Sustainable Information and Corporate Governance

Strategies for New Technology

Edited by Liam Mawhinney & Richard Self
PREFACE

This book is the first of a series, composed of 30 articles and written by A grade students in the Department of Computing and Maths at the University of Derby, on topics covered by a final year module called Sustainable Information and Corporate Governance for the BSc in Information Technology.

The focus of the articles is to “critically evaluate the Sustainable Information and Corporate Governance impact of a new technology on a British University in terms of the Information Governance Strategy that needs to be developed to guide the development and incorporation of the technology into the University’s portfolio of products and services to meet the needs of students.”

This book has been written for all levels of management and members of staff or users working in Universities and critically evaluates the governance issues presented by the incorporation of new technologies into the portfolio of systems used in Universities. Each article then proposes relevant governance strategies which should be followed in order that the incorporation of the new technologies into the corporate infrastructure portfolio meets best governance practices.

It aims to inform readers on many of the most applicable business strategies that should be considered with regards to technology and information systems (IS), thus increasing awareness in the workforce, allowing optimisation of system practices and ultimately driving success in Universities, delivering more of what they should, in the way that they should.

The main themes throughout this book include security (in many forms), online issues (implications and protection), governance and compliance, and insider / human issues.
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Open Data In Higher Education

For The Gulf Cooperation Council

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Abstract—This paper presents a case for open data (OD) at institutions of higher education, with specific references to the Gulf Cooperation Council where introducing new technology will have more resistance from the people there. Such technology has many requirements prior to OD implementation, such as Internet infrastructure and training to improve ICT skills. Nevertheless, OD offers many benefits for students and staff, and it is a good example of technologically driven education. In this context, the principles of OD are the foundation that validates this technology. And unless policies are issued to situate this technology in the correct governance framework, the OD implementation will be partial, at best. This paper contains recommendations for a correct governance framework.

Index Terms—Open data, education, copyrights, service availability, ICT skills.

I. INTRODUCTION

Open data (OD) are resources of data in different formats that allow individual and organisation to collect data in order to perform a task or reuse (Machado and De Oliveira, 2011). OD helps people to make better decisions about their life and society (Howard 2011). The data significantly increases public transparency, as it can help people to understand what the government or organisation does and how it will perform (Ubaldi, 2013). OD resources are free to be used or reused in formats designed to be readable, and the integration would be easier if an application programming interface (API) allowed third parties to use the data for different purpose (Maltby, 2013).

For instance, students in the Gulf Cooperation Council (GCC) could know the local university’s policy related to attendance or accepting offer, which would help them to understand their rights and what the university expects of them. For international students, OD will be useful to learn more about the regime of their host country and the facilities therein, better preparing them for their academic life before joining the university. This will increase the transparency and public awareness of the universities and could provide public participation and collaboration, which may improve decision making from both the students and universities (Ubaldi, 2013).

Using OD in universities will increase the transparency between a university and it students, as the corruption will be easier to track (Granickas, 2013). Furthermore, free access to research will affect the students’ work and give them more opportunities to expand their knowledge. In particular, online learning uses the OD function, allowing students to study online rather than within a classroom; it also provides valuable electronic information resources, such as video lectures, readings, exercises and tutorials (Verhulst, 2012).

A. An example of OD in Higher Education

Free courses and their materials are now available in perpetuity. For example, the Massachusetts Institute of Technology (MIT) has published all of its course content for global usage. MIT’s Open Courseware (OCW) is a web-based programme that improves education and helps students to find extra recourses to support their study. MIT is the first institution to offer such OD courses, which open course data to be available for free and support open courses by annual champion gift to who provide one year support for the course of their choice through them (Massachusetts Institute of Technology, date unknown). The data provided through the MIT web site does not mean that students can miss classes; it is just helps them to acquire knowledge through numerous accessible sources.

B. OD Principles

- OD are free and should be structured to allow for reuse. OD should not have any copyright restrictions or any other such mechanisms. This would allow third-party developers to build the tools to integrate and use the information for their purposes. For that to happen, significant key features need to be considered (Open Knowledge Foundation, 2012). Lessig (2007) offered the following principles to guide the public availability of data:
  - Data must be public information that is not governed and limited to any type of softcopy.
  - Data must be accurately published from the source without any modification to the information.
  - Data must be rapidly available to maintain the data’s value.
  - Data must be accessible to individuals and organisations from the Internet.
  - Data must be readable and structured in a format that can be processed.
  - Data must have a license free, no restriction of copyright.
C. Education on Data Structure

Students always have many questions both before and after joining a university that help them to make decisions on the study. If the answers were available under OD technology, it would reduce the impact on student help centre and reduce the operational costs of services that help to answer their questions. Thus, it is important to prepare a list of relevant questions and keep that information updated on an OD, making sure to audit the process of gathering the information to open data. For instance, immigration information related to international student status is the most common question that first-year international students ask (StudentAwards.com, 2012). Moreover, students and organisations need to get the percentage of students who graduate every year to help with university rankings (Lee, 2013). Nevertheless, other OD uses, such as university course materials, are more significant to students and other stakeholders. Blackboard provides this type of service to universities and students as a third-party software.

The rest of the paper is organised as follows: in section II, the impact of OD on effective learning is discussed; section III proposes a governance strategy; and conclusions and recommendations are provided in section IV.

II. IMPACT OF OD IN HIGHER EDUCATION

Before implementing an OD project, one must identify obstacles that might hinder its implementation. Will implementing an OD project affect the current student culture? Does the university have the right to use student data and how should this be governed? What assurance governs the privacy of student and staff data? And what affect does OD have on a university’s ranking? Furthermore, before publishing any type of data, one must define what higher education seeks to achieve? Are the students and staff able to use the new skills that come with OD technology? The outcome of dynamic data on different fields can affect the results that would announce from wider sharing of data (Davies, Perini and Alonso, 2013). Many of the effects of OD are discussed in this section.

A. Copy Rights

OD are free information. However, one does not simply have the right to use or reuse the data for commercial purpose without offering credit to the author or publisher (Open Data Handbook, date unknown). For instance, a university could publish the materials for a course with an OD resource, but anyone could sell the material or use the data without referencing the original source or giving credit to the owner.

B. Privacy of Students and Staff

There are two types of data used in higher education. The first is performance data, in which the educational materials and records of staff performance show the level of student work and the quality of the study materials. This transparency allows universities to improve their rankings. This also governs the type of data that should be public and the controls necessary to ensure that the data will be suitable for public use. The other data type is the personal data of students and staff, which needs to be kept secure when using an OD (Ruiz et al., 2012).

C. Data Availability

The constant availability of OD materials is a challenge that information technology (IT) must always meet. If the web site providing the data to students is unavailable, it will affect their work and may cause them to distrust IT. Service availability has become a significant management variable when delivering service with high demand from customers (Zeng, 2008). For instance, a student has an assignment with a specific deadline, and the student needs to access some data online to complete it. Suddenly, the online data site is down. This would be especially problematic if many students needed the unavailable service before the assignment deadline.

D. Student Opportunity and Skills

Students in GCC are not always able to access online data from offsite locations. For instance, students in GCC who live out the campus or out the city have no Internet access. No one can ensure that all students get a PC or Internet access especially in GCC as still some areas do not have the Internet infrastructure (Sahraoui, Gharaibeh and Al-Jboori, 2006). Furthermore, most students in GCC grow up without advanced technology, and it is difficult for them to become accustomed to a university that provide online access to data. They lack the skills to understand and navigate the technology with ease. Even the GCC instructors still use paper rather than e-books from data online, which may cause resistance from instructors to change. This required long term of training process and has a risk on making the project success in short term (Morgan, 2003). This lack of information and communication technology (ICT) skill is not simply a matter of using technology or browsing the Internet. It exposes fundamental issues with how GCC students and staff navigate systems, expand on their knowledge and exchange data. A case study conducted at Derby University, UK, showed that many undergraduates and postgraduates are well aware of how to use online social networks but lack the ICT skills to help them with their research and assignments (Self, 2009).

Although that case study was conducted in the UK, the conclusions are even more pronounced for GCC students who have poor Internet infrastructure, which keeps them from having even primary ICT skills.

III. GOVERNANCE STRATEGY PROPOSAL

For any existing or new project, several standards need to be applied to deliver an acceptable service in a stable operation. These have to be suitable for the organisation. Moreover, the organisation should consider the potential risks of adopting OD and predict the project’s potential financial and political effects. These standards and risks are discussed in this section.

A. Applied Copyrights

Copyrights are defined as ‘the exclusive legal right, given to the originator or his or her assignee for a fixed number of years, to print, publish, perform, film, or record literary, artistic, or musical material, and to authorize others to do the
same’ (Standards Council of Canada, 2004). Copyrights should be applied to data, whether they are softcopy or any type of media referenced in ISO 9001 Section 4.2 (British Standards Institute, 2000). This will not be enough, however, as there are many methods to break this rule. Therefore, data is still susceptible to use without proper credit being given. Furthermore, other tasks, such as a reference to the copyright policy for the use of data, need to be applied in context, and target users need to understand the policy with ease. Finally, the addition of a watermark to the data files would be useful, and a link should appear when accessing OD, explaining the absence of restrictions or copyrights on the condition that the re-user gives credit to the publisher (Davey, Dodds and Hirst, 2013).

B. Protection of Privacy Information

International Organisation for Standardisation (ISO) regulations should be followed to ensure that privacy is secure in an OD model, and the Information Technology Infrastructure Library (itSMF UK, 2012) process should be implemented to manage the risk of compromised privacy (Wilhite, date unknown). Publishing any document or data through an OD site requires a process that includes many controls to ensure that no private information related to users, such as students or staff, is released to the public. The first step in that process is to identify the privacy data in need of protection. ISO 27001 lists several such types of data that help to identify the users, such as name, phone number and ID number (passport), and may include email addresses in some cases (British Standard Institute, 2013). A process is required here to help provide data to the public, a process that has accountability and responsibility to withhold any data deemed private (Mccallister, Grance and Scarfone, 2010). According to ISO 27001 the control of privacy and protection of personally identifiable information shall be ensured, as required in relevant legislation and regulation where applicable (British Standard Institute, 2013). ISO 29101 requires universities to address activities such as distribution, access, retrieval and use of OD if universities are to achieve and retain their ISO accreditation (British Standard Institute, 2013). The Data Protection Act should govern the security of student and staff data, and universities should be required to have an internal audit mechanism to prevent internal misuse of privileged access to data (Data Protection Act, 1998). The Data Protection Act controls how organisations use personal data; unfortunately, this act does not apply to the GCC. Thus, the GCC should establish a government organisation for data protection.

C. Service Availability

When the service goes down without notice, it will affect the availability of the service. Impact availability is between failure occur and when it rapiers and run to normal operation (Paschke and Gerull, 2006). Using an ITIL framework and availability management will allow both the university and its IT service provider to have a service level agreement (SLA) that contains the critical metrics. The performance of this SLA should be based on Introduction Overview of ITIL v3 section availability management and several key roles and responsibilities. SLA metrics such outage period and delay need to be kept at acceptable levels and may include a fee for the service provider (Paschke and Gerull, 2006). For instance, if a university and a service provider reached an SLA that guaranteed Internet availability for 95% of the year, and if that availability dropped below 95% in that time, the provider would pay a fee to the university. To have an SLA, the service performance should be tracked, and IT management issues, such as incidents, changes, problems and configurations, should be defined; table 1 shows multi-dimensional categorisation of metric (Paschke and Gerull, 2006). The architecture of the service is the most significant part in any project where the availability management should be study well and the ability of data centre is considered the huge of data, bandwidth and ability of failover of the server using load balancer (Greenberg et al., 2009).

### TABLE I. MULTI-DIMENSIONAL CATEGORISATION OF METRIC

<table>
<thead>
<tr>
<th>Metric</th>
<th>Service</th>
<th>ITIL Process</th>
<th>Automatino Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Down Time</td>
<td>OD Service</td>
<td>Incident Management/Problem</td>
<td>Measurable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management/Change Management</td>
<td></td>
</tr>
<tr>
<td>Number of Repeated</td>
<td>OD Service</td>
<td>Problem Management</td>
<td>Measurable</td>
</tr>
<tr>
<td>Disturbances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>Help Desk</td>
<td>Service</td>
<td>Measurable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desk/Incident/Problem/Availability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
<td></td>
</tr>
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</table>

D. Improving Ability and Skills

Adapting OD technology in the university setting will increase a university’s responsibility to ensure that the needed facilities are available and that the students and instructors can use them when needed. ISO 38500 has provided a framework to evaluate, direct and monitor the use of IT in organisations. These standards determine how to make the technology acceptable and effective (British Standard Institute, 2008). When implementing an OD project, this strategy should be clearly understood to ensure that the proper facilities are in place to meet student and staff needs. To achieve such a goal, ISO 38500 includes a strategy and policies that support the general use of IT in the university setting. Thus, making sure that there are some groups need a space in university to use and access to data that are available on the Internet but they may do not have Internet access at their home. Moreover, in accordance with ISO 9001 (British Standard Institute, 2000) universities should offer training for instructors to use OD technology in their daily work. According to ISO 27001 (British Standard Institute, 2013) the resources should be provided to establish, implement and maintain information security management because the university needs to ensure that the staff are aware of and understand the proper use of this technology. Wireless technology is one source that should be available and secure for students, which will help them to access to the data through their laptops or smart phones. Further still, providing mailing box for students and instructors...
will empower them to increase the communication between them and the ease with which they use it; this will also allow the IT department to monitor the system and evaluate it. Ultimately, according to both ISO 27001 and ISO 29101, establishing information security policy will be necessary to ensure standardization of OD technology’s purpose and the successful facilitation of its objectives (British Standard Institute, 2013).

