ITC 540 – Assessment Item #3:
Annotated Bibliography

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10/05/16

ITC 571
Dr. Mohsin Iftikhar
Assessment Item #3

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1. Introduction

The annotated bibliography below researches the challenges and risks companies must overcome when evaluating expanded use of IoT technology and deployment of cloud solutions. Today, businesses are seeking to find efficiencies and improve decision making through deploying internet of things sensors and devices that capture big data. However, to benefit from these innovative technologies companies must optimise their IT architectures and data management systems to ensure solutions satisfy end users expectations. The objective of the annotated bibliography is to address the gaps and limitations within the deployment of IoT solutions and cloud computing in efforts to inform readers of the challenges that must be overcome to realise benefits of the emerging platforms and enable continued innovation.

2. Annotated Bibliography

Alharbe, N., Atkins, A., & Champion, J. (2015). Use of Cloud Computing with Wireless Sensor Networks in an Internet of Things Environment for a Smart Hospital Network. *The Seventh International Conference on eHealth, Telemedicine and Social Medicine* (pp. 52-58). Lison, Portugal: eTelemed.

This article examines the deployment of IoT technology utilising cloud computing in a smart hospital environment. The various components of IT architecture to support the network are detailed as well as the service and healthcare impact IoT applications have in health care. The research findings detail how fragmentation of IoT is reduced through the interoperability of cloud computing and the capability to supply, collect, and integrate information through a range of sensors, systems, and software. The research focuses on the IoT6 research project aimed at redesigning the standards related to Internet Protocol version 6 (IPv6) to better accommodate the growing demands of IoT innovations and permit objects and devices to Internet Protocol (IP) enabled. Although the research has a health care focus, the findings and benefits of deploying IoT solutions utilising cloud computing is common across industry. A variety of business models can benefit from improvements to privacy and security, scalability, outsourced support and maintenance capabilities, improved data processing and management, improved network access, availability and reliability. The IT proposed smart network systems architecture and benefits are not restricted to any one industry and there is significant convenience in connecting numerous smart objects and networks together and improving interoperability.

Andersson, P., & Mattsson, L.-G. (2015). Service Innovations enabled by the internet of things. *IMP Journal, 9*(1), 85-106.

The objective of the research completed by Andersson and Mattsson is to design a conceptual framework that enables business models to utilise IoT networks to provide service innovations and new dynamic processes that benefit end users. The article highlights has information communication and technology advancements have been fundamental in changes to business models and service propositions that drive growth, efficiency, employment opportunities and competition while evolving business process and improving society. The research method utilised studied IoT reports across industry and the findings are primarily conceptual and driven by the analysis of recent trend and investment across multiple sectors. The research found that overlapping and connecting networks would enable load balancing and efficient and cost effective resource and infrastructure pooling. It details that multiple devices can be collaboratively connected to the same unsecured cloud network and the different actors and objects can effectively overlap. This cloud computing concept details the emergence of new "ecosystems" emerging through interconnect infrastructure. The case of "Connected Vehicle Cloud" outlines how sensors, users, and monitoring devices would all interact across various industries including retail, insurance, maintenance and emergency services. The example highlights the interdependency and collaboration that

possible across all industries with a relation to vehicle and exemplifies the service potential and complexity of integrating business models within IoT applications and cloud computing. This work conducted the outlines integration potential between industries and the importance of the establishment of new business networks and shared IT infrastructure through the utilisation of IoT and Cloud Computing. The conceptual framework proposed is relevant to studies being undertaken as it identifies the future dependency between IoT users and cloud computing and proposes an idealistic future that was derived through the exploration of service improvement and innovation.

Badie, N., Hussin, A. R., & Lashkari, A. H. (2015). Cloud Computing Data Center Adoption Factors Validity by Fuzzy AHP. *International Journal of Computational Intelligence Systems, 8*(5), 854-873.

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Blair, G., Schmidt, D., & Taconet, C. (2016). Middleware for Internet distribution in the context of cloud computing and the Internet of Things. *Annals of Telecommunications, 71*, 87-92.

