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Nexus analysis: Internet of things and business performance

Morrisson Kaunda Mutuku *(a)* , *Stephen M. A. Muathe* *(b)*

a,b School of business, Kenyatta University, Kenya

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ABSTRACT

This paper analyses the influence of the Internet of Things (IoT) on business performance guided by the following objectives; assessing the influence of the Internet of things positively on sales and marketing strategies of business; to determine the influence of the Internet of things on resources management in modern businesses and to analyze the influence of the Internet of things on business profitability. The paper conducted exploratory research to study the Impact of IoT data on Business performance was conducted. Through the literature review process recently published papers on IoT and business performance including sales and marketing strategies, resource management profitability was gathered. Research papers, Journals, Internet Sites, and books were used to collate the relevant content on the subject. The analysis conducted by this study indicated that most published studies showed that IoT has huge potential for businesses across many sectors. The data collected through the implementation of IoT provide business with opportunities of increasing efficiency which improves sales and marketing, resource management, growth potential, and profitability. This study recommends that despite the challenges in the development of IoT technologies, it's an implementation in businesses is inevitable as they seek to increase the performance.

Introduction

The Industry 1.0 was formed way-back in 1784, which comprised of Machines driven by Steam and Water. Industry 2.0 born around 1870 depended heavily on production of goods by mass production techniques using electrical as the source of energy (Yerpude, & Singhal, 2017). In the year 1969, the Industrial Revolution took the Industry to the next step of development where Information Technology (IT) was in practice for replicating and reproducing production at a much faster rate called as Automation. The advanced digitization with the combination of Internet technologies and future oriented technologies in the field of smart objects resulted in a new Paradigm shift. Finally, the era of Cyber Physical Systems arrived where the advancement of the Industrial revolution is termed as Industry 4.0. The vision of the future contains modular, but efficient systems where individual products will be produced with a batch size of one maintaining the economic conditions of mass production (Attaran, 2017).

Today, the Internet of Things is improving the day-to-day lives of citizens around the world In cities from Barcelona to Songdo to Rio de Janeiro, Internet Protocol (IP)-connected sensors are monitoring traffic patterns, providing city managers with key data on how to improve operations and communicate transportation options Similar information flows are improving hospitals and healthcare systems, education delivery, and basic government services such as safety, fire, and utilities Sensors and actuators in manufacturing plants, mining operations, and oil fields are also helping to raise production, lower costs, and increase safety (Garrity, 2015). Impactful IoT interventions in development can improve efficiency (achieving similar levels of impact with fewer resources) and/or enhance effectiveness (increasing impact with similar levels of existing resources) In advancing global development, IoT interventions are helping to improve research, public policy, basic service delivery and the monitoring and evaluation of programmes across a range of different sectors (Biggs, Garrity, La Salle, Polomska & Pepper, 2015).

This paper aims to demonstrate the influence of Internet of Things (IoT) on business performance guided by the following objectives; assessing the influence of Internet of things positively on sales and marketing strategies of a business; to determine the influence of

* *Corresponding author. ORCID ID: 0000-0003-0662-7157*

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Internet of things on resources management in modern businesses and to analyse the influence of Internet of things on business profitability.

The paper conducted an exploratory research to study the Impact of IoT data on Business performance was conducted. Through the literature review process recently published papers on IoT and business performance including sales and marketing strategies, resource management profitability was gathered. Research papers, Journals, Internet Sites and books were used to collate the relevant content on the subject.

This paper organizes as follows: Following literature review, the section evaluates the connection between Internet of Things, business sales and marketing strategies. Finally, this paper concludes with important recommendations.

Literature Review

Internet, by virtue of its ubiquitous presence and impact on all business and technology aspects, has commanded an irrefutable presence in our lives. Internet has grown substantially in the last 5 decades starting from a micro network and to a macro global network serving billions of users. Tis tremendous evolution in the past few years connected billions of things globally (Tang, Huang & Wang, 2018). Among other influences, the most recent one is of Internet of Tings (IoT). Internet of Things (IoT) was presented as a concept in 1999 (Yerpude, & Singhal, 2017). It has provided a platform to connect to different hardware and mobile devices, so that different people can be connected to each other. The "Internet of things" (IoT) is the concept of connecting any device with an on-and- off switch to the Internet and or to each other. The term refers to devices that collect and transmit data via the Internet (Attaran, 2017). This includes everything from cellphones, wearable devices, industrial equipment such as car engines to jet engines or a drill of an oil rig, washing machines, coffee makers and anything else that we can think of. The concept is based on a general rule that “Anything that can be connected will be connected”. IoT could be considered as a giant network of connected people or “things”. The connections is between things-things, people things, or people-people (Massis, 2016).