IV. CONCLUSION

OD are presented to be used in higher education in GCC and the benefits from obtain OD. Furthermore, it was determined that applying international standards of governance ensures that the implementation of an OD project would be worthwhile for institutions of higher education.
V. Reference


Abstract—Over the years, universities around the world have adopted different methodologies such as surveys, questionnaires, focus groups and setting up forums, in their resolve to foster greater relationship between the university staff and the student population whilst also using this approach as a means of gathering information about the challenges inherent in the university community and the need for improvement. With the advancement in technology, techniques such as crowdsourcing are beginning to provide an alternative platform for universities to seek better ways to gather and share information. However, this paper has identified a list of governance issues which include: Information Privacy, Reputational risk, Reliability of Data and intellectual property- that could have an adverse impact on the successful adoption and implementation of this technology (crowdsourcing) in the university environment.

Index Terms— Crowdsourcing, Information Governance, Governance frameworks, University, Emerging Technology

I. INTRODUCTION (WHAT IS CROWDSOURCING?)

The concept called Crowdsourcing is an emerging and evolving technology which mostly leverages on the internet to utilise the ‘power of the people’ in resolving issues (Newman, 2013). In addition, crowdsourcing has been identified as a technology that has the potential to solve some of the biggest issues facing society (Ferrari and Fidanboylu, 2013). Moreover, it is of note that this concept is leading to innovative discoveries in the fields of science and medicine (Newman, 2013). For example, biologists at the University of Washington were able to map the structure of an AIDs-related virus (a problem which had been unresolved for over 15 years) with the help of a crowd of external contributors (Boudreau and Lakhani, 2013). Consequently, due to the evolving nature of this technology, crowdsourcing has emerged as a vital aspect of the university (Skarzauskaite, 2012). This is in conformity with Brabham (2011), who noted that organisations implement crowdsourcing schemes with the hope that the participation of an online community would produce a solution to a particular problem.

Crowdsourcing can best be effectively used by universities to gather data and understand the student data in order to enhance the overall experience (Drysdale, 2013). Consequently, crowdsourcing plays a significant part in the reduction of time spent on research and development (Kumar, 2013). According to Wilson (2013), universities have their fair share of problems and crowdsourcing can provide an alternative means to identifying and solving some of these problems, unlike using traditional approaches such as setting up committees and conducting surveys (Skarzauskaite, 2012).

A. Key Aspects of Crowdsourcing

The key aspects of crowdsourcing, include, but are not limited to the following:

- Information gathering- It is imperative for universities to gather data and understand the student data in order to enhance the overall experience (Drysdale, 2013).
- Collaboration/participation- A key and central feature of crowdsourcing involves collaboration and participation (Aitamurto, Leiponen and Tee, 2011). This is in conformity with Brabham (2011), who noted that organisations implement crowdsourcing schemes with the hope that the participation of an online community would produce a solution to a particular problem.
- Information sharing – With any crowdsourcing initiative, developing content and sharing of knowledge is an essential feature (Skarzauskaite, 2012).
- Engagement- Crowdsourcing can best be effectively implemented if the crowd are well engaged and trust the requester with its information (Buttry, 2011).

B. Benefits of Crowdsourcing

Technology is changing the way businesses and individuals are interacting, communicating and sharing information (Cleavely-Millwood, 2013). Consequently, crowdsourcing is beneficial to the student population in so many ways. For instance, a properly implemented crowdsourcing initiative can enable the student to develop practical problem-solving skills (Wilson, 2013). Nonetheless,
the following section identifies different ways in which crowdsourcing could be of benefit to the student population.

Alternative approach to information gathering- Unlike traditional methods of gathering data, such as - conducting surveys, forums, questionnaires- the adoption of a crowdsourcing technique provides a more convenient and flexible approach that allows the researcher to easily obtain data from a large number of participants (Behrend et al., 2011).

Information gathering- Social networks promote the efficient search for uncommon information (Naroditskiy et al., 2012). Moreover, the university community can explore the evolving nature of the internet, social media sites: which has become a primary means of communication among students; thereby using a crowdsourcing technique to gather information such as - the students opinion about a particular issue or their thoughts on the new programs the university have on offer - from the student population (Wilson, 2013). Consequently, promoting openness and allowing for the sharing of resources and knowledge (Skarzauskaite, 2012).

Real World learning/ skill building - A major benefit of crowdsourcing is the fact that it gives students the opportunity to create innovative solutions to real world problems thereby allowing students to use their classroom knowledge to gain real-world experience (Skarzauskaite, 2012). It is important to take into cognisance of the fact that when a specific community is entrusted with the outcome of a particular issue (Wilson, 2013) they tend to become more involved with finding the solution (Crowdsourcing, 2013).

Collaboration/ Participation - Crowdsourcing creates an ideal platform for the student population and the university community to collaborate and contribute their knowledge and experience to a specific task. (Wilson, 2013). Additionally, this technology provides the opening for students to collaborate on class assignments, problem solving and grading (Wilson, 2013). Furthermore, crowdsourcing can enhance the development and use of educational materials (Skarzauskaite, 2012).

II. EVALUATION OF GOVERNANCE ISSUES

In this section, governance issues such as Information Privacy, Reputational risk, Reliability of Data and intellectual property has been identified and will be critically analysed whilst an appropriate governance framework such as ITIL v3, COBIT 4.1 and ISO 27002 are factored into the overall process. This is because the use of standards and best practices facilitate effective governance of IT activities (ITGI and OGC, 2008). Moreover, establishing a good practice framework within an organisation can go a long way in the process of mitigating some of the identified risks (TechTarget, 2011). It is worth noting that a good practice framework can provide a solid foundation on which to lay the groundwork necessary to meet regulatory compliance requirements (Arraj, 2013). Standards and good practice frameworks such as ITIL v3, COBIT 4.1 and ISO 27002, complement each other (Garbani, Koetzle and Powell, 2005). Additionally, it is of note that each of these standards deal with different aspects of IT governance and none of them independently provide a complete IT governance framework (Calder, 2008). Moreover, as a result of the speed and complexity of the ever changing technologically-driven environment; governance processes, control and risk management have become of huge importance (Cleaverly-Millwood, 2013). Consequently, for crowdsourcing to be successfully implemented as a technology in the University of Derby, it is imperative that the ITIL v3, COBIT 4.1 and ISO 27002: 2005 standards are implemented because the standard provides a set of guidelines and regulations (ITGI and OGC, 2008). For instance, the guiding principles for the ISO framework rely on either legal requirements or generally accepted best practices (ITGI and OGC, 2008). Moreover, the ITIL guidelines enhances productivity, improved use of skill and experience (APMG Ltd., 2013) whilst the COBIT 4.1 framework helps organisations meet business challenges in areas of regulatory compliance, risk management and aligning the IT strategy with organisation goal (ITGI and OGC, 2008). Furthermore, the ITIL operational process strengths can supplement the critical success factors and key performance indicators of COBIT, and both can make good use of the security processes and controls defined in the ISO standards (Garbani, Koetzle and Powell, 2005). Integrating different elements of these frameworks allows for improvement in compliance; increase in governance effectiveness and reduction in internal conflict (Calder, 2008).

A. Information Disclosure/ Information Privacy

In any crowdsourcing model controlling the confidentiality of the information generated could pose a huge challenge (Amin, 2013). Moreover, Online Social Networks like Facebook, twitter and Myspace, are examples of crowdsourcing systems which allows for sharing of information and the information sharing activity on these platforms are emerging as an important privacy concern (Amin,
The COBIT 4.1 framework under the PO8.4 (Plan and Organise domain) adequately addresses issues relating to Privacy, intellectual property and data flow whilst the ITIL best practices addresses issues relating to privacy under the service and delivery domain (SD 5.2) (ITGI and OGC, 2008). This is supported in the ISO 27002:2013 standard under clause 18.1.4 where Privacy and protection of personally identifiable information are comprehensively addressed (British Standard Institute, 2013).

2) Reputational Risk

Reputational risks may occur as a result of bad publicity caused by certain business events. Whether accurate or inaccurate, negative publicity compromises an organisation’s reputation capital and could result in value loss (The Conference Board, 2007). Nonetheless, efforts to protect corporate reputation have become more difficult as a result of the increase in the complexity of the potential sustainability-related risks to corporate reputation (KPMG, 2013).

However, the COBIT framework under the Deliver and Support domain (DS 5) addresses risk management related issues, this is supported in the ITIL lifecycle under the security management, fundamental of security 2.3.1.2 plan and 4.1 control (ITGI and OGC, 2008) whilst clause 6.1.4(e) of the ISO 27002:2013 standard addresses issues relating to implementation of new technologies and information security (British Standard Institute, 2013).

3) Reliability of Data

The ISO 27002:2013 standards in clause 10.1.1 (b) states that the use of digital signatures or message authentication codes can be used to verify the authenticity and integrity of sensitive data (British Standard Institute, 2013). Additionally, Clause (8.2) of the ISO 27002:2013 standards, states that information should be treated with an appropriate level of protection (British Standard Institute, 2013). The COBIT 4.1 framework under the Acquire and Implement (AI 5.5) domain defines the processes and steps needed to address this issue (ITGI and OGC, 2008).

4) Intellectual Property

The COBIT 4.1 framework under the PO8.4 (Plan and Organise domain) adequately addresses issues relating to Privacy, intellectual property and data flow whilst the ISO 27002:2013 standards under clause 15.1.2 (C) elaborates on the steps to take to avoid issues associated with intellectual property (British Standard Institute, 2013).

IV. CONCLUSIONS

As the university community continue to leverage on the use of crowdsourcing as an alternative means of collaboration and information gathering between the student population and university staff for better and improved services, it is imperative that the university develops a governance framework which can help to alleviate identified governance issues such as Information Privacy, Reputational risk, Reliability of Data and intellectual property. This report identifies the integration of COBIT 4.1, ITIL v3 and ISO 27002 standards as a good practice framework which can be implemented before adopting emerging technologies such as
crowdsourcing. Moreover, the benefit of integrating these frameworks is that as a unit they complement each other. Furthermore, IT governance frameworks are vital in the implementation of any IT activity because the use of frameworks enhances improved performance and value transparency.
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Integrating Social Media Networks Into E-Learning

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Abstract—This paper examines how integrating social media networks into e-learning would be beneficial for students at Qatar University. In order to do that it is required to determine the reasons for the adoption of social media networks as successful tools in e-learning. Governance issues framework that pertain to the integration are evaluated and analyzed. Strategies and policies are proposed to apply the chosen framework based on the issues that might impede combining social media with e-learning.

Index Terms—Social media education, social media e-learning, integrate social media, e-learning, education framework

I. INTRODUCTION

Social media usage among universities is rapidly gaining popularity as a main element of educational strategy. The practice is achieving a number of excellent results with regards to educational outcomes (KPMG, 2013). Combining social media networks with e-learning is relatively a new idea. There has been a great deal of experimentation and investigation around the benefits and reliability of making social media networks major tools in e-learning. At Qatar University, there is an urgent need for social media networks as a main learning element to complement the learning process. Developments and effective educational governance plans are required to make e-learning through social media networks a successful and unique experience. This goal would not be achievable without providing sustainable educational solutions and professional governance strategies, procedures, guidelines and policies. It is inspiring to imagine how beneficial it would be to the students of Qatar University if they were to interact with each other through social media platforms. Online courses provided by the university would allow students to socialize and share with each other, helping each other to learn (Lee and McLoughlin, 2010). The whole educational system in Qatar would change and the positivity of the technology would have a massive and long-lasting influence on the students. Applying social media networks would make communication between students easy, simple and much more interesting. Additionally, it would make communication between students and instructors easy and more reliable. The sections that follow will discuss the benefits of using social media networks in e-learning and the need to do so, while providing an overview of successful case studies, with a focus on governance issues and governance strategy proposals. In the conclusion, the main points of the paper will be summarized.

A. Benefits

Social media networks can support the e-learning process through content in the form of useful materials and features. Facebook, Twitter and YouTube are good examples of tools for e-learning through social media networks. Useful materials that support the educational process can be posted and tagged through these interfaces. Wikipedia also a very useful web site for social media e-learning, as it allows users to edit and provide information. The history of education makes it clear that there have periodically been feelings of estrangement and detachment as a result of the application of distance education (Galusha, 1998). With the revolution of the Internet and social media networks, however, there has been great attraction and motivation on the part of students and instructors encouraging participation in distance learning (Veletsianos and Navarrete, 2012). Combining social media networks with the learning process remove the isolation formerly associated with e-learning. Students who use social media networks as e-learning tools are part of a large community in which they interrogate, share, discuss and receive feedback from one another (Li and Liu, 2009). Many educational researchers are supporting the use of social networks as a form of learning technology (Barbour and Plough, 2009; Greenhow et al., 2009). Studies have demonstrated that social media networks are increasing learning ability through facilitation of sharing ideas with others, receiving feedback, identification construction and the production of new original products (Wheeler, Yeomans and Wheeler, 2008). Also, smart phones are playing a major role in the extent of social media usage. All of these factors will contribute to the e-learning process through social media, allowing student to access useful materials anywhere and anytime (Li and Liu, 2009).