This article identifies limitations with conventional middleware architecture that required new advances to effectively support the emergence of the Internet of Things (IoT) and cloud computing. The author suggests the research and development is required to combat the scale, dependability, and scale challenges that are presented by this emerging technology. IoT presents middleware with problems caused by the vast number of objects connected to a dispersed network, the quantity and richness of data collected, the ability to maintain quality of service while satisfying security, privacy, load balancing, and real time data analytics requirements from open access sources. Additionally, as IoT systems are a series of logic driven complex distributed systems, middleware interface and routing capabilities often have shortcomings in regards to

interoperability and integration. Within cloud computing, increasing heterogeneity between the market competition make middle development difficult as limited standards exist. Service level agreements, multi-tenancy and ability to satisfy application requirements underpin areas were further development work is required. The work is useful and relevant to the study undertaken as it also details the complexity of integrating IoT and Cloud Computing technology and justifies the complications by explaining complex distributes systems will no longer be independent, but rather an intertwined systems of systems within a shared large and wide-spread network utilising shared connectivity and infrastructure for disparate functionality.

Cubo, J., Nieto, A., & Pimentel, E. (2014). A Cloud-Based Internet of Things Platform for Ambient Assisted Living. *Sensors, 14*, 14070-14105.

This article examines the challenges that must be overcome to efficiently combine and manage IoT sensors and devices utilising ambient intelligence. The main obstacles to overcome when managing these devices includes: the identification of requirements and implementation of devices and services; effectively design network architecture to manage heterogeneity and composition to enable devices to operate effectively; and managing, interpreting and storing mass data intake collected from numerous sources and systems. To address these common issues within IoT deployment, a cloud computing architecture is proposed as it enables improved integration and sequencing of the diverse IoT applications and enables efficient storage, access, and management of information. Specifically, the authors provides strong recommendations regarding the utilisation of cloud computing to organise and model the behaviour of the devices, the definition of a common service orientated architecture to assist with integration and communication between interfaces, and a proposal for cloud data acquisition and warehousing. This article is useful to my research topic as it explicity proposes cloud computing architecture as a solution to evolve and expand the use of IoT devices and applications. The recommendations to improve business intelligence and data management through providing solutions to better manage ambient intelligence is directly related to my argument of leveraging the cloud to innovate and expand IoT usage.

Dutton, W. (2014). Putting things to work: spcoal and policy challanges for the Internet of things. *Emerald Insight, 13*(3), 1-21.

William Dutton's article describes the anticipated expansion of IoT with a focus on the scale of use and the impact the adoption will have both socially and economically. The work reviews the social and policy challenges triggered by the emergence and innovation of IoT applications and RFID sensor technology. These technological advancements have the ability to stimulate social and economic well-being and how businesses provide service. The outcome of this innovation is that it will expand the use and dependency on the internet use and trigger then need for new business models and policies to be developed. The research conducted is useful from a qualitative perspective as it highlights social and practical implications of expand IoT use including new

government challenges, open vs. closed network systems, spectrum management, and issues related to protocols, addressing and roaming. However, the work includes limited quantitative analysis to support findings. Dutton's study is particularly useful to my research and analysis of IoT and the Cloud as a SWOT analysis of the emergence of IoT was completed. This analysis provides a comprehensive overview of the strengths and opportunities that IoT can provide society and details the technical components and economic benefits of IoT within manufacturing, transportation, utilities, and energy industries. Additionally, the work highlights the weaknesses and threats, such as policy barriers related to privacy, data protection, and proprietary systems and the requirement of large scale technological systems.

Forge, S. (2016). Radio Spectrum for the internet of things. *Emerald Insight, 18*(1), 67-84.

This research conducted by Simon Forge focused on addressing the future challenge of adapting radio spectrum policy to meet the user requirements that the innovative Internet of Things (IoT) technology presents. As IoT relies on networks of autonomous and semi-autonomous devices, dependable and available radio communications networks and development of radio frequency spectrum management policies will have substantial impact on the growth and society's reliance on IoT. The research methodology reviews current IoT application demands on IT Architecture and spectrum frequency requirements for various types of IoT usage and analyses these against current spectrum functionality, capacity, and legislative policy. It is suggested that at the upcoming World Radiocommunications Conference (WRC) that new opportunities are explored and that the status quo is challenged. It is recommended that the spectrum be reframed to allocate the Licence Exempt 700MHz band for IoT. The research complete and policy recommendations provided within this journal highlights an current limitations within the emerging trend of IoT. Specifically, the research is of importance as it highlights that IoT architectural design and informs the development of future spectrum policy. Based on frequency requirements, a fit for purpose spectrum needs to be available for the various IoT applications. Forge's studies are relevant to the research undertaken as his findings and recommendations outline barriers to future growth and reliability of IoT and Cloud Computing. Specifically, Forge details the anticipated architecture requirements of wide spread IoT networks and identifies challenges including band interference, the required growth of unlicensed spectrum and allocation of licence except (LE) bands to enable innovation, and global policy changes.