Referring to the related research from Lee and Lee (2015), five essential technologies of IoT are widely used in IoT-based services and products: Radio frequency identification (RFID), wireless sensor networks (WSN), middleware, cloud computing, and IoT application software. The first technology is RFID, through which electromagnetic fields automatically identify and data capture using radio waves. The tags can store more data than traditional barcodes, and can be attached to cash, clothing, and possessions, or implanted in animals and people. IoT is initiated by the use of RFID technology, which is increasingly utilized in logistics, pharmaceutical production, re-tail, and diverse industries (Krotov, 2017; Guinard *et al.*, 2011; Guinard *et al.*, 2011; Whitmore, Agarwal & Da Xu, 2015). The second technology is WSN, which consists of spatially distributed autonomous sensor-equipped devices to monitor physical or environmental conditions, and can cooperate with RFID systems to better track the status of things, such as their location, temperature, and movements (Atzori *et al.*, 2010).

The third technology is Middleware, which is a software layer interposed between the application and technological levels, making it easier for software developers to implement communication and input/output. Therefore, they can focus on the specific purpose of their applications. The fourth technology is cloud computing, which is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., computers, networks, servers, storage, applications, services, and software). One of the most important outcomes of IoT is an enormous amount of data generated from devices connected to the Internet (Chan, 2015). The last technology is IoT application. The usage of IoT facilitates the development of myriad industry-oriented and user-specific IoT applications. Whereas devices and networks provide physical connectivity, IoT applications enable device-to-device and human-to-device interactions in a reliable and robust manner (Lee & Lee, 2015)

IoT, fundamentally, has grabbed the attention from both the providers as well as the users because of its ability to connect devices, people and goods over a global network. Each entity in the IoT landscape is allotted a unique identifier and the idea is to gather live data from each of them through the network. Live data can help organizations in deriving useful and interesting trends based on advanced analytics models (Brous, Janssen & Herder, 2020).

Extreme market competition and a dynamic business environment have forced companies to adopt state-of-the-art practices to optimize both the cost and operational efficiency of their information technology platform. IoT has emerged as a differentiating factor in business competition in the past few years (2012 and beyond). The technology will bring the next evolution in digital technology. The Internet of Things (IoT) is not new. The term “Internet of Things” was coined by Kevin Ashton, cofounder and executive director of the Auto-ID Center at MIT in 1999 (Attaran, 2017). Among the earliest object with IoT is ATM machines dated back to 1974. The Internet of Things is very different from the Internet of people. IoT enabled devices can sense for themselves and use analytics and business intelligence to respond faster and better than a human. The reactions and adjustments will happen without any human intervention, and often without any human awareness. IoT has evolved from the convergence of four technologies: wireless, microelectromechanical systems, micro services, and the Internet. The convergence has helped tear down the walls between operational and information technology (Attaran, 2017).

According to some estimates, in the next 20 years, IoT will add $10-$15 trillion to global GDP. According to Cisco estimate, devices connected to the Internet were 11 billion in 2013, 15 billion in 2014, 25 billion in 2016 and will be over 50 billion connected devices by 2020-that is up to seven connected Things for every person on planet Earth (Economist, 2014). Yet, according to another study

conducted by markets and markets, the IoT market size is estimated to grow from $157.05 billion in 2016 to $ 661.74 billion by 2021, at a compound annual growth rate of 33.3% from 2016 to 2021 (Mukherjee, 2016). A report by Mckinsey (2019) noted that the number of businesses that use the IoT technologies has increased from 13 percent in 2014 to about 25 percent today. And the worldwide number of IoT-connected devices is projected to increase to 43 billion by 2023, an almost threefold increase from 2018. IoT allows for virtually endless opportunities and connections to take place. Powering the IoT revolution can drastically impact the world we live in and fight our world's biggest challenges. With IoT there are limitless opportunities for business and society. As Table -1 show, more and more industries and consumers are using IoT technology to reduce cost and optimize operational efficiency.

