USING INTERNET OF THINGS FOR HERITAGE MONITORING AND MANAGEMENT

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ABSTRACT: *Abstract— The internet of things is an interconnection of a number of physical devices so that they are accessible over the internet. The current drift into the internet has slowly led to the developments in adding every device into the internet so that they can be controlled remotely. So many devices have been added to the internet by the users to facilitate proper functioning of desired outcomes. With the rising discoveries of device that can be connected to the internet and the dropping costs of connecting to the internet, too many "things" have been continuously added to the internet for use. The ipv6 addressing mechanism has made it possible to have enough IP addresses for almost each and every thing on this earth on the internet. The growth of the internet of things has slowly led to the production of a lot of data and information, which requires proper storage. This has led to development of other technologies like cloud computing which has grossly contributed to the ubiquity of organization resources. The rapid advancements in the internet of things are transforming the world into a small village. People from all over the world have been enabled to interact over the internet and share ideas. This is majorly contributing to the development of a smart culture over the internet. Heritage science is now evolving and is entering into the internet. Access to cultural heritage has been made easy over the internet. Many cultural exchanges have been done online and their conservation, interpretation and management too, thanks to the Internet of Things. This paper will expound on the relation between the internet of things and heritage science.*

Keywords: cloud computing; internet of things; heritage science

1. INTRODUCTION

Almost everything in the corporate world is now connectible to the internet. With the rapid developments of wireless sensor networks, so many devices have been made to be Wi-Fi-enabled so that they can be connected to a network and accessed remotely. A universally acceptable culture is being created by the information technology evolution in the organizational setups to come up with a uniform culture of utilizing information systems in the execution of organization business activities. Some of the major devices that have been able to be successfully connected to the internet include printers, network cameras, control panels, display monitors, biometric doors, metal detectors, tablets, android devices, desktop computers, temperature regulators and ventilation systems among others [1]. Technology is tirelessly aiming at achieving an interconnectivity of each device at the workplace or even at home. This interconnectivity is slowly encroaching into the creation of a culture and the preservation of previously developed cultures in many set ups.

The growth in the number of devices on the internet has escalated the amount of data produced by the same devices hence alternative means of storage have been developed over time. Heritage science, which focuses on the access, conservation, interpretation, and management of cultural science, has strongly relied on the effectiveness of the internet of things. Today almost everything is online or is accessible online. People are sharing their cultures on the internet in the urge of preserving it even for future references. Big data has been as a result of more and more cultural heritage items being shared on the internet [2]. The internet of things has enabled the access of all the cultural heritage stuff on the internet. The interconnectivity it provides is a major contributor to the creation and sharing of a culture that will in the future be prominent.

Cloud computing is one major storage advancement that can be said to have grown with time due to the need for access to data and information across the world. A number of individuals want to access the same data from different locations of the world. They are not able to access physically so everything is stored on a cloud in the internet where they can access it. These developments of the internet of things have grossly contributed to the rise of smart industries, cities, and manufacturers. This is a creation of a culture that will grow over time to a prominence across the heritage science study [3]. The need to know about various cultures has been satisfied by the ubiquitous characteristic of the internet of things.

As many individuals seek to know new cultures, they are slowly building up a new one that is going to be universally acceptable as time goes by. Human beings are a social being and they interact over all the mediums that are provided. It is through constant interactions that new cultures end up being created. Think of it this way; the internet of things is providing a common place where many individuals from a variety of backgrounds from all over the world are interacting and sharing cultures. It will end up cultivating a common culture that will be acceptable by all the members of the societies [4]. This will have contributed to heritage science directly.

Smart cultures are being built up in the current world we are living in. The interactive nature of the human being is the major contributor to the creation of many acceptable cultures. The internet of things creates a culture by providing interactions among many individuals who share their ideologies just the same way physical meetings would. The interactions are however virtual and the parties may not make it to even ever meet physically [5]. The good thing is that a culture is built and maintained regardless of the medium of interaction.

2. RELATED WORK

The internet of things has had many works developed over the years. The first device to be controlled over the internet was a cola machine which let users check for available drinks before visiting the machine. It was followed by a series of other devices over time. Users of the internet

slowly learned how to make use of the devices. They have proven to be very useful and more accurate. Their use has increased effectiveness in the execution of activities. The introduction of more and more devices resulted in developments in all aspects of the human life as a result of the internet of things. Various platforms have been developed that are contributing grossly to the development of cultures as previously established cultures are being maintained.

Take for instance the various social networks that are available on the internet. Facebook can be said to be the most prominent social network that is facilitating interaction across the world. People from many cultural diversities are interacting over the platform. They are building up a culture of connectedness and informative living. All types of information is disseminated over the social platforms. The internet even has varying platforms that are focused on varying aspects of the human life [6]. These include professions, academics, economics, social focus, ecommerce, and many others. The internet of things makes it possible for all the activities to be attainable. The major developments in the creation and use of social platforms that include chatrooms, discussion forums, and direct messaging are the main contributors to the creation of a culture on the internet.