B. Case Studies

A case study conducted by researchers at the University of Minnesota found that the use of social media networks is teaching students the skills required for success in the twenty-first century (Greenhow, 2011). Students are working on online designing, editing and customizing the content. Social media networks have created and encouraged students to share and post original work, such as films, poetry and pictures, all while learning about the responsible use of technology (Greenhow, 2011). Another case study examined a course taught online via social media networks at a public university in the United States. This study aimed to identify learning experiences and the impacts of the learning process through social media
networks (Veletsianos and Navarrete, 2012). Elgg environment was used to teach this course. Elgg is an open source framework which contains social media network features that allow students to create personal profiles, add friends, update status, activity stream follow and receive notification of all Elgg users (Veletsianos and Navarrete, 2012). The results showed that extensive knowledge was built through the social media interaction. Students found it very helpful in extending their learning. For example, when answering questions about e-learning using social media networks, Bob said that he found it to be socially engaging, and that there were valuable contributions from each student. Joan said that she completed her assignment as usual, but that what was different this time was that there was a lot of interaction after submission of work, which was really appreciated. Therefore, the results of this social learning study demonstrate that students appreciate this strategy and find it to provide an enjoyable experience. Evidence revealed that typical e-learning problems, such as a lack of support and a sense of isolation, disappeared when social media networks were used as learning tools (p. 144-166).

II. EVALUATION OF GOVERNANCE ISSUES

A. Choice of Governance Frameworks

Even though there is a lot of positivity and beneficial influence inherent to the combination of social media networks as an e-learning element, there are some disadvantages and issues involved with their use. Those issues and problems need to be identified, evaluated and studied carefully in order to be able to avoid and overcome them. A strong organization needs to have the skills and abilities necessary to understand the possible risks and issues associated with social media. There is a need to control the social media used and fulfill compliance and audit demands (Lester and Lester, 2007). It is important to discuss regularly any issues that arise with regards to the use of social media. Acquiring a strong mutual agreement among those in the internal organizational is important in the risk management strategy when using social media (KPMG, 2013). Developing social media guidelines is the first step. Students within the educational organization will know and identify their responsibilities and duties regarding the organization’s social media usage (KPMG, 2013). Guidelines also need to include the personal usage of social networks. Therefore, it is necessary to have a solid governance plan addressing what the possible consequences of any management failure are that lead to a negative impact on the organization (KPMG, 2013). Naturally, issues are not expected, but it is important to develop the skills within the organization to face and deal with any problems in a clever, quick and effective manner (Rose, 2013). It is necessary to have a resolution issued before the project begins (p.1). There is a difference between issues and risks; they are not the same thing. Both of them have a similar nature, however. Risks give a hint and a degree of advance notice that there is something that should be a source of concern. Moreover, issues seems to be unpredictable. The lack of identifying risks at the beginning of any project will turn them into issues at some point (p.1). Negative developments are encountered by any organization, such as technical issues, shortages of materials, and problems with the staff or the supplier. To identify the most significant issues involved with integrating social media technology at Qatar University, ISO/IEC 27002:2013 standards have been used combined with a research called Benefits and Drawbacks of Social Media in Education made by Wisconsin Center for Education Research at the University of Wisconsin (WCERUW, 2011).

B. Security and Privacy

Chen and Bryer (2012) indicate that safety of data and how well is it protected against any electronic attack is important. This is also related to the European Data Protection regime. Default settings of social media networks are not safe if they allow users to share everything, because security issues are created when both friends and strangers have access to private information. In a poll of 2000 people to determine which social media issues they felt were most important, it was clear that security issues were the greatest concern. 71% said they had been spammed on social media sites and platforms, 46% had been victims of phishing attempts and 45% said they had been victims of malware. This clearly shows that there are many gaps in security and privacy when using social media networks.

Confidentiality of personal information and identity protection. Security of user identity can be compromised through social media profiles and posts by cybercriminals, who will plan attacks based on the information they find and gather from victim profiles, such as the victim’s interests and activities. This problem makes security threats difficult to track. Failing to prevent access to confidential information will expose information that was meant to be private and sensitive, including study materials and research that belong only to Qatar University (UMN, 2008).

C. Legal Issues

1) Confidential Information Disclosure

Confidential information or secrets can be disclosed by a student or instructor on social media web sites. This leads to the loss of academic rights to the study materials.

2) Copyright use without permission: mention trademarks in an inappropriate way:

Students often use protected copyrighted works, such as articles, photographs, videos and music and post them on social media networks without permission from the owners. This inappropriate usage leads to violation of copyright, thereby creating liability. Not only that, but students may mention or use trademarks in an unauthorized manner through social media networks. If a student mentions a product in a review in a fair manner it is acceptable, but if a student uses a trademark in a discussion or review providing false information, it may impose legal liabilities on the organization.

3) Offence Issues

Posts published in discussions or arguments might defame a third party, which might lead to legal action against the educational organization (Neal and McDevitt, 2010).

4) Dynamic Information

Content of some social media web sites can be edited by any one, such as Wikipedia. Students might change certain
information or lie for personal or inappropriate goals. Additionally, knowingly false information might be posted.

D. Reliability and Accuracy

Things that are posted on the Internet are posted by normal people or students, so it is common for mistakes to be made or for people to provide inaccurate and misleading information. Even though a lot of information is accurate and reliable, there is always the risk of delivering false information. If another student writes a paper or conducts research based on false ideas of inaccurate information, it can create serious issues.

E. Using the Whole Ability of Social Media Networks

Some students and instructors might be unfamiliar with how to use social media networks and electronic sources, and will therefore not be able to learn or will not be comfortable using social media as a learning tool. Therefore, it is the organization’s responsibility to ensure that students are comfortable and completely capable of using social media networks. Students also may not have the skills necessary to locate the required information online. These networks also might be a distraction for students, causing them to look at irrelevant information or to meander. Students might feel disengaged using social media to learn and explore the latest trends.

III. GOVERNANCE STRATEGY PROPOSAL

A. Apply the Choice of Governance Frameworks

A major change needs to take place in the future with regards to using social media in e-learning, and to achieve that goal it is important to come up with a solid and genuine governance plan. This can be done through a great deal of research to fill the gaps by developing efficient policies, procedures, strategies and guidelines (Mennie and Smith, 2013). If there is no governance strategy, social media networks can be an enormous liability in an educational organization (Chen and Bryer, 2012). In this study, the governance strategy plan for the integration of social media networks with e-learning at Qatar University is based on BS ISO/IEC 27002:2013, using the main points combined with some additional points from a study conducted by the University of Wisconsin called Benefits and Drawbacks of Social Media in Education. The governance strategy plan is based on four main elements: strategy, policy procedures, guidance and protocols, if necessary (Mennie and Smith, 2013).

B. Security and Privacy

There is a need to establish a management direction to support the security of information. Policies need to be defined and approved by management (5.1.1). Systems and software need development rules within the university (14.2.6). There should be a strict access control policy, which needs to be established, documented and reviewed (9.1.1). Access rights are issued through a formal registration procedure, which will specify the usage, access authorities and features to the students (9.2.1). All access systems and applications need to be secured and controlled by a secure log in (9.4.2). The capacity of resources needs to be monitored and information must be protected from malware and viruses. This requires a procedure and plan to detect, prevent and recover (21.2.1). Record logging and monitoring users allows for ensuring that they have met the expectations (12.4.1). Policies and procedures regarding privacy and protection of identities and personal information need to be established and updated (18.1.4). Policies need to be dedicated to every involved person in terms of the privacy of identities and information. This goal can be achieved by a person in control, who guides students and instructors about their responsibilities regarding the protection of personal identities. Additionally, this individual should teach them how to be aware of the principles of safe use, as well as the procedures they should follow.

C. Legal Issues

Legal policies, procedures and guidelines need to be established, it is expected that all students will use the system according to the copyright agreements and legalization policies (18.1.5). Permission is required from material owners with regards to copyright protected material before use and posting. Even though some materials are available without permission, it is always necessary to mention the original author or owner, so it is important to be cautious. Policies and guidelines need to be established to control the use of trademarks and to ensure students do not use them inappropriately. Awareness should be promoted in all students to avoid any statements or posts that might lead to issues with offence. Protecting confidential information from disclosure requires policies and procedures that need to be updated to make sure students are aware of their continuing responsibilities not to post any confidential information. Backup strategies for system software and information are imperative (12.3.1). Dynamic information must be monitored to make sure it is suitable and accurate. There is a need for a discipline and punishment process applied to any student who breaches the legal rules or does not follow the use instructions and information (7.2.3).

D. Using the Full Ability of Social Media Networks

There must be a training strategy for students to make sure they are using the full ability of social media networks. Training should be based in classrooms and distance learning forums (7.2.2). Teacher recruiting, selection, and training strategies need to be applied. Evaluation of procedures for the students and instructors to make sure their performance meets the university’s goals of social media network education should be undertaken. Regularly collect feedback from students and teachers to improve the strategies and systems of training.

E. Reliability andAccuracy

Data monitoring strategy should ensure that all data posted and uploaded on social media networks should be monitored and controlled on a daily basis. A supervisor needs to control and monitor the accuracy and reliability of information provided by students. Students are expected to be responsible and provide information carefully and accurately. Students who post false information repeatedly on social media platforms
will receive a warning and will be asked to double check any subject before posting it on the social media platform.

IV. Conclusion

E-learning via social media networks showed significant promising opportunities for enhancing learning. It is important to examine and investigate extensively what might be needed to develop and encourage e-learning through social media networks. We need to examine the deterrents and influences of the entire concept in the educational process. To achieve this aim, we need to deem social media networks a feature instead of a destination (Anderson, 2007). Despite the positivity and benefits associated with using social media networks in e-learning, there are some disadvantages as well. Most importantly is the challenge of ensuring the security of private information. Also, some types of face-to-face discussions cannot be accomplished online (Li and Liu, 2009). Social media networks are evolving, however, with the frequent changes in technology.
V. REFERENCES


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3D Printing In Education

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Abstract—Three-dimensional printer (3D printer) has become what everyone is talking about these days from professionals to common people. 3D printer has evolved to be one of the top emerging technologies that one day may change many industries. The aim of this paper is to research 3D printer and its functionality to come up with ideas to integrate 3D printers in the education industry, since tangible objects are more efficient in education than describing an object.

I. INTRODUCTION

Gartner published a study in Aug 2012 indicating that 3D printers were at the top of leading technology back then (Petronzio and Der Meulen, 2012). Nowadays 3D Printer became widely available and commonly affordable; also, 3D printer can also use commercially, by placing it in different industries from design to manufacturing, medical and even surgery, it is very useful tool in research and development as well as educational purposes in schools and universities. It even found its way to the small businesses and domestic environment.

With 3D printers people can literally produce and print whatever they like whenever they want, whatever they can think of and designed the printer can print and produce from teeth, guns, toys, to even airplane wings (Smith, 2013), … etc. Time is not so far from having everything in houses produced and printed by a 3D printer. 3D printer can even create presents for any occasion that is by simply printing it (Petronzio, 2013; Bennett, 2013). 3D printers that can build objects on demand are not just available, but also affordable (Baguley, 2013).

This research will focus on the Three-dimensional printer (3D printer) what is 3D printer technology, how it works, and meanwhile It will talk about advantages, disadvantages, on this technology and the impact on our societies.

In addition, it will end this paper with some suggestions on how to improve this technology as well as how it would be able to govern this magnificent invention of 21st century before it really gets out hands and control.

II. WHAT 3D PRINTING TECHNOLOGY IS?

As the name shows, 3D printer is a printer that have the ability to print 3D objects using different materials; these objects can be a single piece object or multiple pieces that create complex objects or devices (Smith, 2013; Crawford, 2013).

3D printers are mostly friendly to the environment as the printed material can be recycled and reused with least waste.

3D printer are made in many different types, brands and even sizes, started from the small one that can using it in the home, to the mid range that using at the small company or office, to the high range that can be used in manufacturing (Smith, 2013).

A. History of 3d printer

Charles Hull has developed it in 1984 where he got his inspiration from inkjet printers, he thought of using materials instead of ink and it has been developed through the years by many scientists to have the shape and features we see today.