Malik, S., Khan, S., Ewen, S., Tziritas, N., Kolodziej, J., Zomaya, A., . . . Zeadally, S. (2016). Performance Analysis of data intensive cloud systems based on data management and replication: a survey. *Distributed Parallel Databases, 34*, 179-215.

This academic survey conducted the expansive growth within the volume, velocity, and variety of data collected, available, and required to be analysed. This "Data Explosion" has been triggered by Internet of Things technologies including, but not limited to, the growth of social networks, mobile devices and sensors. This explosion has initiated an ongoing challenge for business to determine how to optimally manage large amounts of

data and to efficiently analyse and interpret the data to unlock valuable business intelligence. The explosion has placed extreme stress on on-premise database systems as most IT architectures are not agile enough to readily increase investments and maintenance in hardware and software systems and data management. To meet the dynamic and expanding data storage, replication, availability, and analytics requirements, the authors recommended that Infrastructure as a Service is utilised and that next generation data management systems that consist of cloud based architectures are deployed. End users will benefits from these architectures as they can provide improved Quality of Services in terms of storage capacity, IT agility, and data access, availability and analysis. This work is useful both to the research being undertaken on IoT and the cloud, but also useful to businesses and enterprises looking to transition as it highlights commons issues faces and provides components that should be consider in developing service level agreements with cloud providers to ensure performance and compliance meeting business needs. This survey undertaken aligns directly with current study and contributes the recommendation that IoT innovation must leverage efficiency of cloud computing to continue to grow and innovate. Additionally, the quality of service metrics provided within the review, such as reliability, load balancing, agility, automation and response time, inform key performance indicators that IoT businesses should consider and measure when evaluating transition from on premise to cloud based architecture.

Nolin, J., & Olson, N. (2016). The Internet of Things and convenience. *Internet Research, 26*(2), 360-376.

This work completed by Nolin and Olson explores the connection between convenience and the evolution of Internet of Things (IoT) technology. The concept of "any-everything" connectivity is introduced and described as the movement towards ubiquitous computing and ambient intelligence being frequently connected to the internet and transitioning from 24/7 remote connectivity for anyone to 24/7 remote connectivity for any and every thing, which is defined as alpha convenience. The concept of alpha convenience in relation to IoT is analysed from a critical perspective using the Constructive Technology Assessment (CTA) method. The assessment considers and scrutinizes current issues including the societal impact of wide-spread ubiquitous "smart" computing and ambient intelligence and the violation of privacy. The benefits and alpha convenience that IoT through anywhere, anything connection to the internet including: simplified manual proximity triggers, automatic proximity triggers, automatic sensor triggering, automatic product security, various types of user feedback ranging from simple to extensive to behavioural changing. The practical research study completed highlights the vast opportunity for adaption and expansion with IoT applications and architectures to improve business efficiencies and expand day-to-day societal consumer convenience through smart anything. The limitation of this work is that the concept of alpha convenience identifies challenges within data management and IT architecture but fails to address these problems with best practice strategies. Alternatively, the work is valuable as it markets alpha convenience as a driver of continued IoT innovation while identifies the opportunity costs that are sacrificed along the way.

Sun, Y., Bie, R., Thomas, P., & Cheng, X. C. (2014). Advances on data, information, and knowledge in the internet of things. *Personal and Ubiquitous Computing Journal, 18*, 1793-1795.

The study focuses on achieving the benefits of IoT and the ability to integrate and effectively management large scales of disparate data. To achieve IoT benefits, the authors highlight that it is essential to: correctly and safely identify IoT applications; effectively organise, model and integrate, large volumes of structured and unstructured data; have business intelligence capability to acquire knowledge and value from big data; and ensure security and privacy of your business and consumers is not a risk. The paper is useful as it explores potential solutions to better manage data models and process big data in IoT environments and address security and privacy issues that result from mobile computing and IoT applications and networks. The outlined provided provides valuable insights into the importance of how the capture and organisation of information and internal data management practices are integral in realising IoT benefits. In relation to the topic of IoT and Cloud Computing, this article provides justification the adoption challenges of data management and security which have been outlined in Project Proposal; these findings can be used to validate why alternative approaches and IT architectures need to be leveraged to expand IoT innovations in the future.