Table 1: IoT Spending In Different Industries

Industry	**IoT Spending**
Logistics	Will invest $1.9 trillion in 10 years
Smart Cities	Will reach $1.56 trillion investment by 2020
Retailers	Will spend $2.5 billion by 2020
Auto Industry	250,000 vehicles will be connected to the Internet by 2020
Wearable Device Market	Fitbit and Apple watches sold $10 million devices in 2015
Healthcare	The value of improved health of chronic disease patients through remote monitoring could be as much as $1.1 trillion per year in 2025

Source: Attaran (2017).

Modern firms are increasingly developing and implementing disruptive ICTs in several business processes in order to increase their efficiency and innovativeness through new methods of knowledge flow and data/information gathering (Santoro, Vrontis, Thrassou & Dezi, 2018; Del Giudice & Della Peruta, 2016). Undoubtedly, the rapid development of new technologies impact all areas of everyday life and the presented analytics and reports show that these trends will continue and grow in the years to come. Whether we want it or not, we are part of this technological revolution and the most important thing is to learn how to use it properly and wisely. Gartner (2013) forecasted that IoT will reach 26 billion units by 2020, up from 0.9 billion in 2009. Accordingly, we can realize the intensity of the influencing power that IoT technologies are going to bring about. Currently, studies of IoT focus on the development of IoT technologies and applications, while little research addresses the impact of IoT implementation on firm performance. It is against this backdrop, that this paper analyses the influence of IoT on business performance guided by the following objectives (i) assessing the influence of Internet of things positively on sales and marketing strategies of a business, (ii) to determine the influence of Internet of things on resources management in modern businesses, (iii) to analyse the influence of Internet of things on business profitability.

This paper was ground on Diffusion of Innovation (DOI) theory developed by Rogers in 1962 and is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that a person or enterprise does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person/enterprise must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible (Zitkiene et al., 2015). Adoption of a new idea, behavior, or product innovation does not happen simultaneously in the field of entrepreneurship; rather it is a process whereby some proactive enterprises/entrepreneurs are more apt to adopt the innovation than others. Entrepreneurs who adopt an innovation early have different characteristics than those who adopt an innovation later. IoT is the latest innovations that businesses are seeking to adopt to enhance efficient. The rapid diffusion of IoT demonstrate the benefits accrued to business performance.

The number of studies on Internet of Things continues to increase as more and more businesses adopt or implement IoT in their business process. For instance, Yerpude and Singhal (2017) carried out a study on Internet of Things and its impact on Business Analytics. The study reported that world is moving very rapidly towards the Industry 4.0, where the most impactful position in almost all the areas would be of IoT (Internet of Things). Profoundly IoT allows the connection between people and things at any point and any given place with devices that can transmit data over the network. Attaran (2017) on the other hand focused on the internet of things: Limitless opportunities for business and society. The author concluded that the biggest technology trend that is taking place right now is the Internet of Things. IoT will give us the most disruption as well as the most opportunity over the next five years. Internet of Things is expected to revolutionize and change the world we have come to know and certainly your career and personal life.

Another study conducted in this area is by Santoro, Vrontis, Thrassou and Dezi (2018) which sought to analyse the internet of things: building a knowledge management system for open innovation and knowledge management capacity. This study finding indicate that knowledge management system facilitates the creation of open and collaborative ecosystems, and the exploitation of internal and external flows of knowledge, through the development of internal knowledge management capacity, which in turn increases

innovation capacity. Angelova, Kiryakova and Yordanova (2017) focused on the great impact of internet of things on business and found that implementing this new technology in any business model has advantages but also all the players (companies, governments and consumers) in this field should be aware of some challenges and threats like privacy, security and standardization. Nataša Aleksandra, Zorica and Marijana (2016) posited that IoT is an intelligent network which connects all things to the Internet for the purpose of exchanging information and communicating through the information sensing devices in accordance with agreed protocols. It achieves the goal of intelligent identifying, locating, tracking, monitoring, and managing things.