2009 was the breakthrough year were this device was first offered publically and commercially as it became an open source. Here are some development references:

- In 1986 the 3d systems was developed to be the world first commercial 3d printer to be introduced to the world by Charles Hull that was called Stereo lithography Apparatus.
- 1988 it was the first release for public of model SLA-250.
- In 1955, Massachusetts Institute of Technology (MIT) give the Z Corporation exclusive license to start develop and use the 3D printers founded from 3DP technology.
- Everyone in 2006 can change or create on the Reprap project, as it is open source, but under the General Public License (GNU) trasms.
- Year 2008 was the first time of the 3D printer that could print the object using many different materials at the same time, which is what happened by the Connex500™ rapid prototyping system from the Objet Geometries Ltd.
- 06 Jun 2011 the first bikini world wild printed by 3D printer by Shapeways and Continuum Fashion.
- Some engineers in the University of Southampton print the first 3D printer aircraft at Aug 2011 that was the first air craft in the world printed by 3D printer (Petronzio, 2013; 3ders.org, 2013; Daly, 2013).

B. How it works

There are two major types of 3D printers that 3D printers operate on, below is a brief explanation on these two techniques.

1) Direct and Binder 3-D Printing
First technique is direct and binder 3-D printing. Where 3d printer have two methods to work on, the
First method is the same as 2D inkjet printer work with the difference of nozzle dispenses the wax or plastic printing the object layer after layer (Crawford, 2013)
Solidscape is the company who has opened the door to commercial 3D printing when manufactured Rapid Prototype.
The second method is the binder 3D printer, it uses the same technique of the direct 3D printer, however it works in two phases, one is to put a fine powder then the nozzles dispenses the wax, plastic or glue (Crawford, 2013). Binder 3D printing is a little better than direct printer, as it is faster and have the ability to use different color or material like ceramic or metal.

2) Photopolymerization and Sintering
The second technique is photopolymerization and sintering, Photopolymerization it way to melt the plastic by using the laser beam exposing ultraviolet light on the plastic, then the plastic will get shaped layer by layer, on the other hand the Sintering is another technology that fusing and melting particles together to build the object.

C. What kinds of materials can the printers use?
Today there more than a hundred material, which 3D printers can use to print an object, they come in different types. However, the majority of the low cost 3D printers use three types of plastic PLA (Polylactic Acid), ABS (Acrylonitrile butadiene styrene) and PVA (Polyvinyl Alcohol Plastic), on the other hand the high end printer where it uses the powder to create the object…e.g. Polyamide Alumide or Multicolor. Moreover, materials such as Titanium, Stainless steel, Bronze, Brass, Silver, Gold glass, and Ceramics (Smith, 2013; Hall, 2013; Larsson, 2013; Stratasys.com, 2013b).

III. HOW 3D PRINTER CAN HELP PEOPLE
Importance of 3D printers is increasing and people are realizing this importance more and more, it is helping every one of our lives to be improved (Petronzio, 2013; Bennett, 2013; Kharbach, 2013).
Magic Arms are very good example of 3D printer improving our lives (Bennett, 2013; Katz, 2012).
Dental is another medical example area as the 3D printer is helping the dental implantation market and surgical guides as shown in Figure 1.

Facial parts are now possible to be available be 3D printer, it can provide natural and full color, using a process which uses starch powder to form a shape which is then vacuum-formed using medical grade silicone. The components bound together, and the subsequent prosthetic is durable and flexible. This initial work can cost around the same as the parts made using the traditional processes, each part is possible to be print for just under $250 each.
The result of the old traditional, which depend on on molding and forming in a unique method, can cost about $5,000 for each piece.
Manufacturing is another example as manufacturing start to use 3D Printer in early stages with least cost and much less time consuming over the old fashion or conventional way of prototyping saving a lot of time and effort. Realizing the faults and defects easing the approval procedures and ultimately producing a perfect object, with least time and material and ultimately a better product enhancing the manufacturing and consumer market (Hall, 2013; Keynan, 2013).

A. How 3D printer helping schools and students
Another very important usage of 3D printing is the education industry; students can easily research, develop prototypes and ultimately enhance our lives with better and smarter devices. It is very important to adopt the 3D printer in early educational stages for youngsters to understand the importance of this technology and the effect it would have on our lives (Department of Education, 2013; Kharbach, 2013).
Figure 2 and Figure 3 are the example of an old machine at the museum and how can student see it as designed copy completed and fixed ready to print it in 3D printer.
This technology will enable the students to better understand and improve their thinking much better, this is by using their imagination vastly and without any boundaries enabling them create better, smarter devices, making education and studying a much more fun activity (Stratasys.com, 2013a).

The UK and the USA are booth considered the early adopters of 3D printing technology in their education systems (Millstein, 2013a).
Instead of having students wait for someone to generate a product for them, they can create their own product for education purpose. It can alternate the whole model of how students can see innovation and manufacturing across the world.

3D printing offers many features that can transform education industry (Kharbach, 2013).

Instantly printing book or paper using Mervis language, which anyone can easily do and will help disabled people in many different ways, specially the blinds that can understand the object better than any other ways. Microsoft believes it is important to make 3D printing technology easy as much as printing word document so that Microsoft and MakerBot agreed in windows 8.1 to make printing simple as clicking a button (Millstein, 2013b).

IV. ABUSE AND MISUSE OF 3D PRINTER

In May 3 2013, one of the best gun Smithing Group Defense Distributed have provided Forbes with an opportunity to be one of the few to who looked at the world’s first and unique fully printed gun using only 3D printer, that they called the "Liberator" (Greenberg, 2013). Followed by that the first ever-metal 3D printed gun manufactured in the US, The gun has fired over 600 rounds in testing and ‘functions beautifully’ (Embley, 2013). This opened the door for a big debate, as today anyone who has £37 to buy plastic raw material, can download the 3D-design file in Computer-Aided Design (CAD) format for free from many open sources on the internet or create his own CAD file to customise an gun, putting the communities a more dangerous places to live in.

3D printer technology has already integrated and used by criminal organizations to print ATM card readers to help them in their skimming activity, that then placed into the bank ATM machines (Morelle, 2013).

Copyright and Intellectual Property (IP) rights and its protection solutions are hot debates and discussions in this industry. People today can print complicated designs that take long time form the original creator to manufacture them it ignoring all the patents and (IP) rights. Every industry from art to manufacturing which have complex, expensive research and development processes leading to many financial and commercial losses affecting the economy.

3D printer continues to be a threat to manufacturing industry (Hall, 2013).

People use the 3D printer without considering the safety of the pieces they print; they are printing functional pieces and devices without considering any industry standards and regulation, which is another threat to our communities.

Underage misuse is another issue, which needs some debate, and to be regulate as soon as possible.

V. THE RECOMMENDATION

Referring to Forbes that the copyright laws around 3D printer are complicated (Woollacott, 2013). However, if the 3D printer divide to two type or categories, public use such as university, manufacture government...etc. and privet use, where the solutions should be proposed based on these two categories.

With these two categories, implementation of copyright and IP rights might be easier and more regulated based on section 60(1) (a) of the Patents Act, 1977.

If People can force manufacturers and software developers to implement some kind tracking mechanism, which in case of any dispute they can be tracked, for example, all printed logs such as name, date, owner information to be save and stored for a certain amount of time for investigation purposes. In fact, resale of these devices should also tracked and ownership transfer should be registered properly and obligatory.

Secure usage of these printers, which can used in public places, areas must be obligatory as well for further investigation purposes too. Username password, IRIS (Fingerprint, eye scan, etc.). The suggestions are in according with ISO (2011-27005 sa.4).

These rules should be very strict in countries where weapon usage is legal.

Devices should have a unique identification number such as MAC address or International Mobile Equipment Identity (IMEI).

Computer-Aided Design (CAD) drawings and files should be regulated as well, today with all means of file sharing from Peer to Peer (P2P) to other social medial means this has been never easier, yet a proper international regulation should be implemented to avoid misuse and abuse.

Websites should not accept to publish or any copyright or harmful designs files based on 14Section 17 Copyright, Designs and Patents Act 1988.

Create an international organization to take the responsibility with power to implement and regulate the required rule or standard that will help 3D printer technology to improve and save rights of the customers and manufactures.

Nevertheless with all the rules, regulations and machine controls which might be suggested and implemented, people have to believe that the control of 3D printer most likely come from a people not from machine (Hornick, 2013).

The solutions are from section 60(1) (a) Patents Act 1977

VI. CONCLUSION

In conclusion, 3D Printer is in the early stage of the 3D printing industry, in addition to that people are looking for this technology to be widely available in the education industry, for that people must only focus on the good side of this technology rather than looking for the bad side. 3D printing is a nevertheless started to improve people life for better. Although this technology have yet to reach its peak, it has turned people heads around. Once regulation and governance are both created and implemented this technology will still be far from perfection.
Exploring The Concept Of Big Data

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Abstract—In the following report the impact of an emerging technology is evaluated on a British University along with the benefits the technology is going to have on the functioning of the same and the risks involved. The data governance strategies guiding the implementation is also discussed and critically evaluated. The reason behind choosing the emerging technology and the impact the technology will have on the students and how it is going to be used for the betterment of the University as a whole is also discussed and evaluated. This report also deals with identifying the risks in ethical compliance while implementing, integrating and maintaining the chosen emerging technology.

Index Terms—Technology of Big Data, Data Strategy, Corporate Governance.

I. INTRODUCTION AND BENEFITS

Corporate governance is the systematic, collaborative and corrective approach to increase organizational performance, enhance transparency and establish credibility. Big Data approach is a very significant step towards achieving efficient corporate governance. The strategy to implement Big Data has several benefits and concerns as well (Allen, 2005). The strategies to implement the remedies to overcome the issues and concern of Big Data are very much critical to the organization, The University, University in our case. The details of these are discussed in the subsequent part of this piece of study.

A. DISCUSSING GARTNER’S HYPE CYCLE

The life cycle of any technology can be boiled down to five phases, namely, technology trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and plateau of productivity (Peltier, 2005). During the inception and concept paper presentation, an emerging technology gains hype before any model which is usable is launched. This hype then creates considerable media attention and is followed by expectations (Tricker, 1998). Slowly then the usefulness of the emerging technology circulates in various levels of the society and interest again starts to shoot up. The technology finds investors for production and it reaches homes, delivering the promises it showed (Laney, 2001).

II. BIG DATA CONCEPT AND IMPLEMENTATION

A. EXPLORING THE CONCEPT OF BIG DATA

Every data management tool has its own limitation of data capture and processing. Anything beyond that tolerable limit is considered as big data for that system. Often, the “3Vs” model is used to describe big data, the 3Vs being volume, velocity and variety (Laney, 2001). The volume of data which increasing by the second, the requirement of speed of data input and output also increasing and with the various kinds of data types present, the need for newer forms of processing those data for providing inroads to faster and predictive decision making is rife.

The fast growing data in this world is humongous and mainly unstructured (Stefan, Andres & Thomas, 2011). Hence they cannot be put to good use and therefore the benefit cannot be reached. An idea about the increasingly growing rate of data can be had by the fact that 571 websites are developed each minute and in numerous websites like Facebook, hundreds of terabytes of data are uploaded everyday across the globe. It has been predicted that by 2020, amount of data uploaded per day will multiply 44 times as it was in 2009 (Durbin, 2012).

Fig. 1. Big Data Investments by Industries

The above figure (Gartner, 2012) shows that the education industry has the heaviest investment in big data implementation owing to the fact that universities these days want to use the unstructured and raw data that is available in the web. With their large database of student information, they can easily use the data and analyse it to make the learning experience more personalized and productive (Gordon & Loeb, 2002). They may also analyze the data sets to get predictive results.

B. BENEFITS OF BIG DATA IMPLEMENTATION

The student database of The University, University of London is huge and contains various kinds of information, ranging from the name and other personal details of past and present students, their attendance, their subjects, how they fare in their exams and what are their other areas of interest etc.
(Allen, 2005). All these information put together forms a dataset which is very large in volume and has varied information. For example, collecting information about the past records of a student, their results and attendance in class and labs, disciplinary actions taken if any, will pretty much give an idea about how the student will fare in the upcoming university exams. Data mining techniques can be applied to point out the students at-risk. If this kind of predictive information is in hand, then the inevitable may be reverted if action is taken on time (Stefan, Andreas & Thomas, 2011). This creates an impression in the minds of the target audience and will surely act as a marketing technique in future referrals. This empowers the university management with tremendous insights and benefits. Management of data and business information and embracing emerging technologies are going to be the footstones of quick action and will play a role in staying relevant to the target consumers (Laney, 2001).

The implementation of big data in higher education in The University, University of London has much more broader impact. With proper analytical tool, the huge volume of structured data is available from which various trends amongst students can be derived (GranThornton, 2012). Simple analysis will only provide results regarding the correctness of the answers given by a student, whereas detailed analysis may provide further insight as to how much time has been taken to answer questions of a specific type, or may detect a trend as to which kind of questions are being skipped (CISWG, 2004). Big data tools may also be used to analyze the performance of an individual in a group. It will also help the academics to create personalized course for students aimed at better university results and minimizing the rate of dropouts (GranThornton, 2012).

The University, University of London also enhances online learning experience by customizing the course content for individual. They gather required information in every step of the learning process to customize the curriculum that will follow. The modules, chapters, assignments will be driven by student need and there will be feedback on each of them (Laney, 2001). The big data tool will analyze these collected data and analyze accordingly to drive towards academic excellence. This also simplifies the role of a course instructor as that person will know beforehand all the strong and weak points of his target audience and will be going forward with the course keeping that in mind.