Many devices have been made accessible over the internet as a result of an advancement in the technology. The people who use the internet have to access it using a device. The creation of the online platforms has therefore led to the introduction of devices that are connected to the internet. These devices are the main attributes of the internet of things. They are very appropriate in the interactions that are enabled over the internet. The information technology world has slowly come up with ubiquitous devices that are useful in making it possible to access the internet [7]. Their development is directly related to the use of the internet of things and creation, management, and preservation of a culture since it is through these devices that the users of the internet get to interact with each other hence sharing their cultures as they learn new ones. The cultures that are accessible online are viewed by the users of the internet via the various devices that are connected.

Take for instance the smartphone network which comes with a range of applications developed to connect to the internet. These devices are made ubiquitous to aid in the access to all desired information. Wearables have been granted access to the internet so that the users are able to interact freely on the internet whenever they want and wherever they are. Despite the cost implications of internet access, users of the internet are able to stay online when they want to. Today people say they live online after realizing that most of the things they want to do are available on the internet [8]. Everyone is being assimilated into the culture that everything is accessible on the internet.

On top of the social interactions on the internet, an economic culture has been cultivated such that there marketing, sales, and payments are being done online. This has grossly led to a growth in the ecommerce sector. The internet and the "things" it is connected to has strongly supported the sale of goods online. There is even a currency for the internet that is slowly growing. Cryptocurrencies are slowly becoming acceptable in the economic sector. This will grow an economic culture that will make buying and selling ubiquitous.

3. CLOUD COMPUTING BENEFIT FOR HERITAGE SCIENCE

Cloud computing has emerged as a response to the rapid developments in the internet of things. It has grossly contributed to industry change in the recent past. The recent growth and development of the internet of things has contributed to industry transformation. Everything needs to go online to catch up with the current trends that support business operations. Many businesses are striving to adopt to the online way of conducting business. The creation of large volumes of data due to creation of cultures online needs cloud services even to make everything accessible in the future.

Cloud computing has to come in due to the increased need for memory. There is a growing urge for more and more memory for all the internet of things' data. Many users of the online services enter data and information that needs to be stored safely for access from various locations. The adoption of the cloud computing technology will be a contributing factor to the success of the business [9]. Many users of the online services will be able to access all they need from wherever they are.

It is a very important technology that can be implemented in a number of industries including insurance, banking, retail, media, and the manufacturing industry. Enabling online services of these industries will be a bold move to ensure that there is ubiquitous access to all industry services. Customers will be able to seek for services without having to physically visit the offices. This is even a way of building up competitive advantage in a dynamic market. The use of clouds provides extra storage of data for corporations and firms. The use of physical storage media is slowly being replaced by the cloud computing technology [10]. Cloud computing service providers offer the services to business as a subscription model. The companies only need to pay for more storage space whenever they need it. This will be an effective technology for many industries to aid in storage and access of data.

Individuals upload many cultural aspects on the clouds and share them on the internet. The internet of things makes it possible to view the stuff that is uploaded. Organizations are even able to access other organization's information and can slowly learn their culture. It is very notable how the cultural exchange is effective on the internet. we ought to appreciate the internet for making it possible.

4. RESULTS

Cloud computing will be a contribution to scalability, adaptability, efficiency, accuracy and accessibility of all the cultures that may come up. All this will be in positive contribution to the activities conducted by the individuals on the internet. The internet of things is a major support to the cloud computing technology. With the many devices interconnected on the internet, there is a need for a central source of interrelationship among related devices (Kizza, 2017). Take for example a google drive cloud account; any device that is connected to the google account for the google drive is linked to the cloud and can store its data there be it a personal computer, an android device or a desktop computer. If the owner shares their culture over the drive they may reach out to a wide range of individuals.

Cloud computing technology is a major contributor to scalability of industry activities. In the event where the industry needs to expand its storage to cater for more

inputs, there is a favorable provision for them to expand the memory they have at a fee. Minor changes in the industry activities may call for more memory needs, which will can be achieved by the use of the cloud storage service [11]. Cloud computing has proved to be more efficient. It has not only been used for primary storage but also as a backup mechanism for organization data. The services are accurate and do not seem to manipulate data without human intervention. Cloud storage facilities are accessible to any client who needs them from any location provided they are authorized to access. All services are accessible from one central source hence it becomes a very useful centralized system for any industry to adopt. The internet of things being a major support to the cloud computing technology has had many devices connected to the cloud so that they can store files, folders, and media in the clouds instead of using physical storage media which are susceptible to physical damage.

5. DISCUSSION
The internet of things has many advantages that make it very useful in many industries today. It has supported major industry activities including ubiquitous service provision. Many industries have made it to provide services online so that they are available to many customers across the globe. This has majorly contributed to expansion in target markets and making of more sales. It gradually translates to more profits over time. It is slowly building up an industry culture of ubiquity [12]. Many organizations worldwide are adopting the technology to make sure they perform their activities successfully.