Tao, Z.-G., Luo, Y.-F., Chen, C.-X., Wang, M.-Z., & Ni, F. (2015). Enterprise application architecture development based on DoDAF and TOGAf. *Enterprise Information Systems* , 1-26.

This article introduces the importance of enterprise architecture and explains that successful enterprise architecture drives ICT strategy and the accomplishment of business objectives. Enterprise architecture takes a holistic view and looks at the processes, information, operational and technological changes that enable a organisation to transform from status quo and execute their strategies. The article uses proven enterprise architecture frameworks, including DoDAF and TOGAF, to develop recommendations on how to optimise enterprise architecture in the evolving information technology field with a core focus on supporting key business applications and effectively managing mass data. The paper proposes the growth and expanded use of service orientated architecture (SOA) to achieve improved integration between information systems. SOA has the capability to establish a comprehensive and dynamic architecture that incorporate cloud computing and increase IT agility and provide benefits within security, performance, and flexibility. This article provides strong references and examples of enterprise architectures deployed that combine best practice methodologies and incorporate SOA and cloud computing including the Service-Oriented Cloud Computing Architecture and Cloud Computing Open Architecture. The limitations of these design methodologies are that each design is customised for the enterprise architecture environment and specific design standards are difficult to replicate. The article strongly contributes to the study being undertaken as SOA provides solutions that embed extensive data capture and networks of systems and applications to integrate within a cloud environment. SOA applications provide business

with efficiencies and agility when it comes to design and develop of the enterprise architectures that are required to support technological innovation.

Xu, B., Da, X. L., Fei, Xiang, Jaing, L., Cai, H., & Want, S. (2016). A method of demand-driven and data-centric Web service configuration for flexible business process implementation. *Enterprise Information Systems*, 1751-1775.

This report highlights the rapidly changing business and information technologies environments that are subject to frequent business process re-engineering, data intensive applications and dynamic enterprise systems. These technological advancements are driving organisations away from traditional on-premise IT architectures toward cloud computing environments. The review notes that, although a number of efficiencies are created by cloud computing, data analysis and business intelligence can be less scalable and flexible with extraction information from third party database. This challenge is caused by the data-centric services provided by cloud hosts and multi-tenant resource allocation with their infrastructure that does not enable any variation of customisation of data structure. To overcome these analytics short-comings the authors propose a Configurable Information Resource Pool Architecture (CIRPA) which will enable business process execution and streamlined data extractions in multi-tenant cloud environments. This proposal is an efficient suggestion to resolve customisation restrictions when storing software applications or data in a cloud environment as CIRPA proposes to utilises Web services data queries to display, extract, and manage data in a configurable way. Web services have the ability to provide value to organisations as they enable presentation and analytics of data to occur while outsourcing hardware and infrastructure costs. The CIRPA approach to IT architecture is important to future IoT development as business will outsource data storage requirements to cloud providers while maintaining analytical and reporting capabilities.

3. Conclusion

The research conducted identifies that the implementation and optimisation of IoT technologies and deployment of cloud solutions is complex with a challenges that must be overcome. To benefit from these emerging technologies, business must be prepared to implement and maintain dynamic and agile IT architectures. As outlined by the research conducted, IoT technology places a number of demands on existing on premise solutions. Although barriers exist in regards to the integration of IoT applications and cloud computing, trends indicate that it is recommended that cloud based architectures should be deployed to support IoT solutions in the future. Cloud solutions provide a number of opportunities and benefits that address the specific IoT challenges and create efficiencies and optimise information management and data storage. As cloud computing continues to mature and wide spread internet connectivity and performance improves, companies will continue to bridge the gap between IoT technologies and the adoption of cloud computing which will enable future improvement and innovation from a social and economic perspective.

4. Bibliography

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3. Do direct quotations take up more than 10% of the essay? (We need to change some of the direct quotations to summaries and paraphrases so that at least 90% of every essay is written in our own words.)
4. Are any of the bold, coloured text matches in my originality report purely coincidental? (Sometimes our words coincidentally match with words in other online sources that we have never seen before and that are completely irrelevant to our research topic. If so, we do not need to change anything at all.)
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6. Have I synthesised all of the sources' ideas into my essay by introducing each piece of source information with a signal phrase and by adding my own comments or interpretation to it in the following sentence? (We need to avoid dropped-in quotations and simply reporting facts or other people's ideas because that approach means that instead of building our own arguments and writing our own essays, we are merely stringing together other people's words and ideas.)