Nord, Koohang and Paliszkiewicz (2019) also carried out a study on the internet of things: review and theoretical framework. The study revealed that the number of applications that make use of the IoT has increased dramatically and spans areas from business and manufacturing to home, health care, and knowledge management. Ferretti, Schiavone, Al-Mashari and Del Giudice (2016) study focused on Internet of Things and business processes redesign in seaports. The results showed the adoption of IoT technologies widely redesigns and improves the performance of all the main business process of the port analysed, in particular those processes related to technology and information of the organisation. Ghouchani, Jodaki, Joudaki, Balali and Rajabion (2019) results also have indicated that the quality of IoT services (scalability, availability, reliability and ease of use), security of IoT services (trust, reputation, privacy and encryption) and IT knowledge of users (usage skills, awareness, experience and accuracy) have a positive and significant impact on development of e-business.

Internet of Things, Business Sales and Marketing Strategies

Internet of things has revolutionized how sales and marketing strategies adopted by business around the world. Businesses are now using big data being conducted from IoT and using the same to strategize their sales and marketing approaches. Nataša Aleksandra, Zorica and Marijana (2016) conducted a study on Internet of things in marketing and retail. The study proposed a model that indicates the potential that IoT has vs standard industry practices of marketing and retail to drive business results and competitive advantage. The study showed that the possibility of communicating with the consumer or shopper in real time, at any stage of the purchase cycle and in relevant context, with personalized content and relevant benefit for the user are key reasons for IoT being seen as relevant and potent tool for marketing tactics. Additionally, IoT can improve business processes and user experience being applied for inventory management, retail logistics, payment systems, and store employees management.

Grubor and Jakša (2018) analysed internet marketing as a business necessity. They argued that with the development of the Internet as the main channel and best opportunity for the implementation of the optimal "one-to-one" marketing model, Internet marketing as a new area of marketing theory and practice has emerged and is constantly improving. The study concluded that internet technology has moved the boundaries in company-customer relationship, and completely transformed management and organizational processes. For marketing discipline, connected world has brought plethora of opportunities and challenges.

Another study conducted relating IoT and marketing was by Abashidze and Dąbrowski (2016) that focused on Internet of Things in marketing: opportunities and security issues. The author of this paper argues that large companies try to implement the technology in their marketing strategy that reshapes not only communication style and product promotion but consumers' expectations, perceptions and requirements towards companies. Abashidze and Dąbrowski (2016) concluded that despite all concerns and risks, development of IoT technologies and its implementation in marketing is inevitable. The author further argues that Marketers need to elaborate detailed policy on how and for what specific purposes will consumer data be used and make it transparent. Besides, they should create marketing plans specifically for IoT because the methods and approaches in communication with consumers will be different from traditional internet marketing.

Another paper published on internet of things and marketing and sales is by Abdel-Basset, Mohamed, Chang and Smarandache, (2019) who focused on IoT and its impact on the electronics market. According to the authors of this paper, IoT will influence decision making style in various phases of selling, buying and marketing process. Therefore, every individual and company should know precisely what IoT is, and how and why they should incorporate it in their operations. The study concluded that smart system and neutrosophic technique is considered as a comprehensive system which links between customers, companies, marketers to achieve satisfaction for each of them. This conclusion reinforces the role of IoT on businesses sales and marketing strategies that will result to high performance.

Celik (2016) study focused on Internet of Things as a source of future marketing tools. The author argued that the rapidly evolving development of Internet of Things and its devices create new opportunities and circumstances that can be monitored and applied for more efficient Marketing. Since marketing units suffer from a lack of knowledge about individual customer and the timeliness of the knowledge Internet of Things is anticipated as a potential tool to overcome the knowledge gap. The study concluded that after a proper comparison of the scientific literature and the case studies those main issues that need to be taken into account to utilize IoT for Marketing are Strategy alignment, R&D in cross functional groups & close partnerships and coping security issues sufficiently. Analysis of these published papers on IoT and sales and marketing strategies provides evidence that IoT holds a lot of potential to enhance sales and marketing strategies adopted by business to enhance their performance.