Another aspect of big data tool will be that it will provide real time information to the university management regarding how their institution is faring as a whole. It will keep them updated about the results of the students, the admission rate, the publicity, marketing strategies that need to be adopted to achieve higher revenues, reaching the stakeholders for donation etc (Peltier, 2005).

III. CRITICAL EVALUATION OF THE CONCERNS OVER BIG DATA

In the previous part we have come across several benefits of Big Data implementation. However in spite of the limitless opportunities there are certain serious challenges which often encountered during Big Data implementation in The University, University of London (Laney, 2001).

A. DATA STORAGE & PROCESSING

The first and the most basic challenge is the cost of implementation of Big Data for universities. Most of the traditional servers in the data centers are not competent enough to process Big Data because they are not designed in that way. To process the Big Data, at least analytics servers or High Performance Computing servers can be required and it involves a significant amount of investment, which is quite a challenge for many big enterprises, let alone an educational institute (Turnbull, 1997). Processing of Big Data does work like normal data does. Big Data implementation requires whole new strategies in terms of both storage and processing. For the smooth processing to be done, the University requires special staff having expertise in IT strategic planning. The knowledge level of big data users is also a point of discussion in implementation of Big Data (Boyd, 1996). In most of the cases it is seen that the end users are not provided with the proper training on how to put the right queries to Big Data to extract the desired output so that the University can actually help the students and their parents and guide them to the right path. Proper knowhow of the Big Data can also enable the end user to extract minute details of the students which can be of essential use to the University (Peltier, 2005).

B. DATA LIFE CYCLE MANAGEMENT

A very important step in implementing Big Data is to clean up the data which is under operation. The efficiency of the Big Data is equivalent to the relevance of the data which is being used for the processing of the Big Data. To make sure it is happening consistently, the admin user should remove the inaccurate and redundant data from the data set. This is again a huge responsibility of the technical head of the The University, University of London to make the head of the University understand the importance of this activity (Tricker, 1998). They have to understand that if proper data cleansing is not done, Big Data will not be able to give the best result as the output. Another major responsibility of the head of technology is that they have to monitor strictly the trend of the data. There should be constant monitoring of the data for that purpose and for that to happen, it is really necessary that they should be able to identify which data is important and relevant, so that they can get rid of the rest (Stefan, Andreas and Thomas, 2011).

C. DATA CHANNELIZING AND GOVERNING

The data center should also be evolved in terms of IT daily operations so that it can accommodate the changes due to Big Data. After implementation of Big Data, real time analysis will be required. There should dedicated IT staff looking after the data center workloads so that they can handle this situation with efficiency (Durbin, 2012). Data retention is another major task to be carried out by the IT department of the University. Specific data retention policy should set for each department and proper action should be scheduled after the retention time frame, either it is archived to another database or purged totally.
The role of a vendor often turns out to be critical in the education industry. In most of the cases the end users are not competent enough to utilize the benefits of Big Data. In those cases, vendors provide the reports according to their convenience. So the end users should build their in-house expertise so that they can guide the vendors with the proper requirement (Schneir, 2000). It is also very urgent that there is proper alignment between the business and IT requirement. The University should look for data engineers or should provide through training to their internal technical staffs so that they can evolve as an institution with the evolved data analytics of Big Data (GrantThornton, 2012).

IV. STRATEGIC CORPORATE GOVERNANCE

The present assignment largely focuses on the importance, introduction and application of Big Data technology in The University, University of London. It also deals with several issues regarding application of Big Data and managing the overall data handling and information system management.

A. MANAGEMENT OF INFORMATION SYSTEM

Information governance, a part of overall Corporate governance strategy is crucial and of utmost importance to be implemented successfully. Forerunners of Corporate Governance defines it as a strategy to comply with legal laws and policies, to take into account the interests of stakeholders, and improving organizational performance, transparency in conducting activities, and enhancing accountability (GrantThornton, 2012). A system, under corporate governance will therefore build credibility amongst stakeholders, enhance transparency and ensure smooth functioning. Corporate governance also deals with communication and information management (Elmasri and Navathe, 2000). Smooth, proper, and controlled flow of information is one of the key aspects of corporate governance.

Big Data can be proved as an effective and valuable tool to the University in terms of increasing student’s learning, guiding the students regarding online tutoring, exams, and provide a platform where students can participate in international learning experiences, gain online access to international conferences, libraries, research works, exchange and share knowledge enhance the scope of international platform of learning and research (Durbin, 2012). This technological transformation will help the students to channelize their potential through proper career guidance and skill development.

1) DATA STRUCTURING & CORPORATE GOVERNANCE

The key of successful information governance is to structure the data in a way that it would ensure data availability, confidentiality and integrity (Boyd, 1996). Data should be structured in such a way that it would provide necessary information required to improve student’s performance, but would ensure not to harm with student’s confidential data and hamper with their privacy (Stefan, Andrea & Thomas, 2011). The task of information system management is to leverage the benefits of a well integrated system that would act as a common platform for related data to coexist and be useful for specific tasks to be performed, and increase productivity and performance throughput.

2) DEVELOPING DATA MONITORING AND GOVERNANCE STRATEGY

Policies should be made regarding control and management of information, data processing, data warehousing. This will govern the authority to access data, flow and management, maintenance of quality of data, ensuring data privacy and security, and timely availability (Vonster & Labuschagne, 2005). This will also ensure data lifecycle management, i.e. retention and deletion of data. In respect to Data governance the ISO 270002 policy of information governance can be practiced (Scheiner, 2000). Compliance with the ISO policies of information governance will help in proper management of information and data structuring. The three most important aspects of ISO 27002 are: Data availability, Data Integrity and Data Confidentiality (CISWG, 2004). Right Data should be timely available to the right person at the right moment, while maintaining data security, and confidentiality.

B. CROSS FUNCTIONAL DATA MANAGEMENT

Data management in university should be well monitored as data is accessed by a lot of people at a time. Therefore data management should be an integrated approach of a cross functional team who will collectively and collaboratively handle data to improve students’ learning and performance improvement (Durbin, 2012). Quality audits should be done internally on regular basis to ensure proper storage, documentation and data life cycle management. Implementation of Big Data also requires proper monitoring of financial expenses, resource utilization and the overall performance level should be monitored and evaluated (Laney, 2001). Corporate governance will help in budgeting and evaluation of cost vs performance level.

V. CONCLUSION

The University, University of London has to incorporate the above mentioned strategies as discussed in detail. Big Data implementation is a big step indeed, especially in an educational institution which is not a profit making organization (Durbin, 2012) So the concerns discussed above should be considered before implementing Big Data with able IT staffs to care of the big change along with efficient infrastructure to accommodate the change (Gordon and Loeb, 2002). Above all, the internal staffs should have proper knowledge about this implementation. The business requirement should be suitably aligned with this technological evolution.
VI. REFERENCES


A Critical Analysis Of Whether 3D Printing Is Needed At The University Of Derby

The Benefits, The Risks, And The Strategy Needed To Fully Utilize This Emerging Technology

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Abstract— The purpose of this paper is to look at how 3D printing can be of benefit to the University of Derby. It shall look at how the technology can be used in multiple roles; from use as a teaching aid to the manufacturing of food. The risks associated with the use of 3D printing shall be analyzed and a governance strategy will be proposed in order to develop and implement 3D printing into the university’s existing business model.

II. IS THERE A PLACE FOR 3D PRINTING AT DERBY UNIVERSITY?

A. Is 3D printing just a gimmick or a real tool for tomorrow’s market place?

3D printing is very much an up and coming technology with the economist claiming, using information collected from Wohlers Associates, that there has been a 29% rise in worldwide market value of 3D printers between 2011 and 2012, up to $2.2 billion, and “more than 25% of the 3D-printing market involved making production-ready items.” (The Economist 2013). So for now it really does look like 3D printing has a future in the world market, and should be considered an exciting tool for many industries.

B. Going green using 3D printing

The state of the environment and how manufacturing is affecting it has been a concern for everybody for the past years and will be for the years to come. “Cleaner production” is a concept that strives for optimal efficiencies at every stage of the product life cycle (UNEP 1993). Because 3D printing is an additive manufacturing process rather than subtractive process, waste levels are reduced, therefore increasing production efficiency. This reduction in waste produced by the university will reduce its carbon footprint. Drizo and Pegna (2006) suggest that if symbiotic closed loop links between the manufacturing industry and nature can be achieved it will significantly reduce any negative impacts. The use of 3D printing could be a step towards these aims. Faludi (2013) supports this saying that 3D printing can be greener than conventional manufacturing, if the right technique is used.

C. The benefits to Derby University’s stakeholders.

Simmons et al. (2009) suggests that 3D printing from computerized 3D models is relatively inexpensive and is ideal for producing good quality products and can be used to make functional prototypes without the cost of tooling. To that extent it looks like 3D printing can help Derby’s students, focusing mainly on the ones studying engineering, to produce accurate prototypes that they can use to better critically evaluate their
work and gain a deeper knowledge of their field of study. This is supported in an article by Fanning (2013) where he quotes Stijn De Rijck, a marketing manager for Materialise, at this year’s Engineering design show who states "We believe at Materialise that 3D printing should be part of every designer’s toolbox. But that means that designers have to learn to design using 3D printing not just as a prototyping technology, but as a manufacturing technology". This is where Derby University should be looking, to teach its students to use 3D printing as a manufacturing technology, putting itself on the map as a world leader on the subject.

3D printing’s uses are also being watched closely by the medical field. Leukers et al. (2005) say “3D printing is a suitable technique to create custom implants based on medical data sets”. This is supported by Rengier et al. (2010) who states that 3D visualization has helped radiology become pivotal in many clinical disciplines, but it is limited by only having flat screens to view it on. He goes on to say that 3D printing overcomes this limitation by providing a “graspable three-dimensional object”. If this use of 3D printing takes off in medicine then tomorrow’s medical professionals are going to need to know how this technology functions and what its uses and limitations are. The University of Derby must take this opportunity to become a leading academic institution in the field of 3D printing and its applications.

III. THE RISKS AND ETHICAL ISSUES ASSOCIATED WITH 3D PRINTING
A. What are the financial implications?

Of course 3D printing is a new technology, and because of this the hardware is on the expensive side. A desktop 3D printer will cost you thousands of pounds, with larger scale industrial sized ones costing substantially more, Arnold (2013) outlines “You need to contact the 3D printer manufacturer to get a price quote, but even having access to these 3D printers will cost well over $10,000, and in many cases even over $20,000. The most expensive models cost as much as $50,000, and some of these 3D printers are obviously not even for sale, costing millions of dollars” (Arnold 2013). So the more you want your 3D printer to be able to do and the quality of the printer itself does have a major determination on how much it will cost.

B. 3D printing, what software and knowledge is required?

3D printing, as expected, requires its own specialist software in order to make the most of its functionality. 3Ders.org state that in order to print in 3D you will require computer graphics software that can save files as an STL format. Some 3D graphics design software is free, 3Dcrafter and Blender are a couple of examples but there are several more available. However, there are some paid for, commercial software packages such as 3DS Max a high end 3D modelling tool which can be used to create high quality models and therefore more accurate printing. This software can cost in excess of £4000. Finally 3Ders go on to suggest that not all 3D graphic design software supports 3D printing and that another piece of software such as Netffab Studio may be needed to support the 3D printing of the STL files. Another option comes in the form of “MatterControl” an alpha version of a 3D printer control software being developed by MatterHacker, a US based firm that specialises in 3D printing. “The latest release, 0.7.6, includes ‘Plug and Print’ for Airwolf, Type A Machines and SeeMeCNC printers with support for more printers coming soon. The new feature allows for automatic driver installation, slice settings pre-configuration, automatic printer detection, connection troubleshooting and calibration assistance. Version 0.7.6 also increases simplicity and adds integrated help.” (Titsch 2013). It is evident that at this time no user friendly, fully functioning software exists, therefore 3D printing does require a technical knowledge of 3D graphics design and printing to be performed effectively.

C. Reliability is key; isn’t it?

All consumers want the product they’re investing in to be reliable. However, what is reliability? “reliability is a function of not only the supplier’s actions, but also the level of care that the customer exerts and the pattern of usage that the customer adopts”. (Guajardo et al. 2011). So are 3D printers reliable? “Joe Titlow, vice-president of product management for Z Corporation, agrees that the technology has matured to a point where it’s proven and reliable” (Respini-Irwin 2011). It looks like 3D printers are reliable but the reliability can be diminished by misuse of the hardware by the consumers.

Research has been carried out to look into the energy efficiency of 3D printers and Mongol, Lepicart and Perry (2006) suggest that the energy consumption of 3D printers is directly dependent on the duration of the job and to minimize electrical consumption, manufacturing time must be minimized. Taking all of these factors into account reliability definitely is key because unreliability will cost you dear, “Print heads can be over £15,000 each”, not only in upkeep and repair but in running costs too (Frost 2013).

D. Are there any ethical issues?

Of course with any new technology comes certain ethical issues and in the case of 3D printing it is no different. First of all it has been widely reported the 3D printing can be used in the manufacture of weapons. Barrett (2013) states that plastic guns made using 3D printers could beat metal detectors and compromise security. He goes on to say that law enforcement have become more concerned since weapon blueprints for 3D printers went online in late 2012. The first metal firearm has been printed and accurately fired fifty rounds without breaking. This is very much a cause for concern due to users being able to enter the premises unarmed and walk out of a 3D printing suite with a fully functioning weapon.