Answers:

1) No.
2) No, the majority of bold is annotated bibliography sources or common words and phrases.
3) No.
4) Yes. There are generic terms, word phrases or organisations names.
5) Yes. There are one of two instances that the Turnitin Originality report has captured attempts at paraphrasing that may not have been completed successfully.
6) Yes. The annotated bibliography format helps ensure all works are introduced.

Turnitin Originality Report

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16 < 1% match (publications)
Malik, Saif Ur Rehman, Samee U. Khan, Sam J. Ewen, Nikos Tziritas, Joanna Kolodziej, Albert Y. Zomaya, Sajjad A. Madani, Nasro Min-Allah, Lizhe Wang, Cheng-Zhong Xu, Qutaibah Marwan Malluhi, Johnatan E. Pecero, Pavan Balaji, Abhinav Vishnu, Rajiv Ranjan, Sherali Zeadally, and Hongxiang Li. "Performance analysis of data intensive cloud systems based on data management and replication: a survey", Distributed and Parallel Databases, 2015.

paper text:

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This article examines the challenges that must be overcome to efficiently combine and manage IoT sensors and devices utilising ambient intelligence. The main obstacles to overcome when managing these devices includes: the identification of requirements and implementation of devices and services; effectively design network architecture to manage heterogeneity and composition to enable devices to operate effectively; and managing, interpreting and storing mass data intake collected from numerous sources and systems. To address these common issues within IoT deployment, a cloud computing architecture is proposed as it enables improved integration and sequencing of the diverse IoT applications and enables efficient storage, access, and management of information. Specifically, the authors provides strong recommendations regarding the utilisation of cloud computing to organise and model the behaviour of the devices, the definition of a common service orientated architecture to assist with integration and communication between interfaces, and a proposal for cloud data acquisition and warehousing. This article is useful to my research topic as it explicity proposes cloud computing architecture as a solution to evolve and expand the use of IoT devices and applications. The recommendations to improve business intelligence and data management through providing solutions to better manage ambient intelligence is directly related to my argument of leveraging the cloud to innovate and expand IoT usage.

10**Dutton, W. (2014). Putting things to work:** spcoal **and policy** challanges **for the Internet of things.** Emerald Insight, 13 **(3), 1-21.**

William Dutton's article describes the anticipated expansion of IoT with a focus on the scale of use and the impact the adoption will have both socially and economically. The work reviews the social and policy challenges triggered by the emergence and innovation of IoT applications and RFID sensor technology. These technological advancements have the ability to stimulate social and economic well-being and how businesses provide service. The outcome of this innovation is that it will expand the use and dependency on the internet use and trigger then need for new business models and policies to be developed. The research conducted is useful from a qualitative perspective as it highlights social and practical implications of expand IoT use including new government challenges, open vs. closed network systems, spectrum management, and issues related to protocols, addressing and roaming. However, the work includes limited quantitative analysis to support findings. Dutton's study is particularly useful to my research and analysis of IoT and the Cloud as a SWOT analysis of the emergence of IoT was completed. This analysis provides a comprehensive overview of the strengths and opportunities that IoT can provide society and details the technical components and economic benefits of IoT within manufacturing, transportation, utilities, and energy industries. Additionally, the work highlights the weaknesses and threats, such as policy barriers related to privacy, data protection, and proprietary systems and the requirement of large scale technological systems.

12**Forge, S. (2016). Radio Spectrum for the internet of things.** Emerald Insight, **18(1), 67-84.**