Internet of Things and Resource Management

Business resources include both human resources and financial resources. Implementation of IoT impact both financial resources and human resource. In this section, analysis is done to show the relationship between IoT and resource management in businesses. A study by Barman and DasK (2018) that focused on Internet of Things (IoT) as the Future Smart Solution to HRM was analysed. According to Barman and DasK (2018) IoT will have more serious implications especially in the management of employee wellness. The gradual development and absorption of IoT in the field of human resources are discernable, as the IoT would generate an unprecedented amount of data associated with people and their related processes that will be generated by IoT only. IoT promises improvement in employee experience, and the employee, managers and HR carrying Internet enabled mobile devices are connected with each other round-the-clock, they can instantly book meeting rooms, communicate with any team member, exchange ideas, and do a lot more that will impact positively on their business performance.

Another study reviewed was by Yawson, Woldeab and Osafo (2018) which analysed the relationship between Human Resource Development and the Internet of Things. The author found that the Internet of Things (IoT) is disruptive, and it will change the manner in which human resources are developed and managed, calling for a new and adaptive human resource development approach. The Classical Internet communication form is human-human. The prospect of IoT is that every object will have a unique way of identification and can be addressed so that every object can be connected. The communication forms will expand from human-human to human-human, human-thing, and thing-thing. This will bring a new challenge to how Human Resource Development (HRD) is practiced. Vivekananth, (2016) further argued that IoT forms a global digital nervous network of various devices and the sensors, which is capable of linking different devices with one another and with people. It influences the management of the human resource in that it absorbs the HRM big data. Thus, it gives the HRM the strategies that they can use to maximize the agility, which involves the rights of composing the workforce. Thus, it offers the optimal balance of the advanced essential skills, such as the collaboration, the agility, the organizational development, the cognitive flexibility, and even the creativity.

A study conducted by Deloitte (2016) concluded that the convergence of the IoT and the quantified self gives organizations an opportunity to use data to help make work more productive and meaningful for both employer and worker. If organizational leaders carefully balance business needs with employees' goals, privacy concerns, and lifestyles, they can solve workplace problems and make the company more competitive. Sure, few of us have a real chance to become world-class athletes, even with a technological boost. But by giving people the data they need to accomplish real-world goals; we can all become champions in our offices and workplaces. Brous, Janssen and Herder (2020) results confirmed the duality that gaining the benefits of IoT in asset management produces unexpected social changes that lead to structural transformation of the organization. IoT can provide organizations with many benefits, after having dealt with unexpected risks and making the necessary organizational changes. There is a need to introduce changes to the organization, processes and systems, to develop capabilities and ensure that IoT fits the organization's purposes.

Internet of Things and Business Profitability

Advancement in technology continues to provide business with new opportunities for growth and to increase their profitability. This section presents analysis of the relationship between IoT and business growth potential and profitability as reported by published literatures. A study conducted by Van Leemput (2014) sought to find out Internet of Things (IoT) Business Opportunities–Value Propositions for Customers. The findings suggested that a change of mindset is required; that data management is very important in IoT; that there is a lack of willingness to invest in IoT; and that there may be a lack of knowledge and skills among staff. The findings also indicated that in IoT value can be captured not just during sales but more importantly after sales, and that this can be done with many non-traditional methods.

Manyika, Chui, Bisson, Woetzel, Dobbs, Bughin and Aharon (2015) while studying unlocking the Potential of the Internet of Things found that market and customer information gathered from clients and customers has a huge influence on productivity. The information can help business owners in so many ways with the increase in efficiency. IoT allows devices to work up with efficiency while the connection with each other for best results. It also helps in working up efficiently in minimal time. The appliances and software based on IoT help in working in error-free and fashion manner for the accomplishment of operations and tasks. This promotes enhancing the profit of business along with its efficiency. In addition to this, it keeps up in a well-maintained manner to work up with the quality of equipment. This can be done in a regular fashion to ensure that productivity and efficiency have a huge impact on business processes. Tang, Huang and Wang, (2018) conducted a study on the impact of internet of things implementation on firm performance our results indicate IoT adoption has greater impacts on financial performance and market value.

Kiel, Arnold, Collisi, and Voigt (2016) studied that impact of the industrial internet of things on established business models. They disclosed that the IoT enables an increasing offering of customized, individualized, and smart products and services associated by a consequent service-orientation. For the purpose of the latter, customers are increasingly integrated in development and manufacturing processes on a collaborative basis. In addition, the IoT-inherent generation of enormous amounts of undirected data, i.e. big data, requires target-oriented data analysis, which then again necessitates specific experts capable of data mining and processing activities. Arnold, Kiel, and Voigt, (2016) studied how the industrial internet of things changes business models in different manufacturing industries. The study found that machine and plant engineering companies are mainly facing changing workforce qualifications, the

electrical engineering and information and communication technology companies are particularly concerned with the importance of novel key partner networks, and automotive suppliers predominantly exploit IoT inherent benefits in terms of increasing cost efficiency.