3D printing also brings with it legal issues to do with copyright laws, Hall (2013) quotes Isabel Napper, partner and head of technology division at Mills and Reeve, saying that 3D printing could cause increasing numbers of copyright issues with the onset of digital content through websites and when
files are downloaded they could infringe patents and design rights. For the University of Derby this increase in online downloadable content could result in an increase in plagiarism as well as the fore mentioned copyright problems.

IV. PUTTING A GOVERNANCE STRATEGY INTO PLACE WITH THE GOAL OF IMPLEMENTING 3D PRINTING INTO THE UNIVERSITY OF DERBY

A. An outline of implementation

In order to successfully implement 3D printing into Derby University’s existing environment certain standards need to be met. These standards are outlined by the IT Governance Institute and the International Office of Standardization. This section of the report will cover how various sectors of these frameworks can be used to implement a sustainable governance strategy for the implementation of 3D printing.

B. The 3D printing governance framework

In order to effectively manage 3D printing at Derby University several key principles have to be adhered to. First of all ISO 27002 states that information security policies need to be defined, approved, published and communicated by top level. And at lower level, topic-specific policies are needed to meet the needs of target groups to cover certain topics (British Standard Institute, 2013). Policies relating to 3D printing are needed to effectively manage its implementation, use and security at all levels of the university’s hierarchy.

C. Who is responsible for the printers and who has access?

It is suggested in ISO 27002 (2013) that ownership (responsibility) should be assigned to assets when they are either created by, or transferred into, the organization. The owner should be responsible for the proper management of an asset for its entire lifecycle. In the case of the 3D printers at Derby University ownership should be assigned to the IT manager(s), as they will be in the best position to properly manage them. To that end the IT manager(s) should also overlook granting permissions to end users, ISO 27002 suggests that users should be given a unique identifier, fortunately the University already has a procedure in place in the form of staff and student ID numbers, this allows for the users to be “linked to and held responsible for their actions”. It is also recommended in ISO 27002 that event logs recording user activities are produced, stored and reviewed regularly. Using these standards the University can effectively govern the use of 3D printers to ensure that they are only being used properly by the users that genuinely need them and the security risk is kept to a minimum (British Standard Institute, 2013).

D. Where should the printers be located?

From reading this report it is obvious that 3D printers have their uses in several areas of the university, from engineering to medicine, but “equipment should be sited and protected to reduce the risk from environmental threats and hazards, and opportunities for unauthorized access” (British Standard Institute, 2013). Using this as a guideline the IT manager(s) should look at installing the printers where they will be secure and protected by the universities security system. Effective communication between the IT team and on campus security should be maintained to further enhance the safety of both the equipment and its users.

E. What if something goes wrong or Compliance is ignored?

Götz (1996) quotes Murphy’s law “If anything can go wrong, it will”. Now nobody can be certain that something will definitely go wrong, however we also can’t be certain that nothing will go wrong. To that end the University of Derby must ensure it has procedures in place to cope with any unforeseen circumstances that may present themselves that prevent the university’s 3D printers working properly. This is supported in ISO 27002 (2013) that advises that management responsibilities and procedures are established so that a quick, effective and orderly response to any incident is achieved. These procedures should be set up to cope with both unforeseen faults and human ignorance of compliance standards, e.g. if the printers go down, students still have access to other technologies to generate 3D models (British Standard Institute).

F. Why compliance must be ensured across the university

“Information systems should be regularly reviewed for compliance with the organization’s information security policies and standards” (ISO 2700, British Standard Institute, 2013). The University of Derby should be reviewing all access to 3D printers regularly to ensure good compliance. This is of vital importance because noncompliance will result in serious consequences. The Copyright, Designs And Patents Act Of 1988 holds real bearing on the use of 3D printers with the copying of designs, that may be easily accessed on the internet, is a criminal offence and both the user, liable for Copyright Infringement (part 1 chapter 6), and the university, liable for secondary infringement: providing a means for making infringing copies (part 1, chapter 2), could be prosecuted. It is critical that the university has measures in place to ensure no unlawful activities take place, after all ISO 27002 states that managers should be aware of all legislation applicable to their organization. Methods need to be in place from the onset to ensure compliance from all stakeholders of 3D printing at the university (British Standard Institute, 2013).

V. HOW TO MEASURE THE SUCCESS OF 3D PRINTING AT DERBY UNIVERSITY.

3D printing at university is essentially a service that the university is going to provide it’s students to help further their own education and knowledge; putting this into context 3D printing is the service used by customers to create their assets, in this case it’s their knowledge, “without customer assets,
there is no basis for defining the value of a service. The performance of customer assets is therefore a primary concern for service management” (Hunneback 2012). Student future attainment is the measure the University should use to determine the success of introducing 3D printing into its environment.

VI. CONCLUSION AND RECOMMENDATION

3D printing clearly has its risks and at the moment is quite a specialized piece of equipment. Along with that the set up costs are high, with the units priced at thousands to tens of thousands of pounds each. However, 3D printing is becoming a very popular tool across many different market sectors due to increasing reliability of the technology/manufactured product and the green effects it has on the environment. A final thought comes from Vernon (1979) who highlights that all products appear, mature, but eventually die. Being able to educate students to confidently and effectively use 3D printers should result in the University of Derby becoming a world leader in the research and development of this technology and its users/stakeholders, ensuring that the technology has a long, useful future ahead of it and will become a must have tool for any organization in any market sector. Due to this factor and the expediential rise in the technologies popularity I would certainly recommend the university invests in 3D printing. However, the clear ethical issues need to be managed and a very well structured governance strategy needs to be in place to ensure any potential pitfalls are avoided.
Abstract—This paper critically evaluates the sustainable information and corporate governance impact of hybrid cloud computing. The paper provides an evaluation of the information governance strategy that should be developed to guide the development and incorporation of hybrid cloud computing into the university’s system. The governance issues in hybrid cloud computing involves safeguarding of information from unauthorized access. The proposed governance strategy proposal involves the use of a standard quality management cycle.

Index Terms—Cloud computing, hybrid clouds computing, information security, and information governance.

I. INTRODUCTION AND BENEFITS

Hybrid cloud computing is an emerging technology that allows an organization to use both public and private clouds to carry out different functions. Cloud computing technology allows convenient and on-demand access to shared resources. These resources can be accessed from anywhere and at any time (Baun et al., 2011). A cloud service provider provides cloud-computing services and there is minimum interaction between the service provider and the clients. The cloud service provider provides shared resources such as storage space, servers, applications, and services. Using hybrid cloud computing, an organization handles some of its data operations within the organization and other services are obtained from the cloud.

A. Benefits of Cloud Computing

The benefits of hybrid cloud computing includes:

- Flexible operation of an organization: Hybrid cloud computing provides access to data at any time and from any place. This provides a flexible way of operating an organization.
- Optimization of costs: Scalable solutions are provided for the cloud services at a reduced cost.
- Improved security: Hybrid clouds offer additional security by keeping sensitive data out of the public cloud.
- Improved performance: Hybrid cloud computing enables organizations to maximize output through the optimization of the available resources.
- Easy access: The users within the university will have an access to the cloud computation through the use of networked client equipment like desktops or even laptops. Most of the devices will be relying on hybrid cloud computers for most of the applications and they will not be able to function without the right application. The thin clients will be applicable (Han, 2012).
- Flexibility: Most of the hybrid cloud applications will not need particular software on their clients and web browsing will be applicable under the cloud applications. Ajax may used as a native application. Different cloud applications will be supporting particular software for the said applications (Mao, 2012, p.423).
- Conveyance: Particular legacy applications within the university that are applicable in hybrid cloud computing are conveyed through different screens. It will be important to ensure that any given set of people within the university that is being served by the system should be well connected so that the right realization of the best principles will be applied at any given time in the entire system (Ko, et al., 2011).
- Easy analyzing: Variations resulting from the way in which the system is structured should be well analyzed before the different users may be considered to advance the use of the university’s hybrid computing system. The different hybrid services should allow cloudbursts for different clouds.

II. EVALUATION OF GOVERNANCE ISSUES

There are various governance issues that are presented by the integration of this technology into the university environment. These issues are discussed below.

A. Risks

There are various risks involved in hybrid cloud computing. The university can control and govern data that is stored in the cloud. Other risks include cloud service failure or termination, cloud provider acquisition, SLA challenges, and provider lock in. These are beyond the control of the university. Security risks include presence of a malicious insider at the cloud, data leakage, security breach, and loss of encryption keys among others (Harkins, 2013). The cloud service providers must protect their customer’s information. The providers’ information security controls must adequately mitigate their customer’s information security risks. In addition, the university must put in place policies and controls to mitigate its information on security risks (ISO/IEC 27002:2005). According to ISO 27002, the cloud service provider should
carry out information security management systems auditing in order to ensure that the university’s information is secured (British Standard Institute, 2005).

B. Ethics

Both the university and the cloud service provider must exercise a high level of ethics. The cloud service provider must meet the expectations of the customers. These expectations include information security, time value, pervasiveness, information access, deployment agility, and scalability (Baum et al., 2011). The ethics also include respect for the cloud service provider regulations to meet customers’ needs while accessing the resources. It involves avoidance of any malicious intentions while accessing the services. The service provider must also uphold the high level of ethics while handling the client’s data.

C. Compliance

The use of cloud computing services must comply with the legal and cloud service provider requirements. These requirements include data protection requirements, security control requirements, and multi-tenancy requirements. In addition, the cloud service provider should comply with the internal audit and external audit requirements. ISO 27002 requires the provider to perform an internal IT audit to ensure that its information security controls are able to mitigate the information security risks. The provider should also allow external IT audits to ensure reliable handling of information (British Standard Institute, 2005). Also, ISO requires the service provider to perform management reviews in case of any information security incident. This will form the basis of root cause analysis for identification of corrective actions. This compliance is necessary for the management of information. The university and the cloud service provider should implement security controls, which comply with the laws and regulations (British Standard Institute, 2005).

D. Effectiveness

Legacy infrastructure within the university will relate to concepts regarding system links and architecture construction. They are not suitable for cloud environment incase the instances have a continuous launching and decommissioning (He, Guo and Guo, 2011). The diversified characteristics for computing need to be monitored and managed adapt ably, extensively. Hybrid cloud computing within the university will have a variety of management problems. The university making use of public clouds does not own the equipment for the environment due to the fact that the environment will not be part of the private network. Public cloud clients will not have high visibility or controlling ability (Zissis, 2010). The university will ensure an integration with the architecture as per their cloud provider through the use of the particular parameters for dealing with the cloud constitutes. Integration will relate to linking into a cloud APIs to configure the IP address, net, firewall and the data for storing. The control of functions will relate to a cloud provision infrastructure and servicing. The cloud users within the university will have integration with their cloud infrastructure managing (Carroll, Kotze and Merwe, 2012). The capacity issue challenges all the cloud environments due to the user’s capability in deploying applications through self-servicing portals.

E. Control

In the University, applications of different magnitudes will be in the university environment, consuming high volume of resources before disappearing at different times. The chargeback challenges all the environments and the service prices to the university will be charged competitively for a profit to be created (McKendrick, 2011). The university will regard the chargeback to be a challenge because IT groups will not be able to have a view of the real resources due to the overlap of the resources that will be paid for individually by the university. For a private cloud operator charge back is clear. The problem will relate to the guesses regarding the allocation of resources as per the real resource using in achieving a huge operational efficiency. Excess budgets will be risky for the organization.

III. GOVERNANCE STRATEGY PROPOSAL

Security governance is the challenge that will be addressed in this part. The proposed governance strategy is the information security governance framework. This framework involves the use of a standard quality management cycle (Mahmood, 2013). This cycle consists of a continuous improvement that is aimed at four outcomes. These outcomes include strategic alignment, value delivery, risk management, and performance measurement. This framework is composed of management processes governing the implementation and governance of the functional processes in the hybrid-computing environment.

The governance framework strategy will be implemented in three phases namely: Architect and Establish, Implement and Operate, and Monitor and Review (Vladimirov, Gavrilenko and Michajlowski, 2010).

A. Architect and Establish Phase

This is a crucial phase that will allow the establishment of strategy, policy, and risk management of the hybrid cloud in the university. This phase will develop the hybrid cloud vision, strategy, and deployment plan that will be aligned to the objectives of the university. This phase involves strategy and planning, policy portfolio management, and risk management.

Strategy and planning will ensure that the information security program is established in the right direction and will provide the guiding activities (Meijer and Thaens, 2010). It will also ensure that the information security program is aligned to the university’s goals and objectives. In addition, it will define the components of the information security program. The policy portfolio management will provide the management’s expectations of the information security, transform the aims and requirement into actionable directives, and provide a clear definition of the roles and responsibilities of the information security. Risk management will provide the information protection and mitigation plan, early identification and mitigation of particular risks and threats to ensure reliable information security evaluation techniques, and measure
information security program efficiency and effectiveness (Kuinam and Chung, 2013). The safeguarding of information against the unauthorized access will be a great complication to the university because the need to ensure privacy (Rochwerger, 2009). It will be important to ensure that the entry into the different data fields within the system is well protected so that there will not arise a case of insecurity. The different aspects of the hybrid cloud computing will call for the best attention right away form the implementation has so that the system will be maintained at its best at all time (Ryan, 2011). The fact that different individuals will be using the hybrid system at any particular time does not mean that there will be issues regarding the manner in which data is well protected.