This research conducted by Simon Forge focused on addressing the future challenge of adapting radio spectrum policy to meet the user requirements that the innovative Internet of Things (IoT) technology presents. As IoT relies on networks of autonomous and semi-autonomous devices, dependable and available radio communications networks and development of radio frequency spectrum management policies will have substantial impact on the growth and society's reliance on IoT. The research methodology reviews current IoT application demands on IT Architecture and spectrum frequency requirements for various types of IoT usage and analyses these against current spectrum functionality, capacity, and legislative policy. It is suggested that at the upcoming World Radiocommunications Conference (WRC) that new opportunities are explored and that the status quo is challenged. It is recommended that the spectrum be reframed to allocate the Licence Exempt 700MHz band for IoT. The research complete and policy recommendations provided within this journal highlights an current limitations within the emerging trend of IoT. Specifically, the research is of importance as it highlights that IoT architectural design and informs the development of future spectrum policy. Based on frequency requirements, a fit for purpose spectrum needs to be available for the various IoT applications. Forge's studies are relevant to the research undertaken as his findings and recommendations outline barriers to future growth and reliability of IoT and Cloud Computing. Specifically, Forge details the anticipated architecture requirements of wide spread IoT networks and identifies challenges including band interference, the required growth of unlicensed spectrum and allocation of licence except (LE) bands to enable innovation, and global policy changes. Malik, S.,

14**Khan, S., Ewen, S., Tziritas, N., Kolodziej, J., Zomaya, A.,**

. . . Zeadally, S. (2016).

9**Performance Analysis of data intensive cloud systems based on data management and replication: a survey. Distributed Parallel Databases, 34,**

179-215. This academic survey conducted the expansive growth within the

16**volume, velocity, and variety of data** collected, **available,**

and required to be analysed. This “Data Explosion” has been triggered by Internet of Things technologies including, but not limited to, the growth of social networks, mobile devices and sensors. This explosion has initiated an ongoing challenge for business to determine how to optimally manage large amounts of data and to efficiently analyse and interpret the data to unlock valuable business intelligence. The explosion has placed extreme stress on on-premise database systems as most IT architectures are not agile enough to readily increase investments and maintenance in hardware and software systems and data management. To meet the dynamic and expanding data storage, replication, availability, and analytics requirements, the authors recommended that Infrastructure as a Service is utilised and that next generation data management systems that consist of cloud based architectures are deployed. End users will benefits from these architectures as they can provide improved Quality of Services in terms of storage capacity, IT agility, and data access, availability and analysis. This work is useful both to the research being undertaken on IoT and the cloud, but also useful to businesses and enterprises looking to transition as it highlights commons issues faces and provides components that should be consider in developing service level agreements with cloud providers to ensure performance and compliance meeting business needs. This survey undertaken aligns directly with current study and contributes the recommendation that IoT innovation must leverage efficiency of cloud computing to continue to grow and innovate. Additionally, the quality of service metrics provided within the review, such as reliability, load balancing, agility, automation and response time, inform key performance indicators that IoT businesses should consider and measure when evaluating transition from on premise to cloud based architecture.

11**Nolin, J., & Olson, N. (2016). The Internet of Things and convenience. Internet Research, 26(2), 360-376.**

This work completed by Nolin and Olson explores the connection between convenience and the evolution of Internet of Things (IoT) technology. The concept of “any- everything” connectivity is introduced and described as the movement towards ubiquitous computing and ambient intelligence being frequently connected to the internet and transitioning from 24/7 remote connectivity for anyone to 24/7 remote connectivity for any and every thing, which is defined as alpha convenience. The concept of alpha convenience in relation to IoT is analysed from a critical perspective using the Constructive Technology Assessment (CTA) method. The assessment considers and scrutinizes current issues including the societal impact of wide-spread ubiquitous “smart” computing and ambient intelligence and the violation of privacy. The benefits and alpha convenience that IoT through anywhere, anything connection to the internet including: simplified manual proximity triggers, automatic proximity triggers, automatic sensor triggering, automatic product security, various types of user feedback ranging from simple to extensive to behavioural changing. The practical research study completed highlights the vast opportunity for adaption

and expansion with IoT applications and architectures to improve business efficiencies and expand day-to-day societal consumer convenience through smart anything. The limitation of this work is that the concept of alpha convenience identifies challenges within data management and IT architecture but fails to address these problems with best practice strategies. Alternatively, the work is valuable as it markets alpha convenience as a driver of continued IoT innovation while identifies the opportunity costs that are sacrificed along the way.