The use of the internet of things has however escalated many security concerns. There is major concern that the more the devices are added to the internet, the more insecure it becomes. It becomes more and more susceptible to malicious attacks from hackers. Information transmitted over the internet therefore has to be guarded from interception by malicious individuals who might want to damage or just access it. Many industries have avoided using the cloud computing technology of fear that it might be prone to attacks [13]. For instance, the banking industry has adopted the technology as a backup mechanism. They may not trust the technology for transactions and money transfers.

The IPv6 addressing has made it possible to add as many devices as possible to the internet. Ideally, anything can be added to the internet upon being assigned an IP address. The technological environment of all industries has proved to be dynamic in many ways. The internet of things is one major aspect that has contributed to the gradually changing environments. Major players in the industries strive to adapt to the changes that are needed [14]. They have put in place strategies that will contribute to the success of their online services
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6. CONCLUSION AND FUTURE WORK
There is a great need for individuals to adapt to the current trends on the internet of things. The development of wireless sensor networks is a contribution to the success of the internet of things. Many devices have been made useful by connecting them to the internet. Proper utilization of the internet of things has grossly contributed to industries building their business intelligence which has translated to proper understanding of the market demands. Customer

satisfaction is therefore realized successfully. The internet of things strongly contributes to international business of the industries that adopt it. Business activities have been supported by the technology across the world. When the industry has made it to offer services globally, it successfully establishes itself to more potential customers who have interest in their services. The evolvement of the internet of things will support major activities of industries in the future. This is a creation of an industry culture that is proving profitable to the organizational as many individuals are sharing organization wide ideas. The interaction majorly contribute to the creation, development, management and preservation of an acceptable culture.

The internet of things is working towards achieving automation of devices in the industry environment. Imagine a setup at home that is automated such that the moment your alarm to wake up rings the lights turn on and the coffee maker begins preparing some coffee, all enabled by a wireless sensor network that is connected to the internet. This will be a major advancement. The people who will adopt the technology will most probably all adopt a similar culture regardless of their location, time, and place. Heritage science should begin focusing on cultures that are being creates as a result of the use of the internet. these cultures somehow affect the way things are being done outside the internet. Living online is going to be a major achievement of the internet of things [15]. Let us all look forward to a time in the future where everything is going to be on the internet.

An office set up can also be automated such that an employee will be able to access their work station from their premises and conduct tasks as is the were in the office. The interconnection of many of the devices in the various industry set ups will slowly translate into an automated environment for conducting industry activities [16]. An automation of the workplace will translate to a scalable working environment which will be accessible constantly. There will be a major call for security systems to be enhanced to prevent malicious attacks by cyber criminals. This is just an overview of the kind of organizational culture that will most likely be cultivated as a result of using the internet of things.

REFERENCES
[1] A. Abbasia and M. Younis, "A survey on clustering algorithms for wireless sensor networks," in *Computer Communications*, vol. 30, no. 14–15, pp. 2826-2841, 2007.
[2] I.F.Akyildiz, W.Su, Y. Sankarasubramaniam, and E.Cayirci, "Wireless sensor networks: a survey," in *Computer Networks*, vol. 38, no. 4, pp. 393-422, 2002.
[3] A. Phillips, B. Nelson, C. Steuart, "Guide to Computer Forensics and Investigations," Mixed media product, 2015.
[4] E. Bugnion, Computer Systems Research in the Post-Virtualization Era, 2017.
[5] J. M. Carroll, Computer security, Butterworth-Heinemann, 2016.
[6] J. M. Kizza, Guide to computer network security, Springer, 2017.
[7] W. M. P. Kumari, "Artificial Intelligence Meets Internet of Things," 2017.
[8] X. Cui, "The Internet of Things," in *Ethical Ripples of Creativity and Innovation*, pp 61-68, 2016.

[9] K. Ashton, "That'Internet of Things' Thing," 2009.

[10] G. Walsham, Interpreting information systems in organizations, John Wiley & Sons, Inc, 1993.

[11] P.J. Chuang and C.H. Wang, "An Efficient Group-based Data Backup and Recovery Scheme in Cloud Computing Systems," in *Journal of Information Science & Engineering*, p. 44, 2017.

[12] Y. Zhang, S. Zhao, and X. Xu, "Business model innovation: an integrated approach based on elements and functions," in *Information Technology and Management*, vol. 17, no. 3, pp. 303–310, 2016.

[13] J. Matthews, ENG 305: Business and Technical Writing., 2017.

[14] A. R. Hendrickson, "Human resource information systems: Backbone technology of contemporary human resources," in *Journal of Labor Research*, vol. 24, no. 3, pp. 381-394, 2003.

[15] P. E. &. D. A. B. Bathurst, Building cost control techniques and economics, Heinemann Educational Books, 2014.

[16] D. &. F. G. Avison, Information systems development: methodologies, techniques and tools, McGraw Hill., 2014.