Conclusions

The analysis conducted by this study show that most published studies showed that IoT has huge potential on businesses across many sectors. The data collected through implementation of IoT provide business with opportunities of increasing efficiency which improves sales and marketing, resource management, growth potential and profitability. Using IoT significantly make users' day to day activities more convenient since many services can be accessed on their mobile devices. It also improves inventory management, tracks product usage, monitors selling rates and locations. Also, the IoT improves the customer services to allow real-time communications. Additionally, it can allow businesses to forecast possible customers' concerns and cases, and proactively provide solutions. By doing so, it can achieve a better customer satisfaction. As a result, IoT can also save time, reduce costs and also human errors in order to avoid any sort of misunderstanding and risks, marketing teams should make aware consumers that their personal data is stored and used for commercial purposes. This study recommends that despite the challenges development of IoT technologies and its implementation in businesses is inevitable as they seek to increase the performance.

References

Abashidze, I., & Dąbrowski, M. (2016). Internet of Things in marketing: opportunities and security issues. Management Systems in Production Engineering, 24(4), 217-221. https://doi.org/10.2478/mspe-01-04-2016.

Abdel-Basset, M., Mohamed, M., Chang, V., & Smarandache, F. (2019). IoT and its impact on the electronics market: A powerful decision support system for helping customers in choosing the best product. Symmetry, 11(5), 611. https://doi.org/10.3390/sym11050611

Angelova, N., Kiryakova, G., & Yordanova, L. (2017). The great impact of internet of things on business. Trakia Journal of Sciences, 15(1), 406-412. https://doi.org/10.15547/tjs.2017.s.01.068

Arnold, C., Kiel, D., & Voigt, K. I. (2016). How the industrial internet of things changes business models in different manufacturing industries. International Journal of Innovation Management, 20(08), 1640015. https://doi.org/10.1142/S1363919616400156

Attaran, M. (2017). The internet of things: Limitless opportunities for business and society. Journal of Strategic Innovation and Sustainability Vol, 12(1), 11

Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. Computer networks, 54(15), 2787-2805. https://doi.org/10.1016/j.comnet.2010.05.010

Barman, A., & Das, M. K. (2018). Internet of Things (IoT) as the Future Smart Solution to HRM

Brous, P., Janssen, M., & Herder, P. (2020). The dual effects of the Internet of Things (IoT): A systematic review of the benefits and risks of IoT adoption by organizations. International Journal of Information Management, 51, 101952. https://doi.org/10.1016/j.ijinfomgt.2019.05.008

Celik, F. (2016). Internet of Things as a source of future marketing tools (Bachelor's thesis, University of Twente)

Chan, H. C. (2015). Internet of things business models. Journal of Service Science and Management, 8(04), 552. https://doi.org/10.4236/jssm.2015.84056

Del Giudice, M., & Della Peruta, M. R. (2016). The impact of IT-based knowledge management systems on internal venturing and innovation: a structural equation modeling approach to corporate performance. Journal of Knowledge Management. https://doi.org/10.1108/JKM-07-2015-0257

Deloitte (2016): Digital Education Survey. https://www2.deloitte.com/cn/en/pages/technology-media-andtelecommunications/articles/2016-digital-education-survey.html

Ferretti, M., Schiavone, F., Al-Mashari, M., & Del Giudice, M. (2016). Internet of Things and business processes redesign in seaports. The case of Hamburg. Business Process Management Journal. https://doi.org/10.1108/BPMJ-05-2015-0079

Gartner. (2013). Gartner says the Internet of things installed base will grow to 26 billion units by 2020. Retrieved from http://www.gartner.com/newsroom/id/2636073

Ghouchani, B. E., Jodaki, S., Joudaki, M., Balali, A., & Rajabion, L. (2019). A model for examining the role of the Internet of Things in the development of e-business. VINE Journal of Information and Knowledge Management Systems