B. Implement and Operate Phase

The hybrid cloud will have an oversight management of security operations, which will be provided in this phase. This phase will consist of management oversight and functional processes that will govern the hybrid cloud (Kuinam and Chung, 2013). The management oversight will provide program direction and priorities and will develop the university’s information security governance. The management oversight will also ensure that the information security program and risk management are aligned to the goals and costs of the strategy. It will also track and maximize the information security resource allocation and constantly improve the information security program. The functional processes will focus on issues outside the scope of information security governance.

Different complications will result from the manner in which a variety of people will be coming up with their own opinions regarding the best application of the bets principles that are useful in coming with the most advanced utilization of the hybrid cloud computing (Voorsluys, Broberg and Buyya, 2011). The data that will be required at any time in ensuring that the processing is done effectively will greatly relate to the desirable realization of the most developed criteria of the hybrid cloud computing infrastructure (Winkler, 2011).

C. Monitor and Review Phase

This phase will emphasize on communications, awareness and training, and compliance for the hybrid cloud. Therefore, there are three specific areas that will be the focus in this phase namely communications and outreach, awareness and training, and compliance and performance management. Communications and outreach will ensure that the university community is fully informed on the importance of information security. Moreover, the same will define roles and responsibilities and assist the information security staff (Vladimirov, Gavrilenko and Michajlowski, 2010).

Awareness and training will inform the staff on the required response to any changes, ensure security awareness within the university, and facilitate compliance. Compliance and performance management will ensure regular measurement and reporting of various issues, optimize reliability and efficiency of security implementations, minimize the probability of repetition of systemic issues, and constantly improve and inform the information security program.

In the university, a professional application of the best computing knowledge will be critical in the follow-up criteria that will be required at any point that the different technicalities will be effectively sorted out. The differences regarding the most critical factors will be safeguarded in a way that comes in a progressive realization of the best principles in a successful realization of the key components of the desirable information technology aspects. The information obtained form the hybrid cloud-computing infrastructure will relate to different categories of the most advanced analyzing of events and this result in the complimentary realization of the bets results.
IV. REFERENCES


Using RFID In Qatar University

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Abstract—Nowadays, in universities every student has to identify himself or herself several times during the day, this makes it essential for universities to have an easy identification technology that can enable students to prove their identity in an easy and efficient way. This paper will identify and analyze the current implemented identification technology in Qatar University and their issues, then to choose the most useful technology for Qatar University. It is noticed that the current identification tool consume long time and waist valuable time for both students and teachers.

This paper proposes radio frequency identification technology (RFID) to be embedded with student cards, this technology is suggested to replace the barcode system which is the current authentication method, as the use of the RFID to authenticate would require less time and effort on both students, faculty, and staff.

Index Terms— RFID; identification; student card; authentication technologies; radio frequency identification

I. INTRODUCTION

Today Qatar University records students attendance by asking the instructor to use a hand held barcode scanner and scan the student cards individually, this process may takes some time away from the lecture as students will take a minute to get their card out and it will take two or three minutes to scan every card for small class, the same process can take more time with more students. On top of this when someone comes few minutes late he interrupts the class so he can scan his card (Ganucheau, 2013). This process takes valuable time away from teachers and students. The proposed solution is looking for an emerging technology that can replace the current attendance and access system that will have the ability to be functioning without any intervention from students or instructors (Cook, 2005).

The aim of this paper is to find an emerging technology that detects which student is entering and leaving the classroom, and describe the benefits of having this technology. Then to critically evaluate any governance issues that this technology has, that by researching for the implementation of RFID in organizations. Finally this paper will match and apply Qatar Government information assurance policy and ISO standards in order to solve the mentioned issues related to governance. 

A. Radio Frequency Identification System

The RFID technology consist of two parts the first part is the RFID tag which is a small chip combined with antenna; it is designed with the ability to be attached to any object to allow the user to track it. The tag will return the signals to the, usually it returns the signal along with additional data like an identified serial number or any predefined customized information. In term of size RFID tag can be as small as a large rice grains and as then as paperback (Hopkinson and Chandrakar, 2006).

The second part is the RFID reader with its antenna, the RFID reader can be fixed, for example the reader fixed in the retail shops to protect their item from taken away, and the second type of the RFID reader is the handheld reader which is used in the warehouses and for inventory purpose. The reader will transmit a signal that will wake up the tag, the tag will respond with a predefined signal that the reader will then pass this data to a database to be stored and called by any application as needed (Cook, 2005) as it is illustrated in figure 1.

The RFID technology is widely used and popular because the RFID tags do not need to contain batteries to be operated therefore it can be functional and usable for long periods of time, and because of its ability to read multiple tags as a bulk not as an individual item, on top of this it can operate under extreme circumstances like hot and cold weather.

B. The Current Technology in Qatar University

Today Qatar University is using a barcode system that is printed on the student magnetic card for access and attendance purpose as well as its use in the library for access and borrowing books.

Barcode is read by using a special scanner that is fixed or handheld to reads the information directly off of the surface where the barcode is printed on, the data is then transferred into a database where it will be recorded and used later for attendance.

The other use of the barcode system in Qatar University is when students want to access the library they have to scan their
the student card to link the borrowed book to the student. And some specialized labs require the student to swipe his or her magnetic card to allow access to the lab. And when taking the attendance the instructor will ask the students to bring out their student card and will scan them one by one, if there was 50 students and the scanning rate is 3 seconds it will take about two and half minutes to scan all students, and some classes can have much more students therefore it will consume much more time to scan all in, not mentioning the students who come late and interrupts the class to scan their card (Gibson, 2013).

C. Advantages of RFID Against Barcodes

RFID has many advantages over the traditional barcode system, one of those advantages is the distance that the reader can read the tag or the barcode, for example the barcode can be read from maximum of 5 meter, while RFID can be read from 90 meter. Another advantage of the RFID is that it can scan tags in a bulk around 40 tags a seconds while barcode can scan one barcode at a time. The RFID is bidirectional technology while barcode is directional. RFID tags can be read, and the tag can be rewritten or modified as needed, On the other hand barcode is read only, and the data cannot be changed if it was printed on a label or on a card. The one advantage of the barcode that it is much cheaper that the RFID system in the short term, but considering the Return of Investment (ROI) RFID is more cost effective (Roberti, 2013).

Overall RFID have more advantages and have more uses than the traditional Barcode technology.

D. Using the Proposed Technology in Qatar University

RFID has many uses within Qatar University in term of security and making it easy for students to study. As a start the recommendation is to use the RFID technology for attendance, access control, and in the library.

Implementing the RFID in the library will make it easy for student to borrow books by just scanning his card and the book he wants to borrow. In security and access control RFID can ensure the safety of students within Qatar university campus and university residence that is by integrating RFID with the student card, that will allow the student to easily access any university facility and residence that he or she is permitted to do so. Another advantage that RFID can provide is that it will save time on teachers when they are taking the attendance using RFID where student enters the classroom as a group and RFID reader can scan all of them in the same time saving the time and efforts to scan the individual student using the barcode system (Hopkinson and Chandrakar, 2006). Middlesex University just like other universities adopted this technology to be used mainly in the library.

II. ISSUES WITH RFID USE IN QATAR UNIVERSITY

A. RFID Privacy concerns

Every time the subject of RFID is mentioned by any school or university students and parents booth will start thinking of privacy and how this technology be used agents them.

One of the RFID privacy issues is that anyone can scan and read the information on the RFID card that is by simply scanning using any portable RFID reader from a distance, in this case anyone can read all the data that are stored in the card and use them. The RFID tag don not know the difference between one reader and another.

Another big concern about this technology is that people don’t like to be monitored, so they always think of the RFID cards as a tool that will be used to know where they are and what they are doing (Oremus, 2012), here where people and privacy activist refuse the concept of having RFID tag on themselves, many students have appealed to courts to show their rejection of carrying RFID tags like what happened in some of Texas schools where an implementation of RFID was don.

B. Reading Inaccurate Data

RFID tags has the ability to be read from great distance by the RFID reader, this is a privilege but it has the potential to be casing some obstacles; as that can affect the implementation of this proposed technology in Qatar University.

One of the potential problems in reading the RFID tags is how to come up with a mechanism which can ensure that the RFID reader will only read the tags of students who are entering and leaving the class room and not to scan the students that ate sitting next door or students who pass by the class room.

Scanning everyone within the reader range will provide a large list of student who are registered and marked as present but didn’t attend the class, or will mark the same student present in two or three class in the same time which is not true neither possible (Newitz, 2013).

C. Proof of identity

When using RFID people may think of a concern in the regards of how a student can prove his or her identity since the student card that is the only identification method can be lost,
stolen or borrowed. For example a student may try to give his or her student card to another student to carry it with him while he entered the classroom and in this case both students will be marked as present in attendance records despite the fact that this is illegal (D’orazio, 2012).

Another example is when the student loses their card or when thier student card; he will not be able to attend to the classroom or prove his identity and whoever has the card may do things or access places that he is not authorized to do or access.

D. In attendance

It is very challenging to keep record of attendance of student while they are continuously going in and out from the class room. For example any student may come early to the class room or he may have leave to the bathroom during the teaching session, in this case he may mark as not present or late or just having long list of records of him entering and leaving thou out the day.

Or in other cases the instructor may see the need of leaving for any reason or decide to shorten the class period for a reason that he see fit, keeping records on teachers and making them feeling that they are always monitored will lead them to think that this may be misinterpreted and in some cases it may affect the teaching quality.

III. GOVERNANCE STRATEGY PROPOSAL

Till today there is no specific approved guideline or unified approved standards to govern RFID systems, but using other recognized standards can address most of the mentioned concerns.

A. Addressing the RFID Privacy concerns

The way to overcome the people fear of the privacy breach when enabling and using RFID is to start by spreading awareness and educate people of what is the technology is used for as in the Government Information Assurance Policy (GIA) (Supreme Council of Information Communication and Technology, 2012).

Also when implementing the RFID system don’t include sensitive or private data in the RFID tag, it is possible limit the information in the RFID tag on just the manufacturer’s ID number, so when the RFID reader asked for identification the tag will respond with the manufacturer's ID number which is linked to the student in the database. Another solution to this issue is to limit the access to the staff to what each one need to complete his task only and not to give every staff member full access to the RFID system as mentioned in the access control and security section of GIA (p.6).

B. Solving Reading next door student

RFID readers has the ability to scan and read tags from distance, as mentioned above this may affect the accuracy of the scanned result. So the solution is to use RFID door frame reader as shown in figure 3 instead of the regular readers, this type of readers can be implemented in the door frame and limited the range of scanning to what pass between the two readers. So anyone who go through the door will be scanned and will be marked as present, while it is preventing from scanning everyone who pass by or happened to be sitting next door as in GIA (p.27).

Another possible solution is for the RFID reader to target only those who are supposed to attend the class and exclude everyone else. Using ITIL v3 framework to identify clear service strategy for implementing RFID which will address this issues and identify clearly what need to be considered and what need to be excluded.

C. Proof of identity

The good thing about the RFID system is that it can be detected easily if it is located within the scanning range, so if any student lose or misplace his student card within the scanning range, it can easily be found simply by reporting this to the university and by starting an immediate scan to locate it by the staff.

When the card is lost or forgotten out of the scanning range it cannot be located therefore the attendance must be taken manually, for those who forgot or lost their card the teacher will ask them to write their name and student number on a piece of paper and he will mark them present later in the system.

And to solve the issue that students may borrow each other card is by easily either counting students when they come in to the class using any technology, or by letting student to add money to their card and allow them to buy items in the university or in the cafeteria, this solution will force students to not giving their card to each other, on top of this a penalty can be set to those who exchange their student cards (Dobkin, 2013).

D. In attendance

Students and teacher both may come in and out many times during the class time. The issue with this is that there will be so many records for entering and leaving the class room, and there will be confusion on when the student entered or left the class. So the system must only record the first in and the last out of the class for each student. Also the teacher has to have the right to cut the class short or to cancel it as he see fit since he is the authorized to do so by the university. Also enabling the students to comment or justify their attendance records by giving them limited access to the RFID attendance system, this will make students less concerned with the privacy issue and make them feel more responsible about their time in the university.
IV. CONCLUSION

In conclusion people may find advantages and disadvantages in RFID systems but its advantages are much more, and using the right rules and focusing in implementing the system using the right governance strategy will contribute in making the system more practical and will benefit both Qatar university and its students.
V. REFERENCES


Exploring The Adoption of 3D Printing
At The University of Derby

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Abstract—The study discusses the adoption of the emerging technology of 3D printing for the University of Derby. 3D printing is found to be extremely beneficial for facilitating practical learning in students and may also help visually impaired students in gaining a better perspective of various objects. However, there are several ethical, compliance and legal issues that may lead to serious problems and hence it is important for the University to adopt appropriate governance practices like adopting shared governance framework and reviewing the use of the printers to minimize the risks of these issues.