5**Sun, Y., Bie, R., Thomas, P., & Cheng, X.** C. (2014). **Advances on data, information, and knowledge in the internet of things. Personal and Ubiquitous Computing**

Journal, 18, 1793-1795. The study focuses on achieving the benefits of IoT and the ability to integrate and effectively management large scales of disparate data. To achieve IoT benefits, the authors highlight that it is essential to: correctly and safely identify IoT applications; effectively organise, model and integrate, large volumes of structured and unstructured data; have business intelligence capability to acquire knowledge and value from big data; and ensure security and privacy of your business and consumers is not a risk. The paper is useful as it explores potential solutions to better manage data models and process big data in IoT environments and address security and privacy issues that result from mobile computing and IoT applications and networks. The outlined provided provides valuable insights into the importance of how the capture and organisation of information and internal data management practices are integral in realising IoT benefits. In relation to the topic of IoT and Cloud Computing, this article provides justification the adoption challenges of data management and security which have been outlined in Project Proposal; these findings can be used to validate why alternative approaches and IT architectures need to be leveraged to expand IoT innovations in the future.

2**Tao, Z.-G., Luo, Y.-F., Chen, C.-X., Wang, M.-Z., & Ni, F. (2015). Enterprise application architecture development based on DoDAF and TOGAf. Enterprise Information Systems , 1-** 26. **This article**

introduces the importance of enterprise architecture and explains that successful enterprise architecture drives ICT strategy and the accomplishment of business objectives. Enterprise architecture takes a holistic view and looks at the processes, information, operational and technological changes that enable a organisation to transform from status quo and execute their strategies. The article uses proven enterprise architecture frameworks, including DoDAF and TOGAF, to develop recommendations on how to optimise enterprise architecture in the evolving information technology field with a core focus on supporting key business applications and effectively managing mass data. The paper proposes the growth and expanded use of service orientated architecture (SOA) to achieve improved integration between information systems. SOA has the capability to establish a comprehensive and dynamic architecture that incorporate cloud computing and increase IT agility and provide benefits within security, performance, and flexibility. This article provides strong references and examples of enterprise architectures deployed that combine best practice methodologies and incorporate SOA and cloud computing including the Service- Oriented Cloud Computing Architecture and Cloud Computing Open Architecture. The limitations of these design

methodologies are that each design is customised for the enterprise architecture environment and specific design standards are difficult to replicate. The article strongly contributes to the study being undertaken as SOA provides solutions that embed extensive data capture and networks of systems and applications to integrate within a cloud environment. SOA applications provide business with efficiencies and agility when it comes to design and develop of the enterprise architectures that are required to support technological innovation. Xu, B., Da, X. L., Fei, Xiang, Jaing, L., Cai, H., & Want, S. (2016).

3**A method of demand-driven and data-centric Web service configuration for flexible business process implementation. Enterprise Information Systems,**

1751-1775. This report highlights the rapidly changing business and information technologies environments that are subject to frequent business process re-engineering, data intensive applications and dynamic enterprise systems. These technological advancements are driving organisations away

3**from traditional on-premise** IT architectures toward **cloud computing environments. The**

review notes that, although a number of efficiencies are created by cloud computing, data analysis and business intelligence can be less scalable and flexible with extraction information from third party database. This challenge is caused by the data-centric services provided by cloud hosts and multi-tenant resource allocation with their infrastructure that does not enable any variation of customisation of data structure. To overcome these analytics short-comings the authors

3**propose a Configurable Information Resource Pool Architecture (CIRPA)**

which will enable business process execution and streamlined data extractions in multi-tenant cloud environments. This proposal is an efficient suggestion to resolve customisation restrictions when storing software applications or data in a cloud environment as CIRPA proposes to utilises Web services data queries to display, extract, and manage data in a configurable way. Web services have the ability to provide value to organisations as they enable presentation and analytics of data to occur while outsourcing hardware and infrastructure costs. The CIRPA approach to IT architecture is important to future IoT development as business will outsource data storage requirements to cloud providers while maintaining analytical and reporting capabilities. 3. Conclusion The research conducted identifies that the implementation and optimisation of IoT technologies and deployment of cloud solutions is complex with a challenges that must be overcome. To benefit from these emerging technologies, business must be prepared to implement and maintain dynamic and agile IT architectures. As outlined by the research conducted, IoT technology places a number of demands on existing on premise solutions. Although barriers exist in regards to the integration of IoT applications and cloud computing, trends indicate that it is recommended that cloud based architectures should be deployed to support IoT solutions in the future. Cloud solutions provide a number of opportunities and benefits that address the specific IoT challenges and create efficiencies and optimise information management and data storage. As cloud computing continues to mature and wide spread internet connectivity and performance improves, companies will

continue to bridge the gap between IoT technologies and the adoption of cloud computing which will enable future improvement and innovation from a social and economic perspective. 4. Bibliography

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