Guinard, D., Trifa, V., Mattern, F., & Wilde, E. (2011). From the internet of things to the web of things: Resource-oriented architecture and best practices. In Architecting the Internet of things (pp. 97-129). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-19157-2_5

Kiel, D., Arnold, C., Collisi, Matthias., & Voigt, K. I. (2016). The impact of the industrial internet of things on established business models. In Proceedings of the 25th international association for management of technology (IAMOT) conference (pp. 673-695)

Krotov, V. (2017). The Internet of Things and new business opportunities. Business Horizons, 60(6), 831-841. https://doi.org/10.1016/j.bushor.2017.07.009

Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. Business Horizons, 58(4), 431-440. https://doi.org/10.1016/j.bushor.2015.03.008

Mackinsey (2016).Growing opportunities in the Internet of Things. https://www.mckinsey.com/industries/privateequity-and-principal-investors/our-insights/ growing-opportunities-in-the-internet-1of-things

Manyika, J., Chui, M., Bisson, P., Woetzel, J., Dobbs, R., Bughin, J., & Aharon, D. (2015). Unlocking the Potential of the Internet of Things. McKinsey Global Institute

Massis, B. (2016). The Internet of Things and its impact on the library. New library world. https://doi.org/10.1108/NLW-12-2015-0093

Mukherjee, A. (2016). How IoT Might Cause Cyber Security Threats in 2017. DZone, December, Retrieved from: https://dzone.com/articles/7-critical-facts-tells-how-iot-can-cause-cyber-sec

Nataša Đ., Aleksandra L, Zorica B, Marijana D., (2016) Internet of things in marketing and retail. International Journal of Advances in Computer Science & Its Applications

Nord, J. H., Koohang, A., & Paliszkiewicz, J. (2019). The Internet of Things: Review and theoretical framework. Expert Systems with Applications. 133(1), 97-108.https://doi.org/10.1016/j.eswa.2019.05.014

Santoro, G., Vrontis, D., Thrassou, A., & Dezi, L. (2018). The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. Technological Forecasting and Social Change, 136, 347-354. https://doi.org/10.1016/j.techfore.2017.02.034

Tang, C. P., Huang, T. C. K., & Wang, S. T. (2018). The impact of Internet of things implementation on firm performance. Telematics and Informatics, 35(7), 2038-2053. https://doi.org/10.1016/j.tele.2018.07.007

The Economist (2014). Internet of Things will bring businesses success to the rest of the world. https://www.economist.com

Van Leemput, E. (2014). Internet of Things (IoT) Business Opportunities-Value Propositions for Customers

Vivekananth, P. (2016). The impact of Internet of Things (IoT) in human resource management. IPASJ International Journal of Management (IIJM), 4(9)

Whitmore, A., Agarwal, A., & Da Xu, L. (2015). The Internet of Things-A survey of topics and trends. Information Systems Frontiers, 17(2), 261-274. https://doi.org/10.1007/s10796-014-9489-2

Yawson, R. M., Woldeab, D., & Osafo, E. (2018). Human Resource Development and the Internet of Things. In Proceedings of the 25th Annual Academy of Human Resource Development International Research Conference in the Americas. Richmond VA, USA. https://doi.org/10.31124/advance.9638417.v1

Yerpude, S., & Singhal, T. K. (2017). Internet of Things and its impact on Business Analytics. Indian Journal of Science and Technology, 10(5), 1-6. https://doi.org/10.17485/ijst/2017/v10i5/109348

Grubor, A., & Jakša, O. (2018). Internet marketing as a business necessity. Interdisciplinary Description of Complex Systems: INDECS, 16(2), 265-274. https://doi.org/10.7906/indecs.16.2.6

Garrity, J. (2015). Harnessing the Internet of Things for global development. Available at SSRN 2588129. https://doi.org/10.2139/ssrn.2588129

Biggs, P., Garrity, J., La Salle, C., Polomska, A., & Pepper, R. (2015). Harnessing the internet of things for global development, a contribution to the UN broadband commission for sustainable development. Available at SSRN. https://doi.org/10.2139/ssrn.2588129

Zitkiene, R., Markeviciute, G., & Mickeviciene, M. (2017, October). The Determinants of Consumer Behaviour Influencing the Smart Technology Recognition and Acceptance. In International Conference at Brno University of Technology, Faculty of Business and Management