


Prashanth Bethi is the recent MSc FM Graduate from Heriot-Watt University, with prior work experience as Project engineer and Operations trainee. His passion and interest in the service industry driven him to choose FM as professional career from his Bachelors. He also holds a Post Graduate Diploma in Energy Management.

He is IFMA 2018 Foundation scholarship recipient and active Committee Member of IWFM (Formerly BIFM) representing Millennials in the UAE Region. Currently he is looking to advance career, his strategic thinking, decisiveness and leadership thoughts are an added value and can be asset for the organization.

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