Index Terms—Emerging Technology, 3D printing, Governance Issues, Governance Framework

I. INTRODUCTION AND BENEFITS

Technologies have developed tremendously in the last few decades all over the world. Additionally, emerging technologies refer to the new technologies that are developed as a result of some new knowledge or capabilities of people and lead to progressive development in their respective areas. The emerging technologies keep changing from time to time because new technologies keep coming in and the existing ones become old and used (Godwin-Jones, 2003).

A quantity of the current emerging technologies and technology trends include 3D printing, BYOD, content analytics, social analytics, cloud computing, augmented reality etc. Le Hong and Fenn (2012) talk about some of the emerging technologies of 2012 categorized on the basis of the time that they would take to reach a plateau. The study here thus takes one of these emerging technologies and analyzes the benefits of implementing the technology in a British University. The governance issues related with the use of technology in the university and a framework for developing a governance strategy are also discussed. The technology that has been chosen for the study is 3D printing.

A. Overview of 3D Printing

3D printing is a next-generation technology, which has led to the development and manufacturing of a large number of products that either required huge machinery or couldn’t be made at all. 3D printing, also known as additive manufacturing, helps in manufacturing different items simply from a CAD design or a drawing with specifications (Sachs, 2001). The 3D printers may also be used for several materials including plastic, metal, nylon etc. The basic idea behind these printers is that they take the design and transform it into a three dimensional object from the material provided. The products are manufactured on a layered structure, wherein one layer is built on another and the process continues (Canessa, Fonda and Zennaor, 2013).

The basic process starts with the development of a virtual design, which is basically a computer aided design that provides the specifications of all the three dimensions of the object. Once the printer receives this diagram, it keeps on adding layers to the object till the time the entire object is not ready according to the specifications (Bassoli, et al. 2007). There are large numbers of 3D printers already available in the market, which are used for several commercial as well as personal applications. Some of the most common applications of 3D printing are discussed below.

- Medicine- medicine is one field where 3D printing has found numerous applications. The technology has been proven to be successful in developing human tissues and is expected to be able to grow entire human organs in the future (Rengier, et al. 2010).
- Industries of 3D have made the entire process of research extremely fast, as they help in developing prototypes that may be used for research purposes. Not only can the 3D printers develop prototypes but may also facilitate prototype and mass manufacturing processes and applications (Rengier et al. 2010).
- Architecture- One area where 3D printing is widely being employed is architecture. The development of 3D models for different construction sites and buildings has become simpler and much easier with the help of these 3D printers (Sachs, Cima and Cornie, 1990).
- Education- 3D printing has enabled students from different fields to transform their imaginations into reality. The technology perhaps helps them in carrying out research and experiments in a better and faster manner. The students may not only develop models but may understand their structure and operations in different fields such as biology, nanoscience etc. (Greenberg, 2009).
- In addition to these fields, the technology of 3D printing is being applied to art, archeology, clothing and jewelry industries as well. Scientists expect these printers to revolutionize the world and help in
developing and building massive structures and generate maybe whole buildings out of them.

**B. Benefits of 3D Printing**

The use of 3D technologies for education has also been continuously increasing, as 3D modeling approaches facilitate the study of real-time phenomena. The students of disciplines like engineering, architecture, medicine etc may learn a lot from the application of 3D tools and techniques (Dynarski, 1999). And the latest addition to this world of 3D technologies is 3D printing, which definitely provides special assistance to visually impaired and other students who cannot understand the 3D graphics and other designs in an easier manner.

Noorani (2005) has proven that the use of 3D printing may significantly help the visually impaired and challenged people in learning better as they may use the touchable replicas and models prepared via 3D printing to understand the structures of objects. Till now these disabled students have been making use of 2D models, which does not give them a clear understanding because the students make use of their touch and feel abilities to learn. Thus, the use of 3D printing may facilitate learning for every type of student by giving them better visualization ability for different objects (Lipson and Kurman, 2013).

Till now students have been theoretically reading about technologies and the physics of different objects but the use of 3D printers would allow them to understand the physics contained in each layer (Kroll and Artzi, 2011). In addition to facilitating research and development activities for students, the incorporation of the technology may also allow students to be more prepared for the corporate world that requires continuous innovation and discoveries. Thus, the application of the emerging technology of 3D printers may perhaps help students in learning better and learning practically (Gonzalez-Gomez et al. 2012). This will help them in the future and in their current learning environment to achieve better outcomes and advanced learning (Arayici and Hamilton, 2005).

**II. EVALUATION OF GOVERNANCE ISSUES**

Though the emergence and adoption of the 3D printing technology seems to be extremely effective and beneficial, it is possible that the technology would lead to the creation of several governance issues at the university level. There is no doubt to the fact the use of 3D printers would support the learning experience of students to a great level but in addition to learning, these printers are also expected to raise several ethical and compliance issues. The section thus discusses and analyzes the various possible issues or problems that may arise in the University because of application of this new technology so that recommendations to face these challenges may perhaps be suggested.

**A. Ethical Issues**

There are several ethical and moral issues that may be raised in the university because of the 3D printers. The files of the technology that are generally used for printing are something that may be copied very easily (Moilanen and Vaden, 2013). And due to the technologies and cheap costs involved in it, the methodology of person copying a file or a design is not simple and indeed difficult to implement. Thus, students might get an easy mode of copying other people’s work (Moilanen and Vaden, 2013). This may raise several ethical issues and be disadvantageous for the students.

**B. Copyright Issues**

Every design of a product has a copyright or a patent related to it. It is legally binding to not use the patented information in any manner. But 3D printing is a technology that may make infringement of patent laws very easy. If these printers are made available in the University, the students may tend to copy designs to build their own products and this may lead to legal issues of compliance (Bowyer, Bradshaw and Haufe, 2010). The students might even be unaware of the fact that they are breaking law and hence it is important to devise a way to address these compliance issues before providing the access to technology to students.

Not only students, even the professors and academicians involved in research projects that may cause infringement of law and perhaps raise several litigation issues. The professors and researchers at the university may easily copy designs and break the law.

**C. Risks and Threats**

Providing the technology of 3D printing to students is like giving them a power to create anything they like. This can impose several risks and threats for the students. While it’s a great opportunity for students to be innovative and create new solutions for different problems, the irrational use of the technology may lead to several risks and threats. Students may develop products that can harm the people and the environment. They can easily misuse the technology and create harmful products (Heller and Eisenberg, 1998). Thus, the threats are imposed not only to the copyrights and patents of a design but even to the people and environment around them.

**D. Fraud and Scam**

The use of the 3D printing technology can make several fraudulent activities extremely simple to implement. The technology may be used for copying and making fake identity cards, credit cards etc. This can lead to a significant increase in the fraud activities in the university. Students and other members of the university may be able to misuse the technology for fraudulently developing and creating items that are fake (Erdogmus and Marcel, 2013). The Universities do maintain log files to identify the individuals using any machine at a given point of time but still the chances of fraudulent activities become higher. An appropriate system for monitoring the usage thus needs to be implemented in the University.

**E. Governance Issues**

The technology of 3D printing comes hand in hand with a large number of legal issues. UK is known for its innovations and developments of new ideas on a regular basis and hence there exist a large number of copyrights for different products and designs. The use of 3D printing technology can lead to several copyright issues. The patent laws that currently exist do not have the required rules or mechanisms to stop and avoid
these governance issues. The patent laws are currently valid only for innovations and hence applying them for the manufacturing of additional items via 3D printing would be difficult (Bowyer, Bradshaw and Haufe, 2010).

The governance issues may not only occur at the legal and national level but may also arise at the university level. The protection of designs, copyrights etc. are essential for individual projects in the university and the technology can enable students to copy each other’s designs and hence can break the governance rules of the university. It is hence advisable for the university to adopt a governance strategy framework to successfully implement the technology and obtain higher sustainability.

III. GOVERNANCE STRATEGY PROPOSAL

The management of technology in an organization is not an easy task. Especially for educational organizations, it is extremely important to ensure that all the technologies are being implemented within the defined framework of governance and compliance. Thus, it is very crucial for the British University also to adopt a well-thought of and practical Governance Strategy so that the chosen technology can be developed and implemented well (Lipson and Lorsch, 1992).

The strategies discussed here can help in minimizing the risks and the discussed problems related to the adoption and implementation of the 3D printing technology in the University. The framework and methods for mitigating these issues and risks have been chosen based on the experience of other universities and recommendations made by experts to improve the governance practices while adopting new technologies.

A. Ethical-Adoption of a Shared Governance Framework

A develop of a special framework for the adoption of the 3D printing technology. First and the basic principle of incorporating the technology into the system is that the technology should support the long term goals of the university. Shared governance framework is a commonly used framework for the adoption of a governance approach for the management of information and technologies in an organization. The framework has been extremely successful at the University of Georgia and can be helpful in the adoption of 3D printing technology at the British University as well (Gary, 2005). It requires the formation of different councils and committees that can regularly monitor and report the issues of using the technology in the University (Scott and Caress, 2005). In order to maintain the ethical and compliance issues, British Standard Institute (2013) publications such as ISO 27002 (2013) suggested the use of adequate controls at every level for complete information security and hence the University must devise rules and regulations that can help prevent student from committing any sort of fraudulent activities. OECD (2003) has also stated that the Universities have complete freedom to develop their rules and regulations for better governance and hence suggests adopting leaders who can progress the governance issues and implementations for better management of information technology risks. Hence, the implementation of such framework and control measures can help in eliminating ethical, governance as well as compliance issues in an effective manner.

B. Copyright-Training Programs

Another aspect of governance and managing the compliance and other problems that may arise with the adoption of 3D printing technology is the conduction of a training program. The University can design special training programs for the students to make them understand the compliance issues that may arise if they do not make the correct use of the technology (Kelly, 2013). The consequences, checks that the students should consider and the ways they may handle these issues all need to be addressed and explained to the students to minimize the chances of any legal or compliance problems.

C. Security-Conducting Regular Checks on Technology Use

While the libraries and computer labs of any university usually have a system log maintenance program, it can be helpful to add additional checks on the use of this 3D printing technology. One of the ways of monitoring the use of the printers is to appoint a person who can check the purpose for which the printers are being used by the students. The authorized person can check prototypes being developed by the students to make sure that no criminal or fraudulent activities can take place (Scalfani and Sahib, 2013). An appropriate reporting structure for ensuring that regular reports related to the governance issues and their management are generated and presented to the university also needs to be developed. The systems can also be designed to send complete reports of activities conducted on the University printers on a regular basis to prevent the occurrence of any major problem (Facer, 2011).

D. Risk Management

Risk management is an extremely important part of the governance framework. In order to effectively manage risks, an appropriate communication plan must be framed so that the students, faculty and all other members of the university are aware of the risks and hence can act accordingly (Kezar and Eckel, 2002). A risk management scorecard and the consequences of failing to adhere to the governance rules also need to be developed so that students and faculty members all can follow them appropriately and can act accordingly.

IV. CONCLUSION

3D printing, a technology that aims to change the face of technology in several applications is something that is being adopted by organizations in all fields and disciplines. The adoption of this emerging technology in a British University may have numerous advantages and benefits for the students, as it can help students in gaining better practical learning and can help them in bringing out their creativity. But the benefits of the 3D printing technology come with several compliance and governance issues. Students can break the copyright rules and there can be numerous risks and intellectual property issues
that can arise because of the use of this technology. The intellectual property laws currently prevailing in UK are not enough to address these issues. A shared governance framework with the developments of appropriate committees and development of standards and reporting rules has thus been proposed that may help in reducing the governance risks and issues associated with the use of technology.
Governance Strategy Of Using Social Media Analytics In A British University

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Abstract— Big data has bred a new way of analyzing data faster and bred a whole new industry in IT, as has social media. Social media analytics combines both and has revolutionized the way businesses operate. Taking students opinions from social media and improving the university based on what they say. However this has many potential risks and problems which need to be addressed. With a solid governance framework addressing the key issues, these issues can be addressed, giving a British university a strong framework for the use of social media analytics.

Keywords: Social Media, Analytics, University, Framework

I. INTRODUCTION AND BENEFITS

The concept of data analysis has been around for over forty years with papers being written about it back in the 1960’s. (Press, 2013) and is used by many different organizations with a variety of aims depending on the organization. With the recent phenomenon of social media, a new type of analysis has emerged, social media analytics.

Social Media Analytics scans social media sites such as Twitter and Facebook for key words and trends so that they can be analyzed and utilized for business purposes. This can lead to many different changes within a business. Such as altering products or a marketing strategy to target potential customers more effectively. Generally this technology is used by large organizations though it can work for small organizations too. In fact at the moment it is recommended to start small when using social media analytics (Rashid, 2013) and a British university could keep small datasets easily.

The number of people attending university is currently around 2.5 million and the market is extremely competitive. Universities need to advertise them properly and social media analytics could give them the edge they need to attract the best students, as well as getting current students to have the best experience at university. This however raises issues of how it is used and governed and both will be addressed in this paper as well as the benefits it will bring.

A. Student’s Mood

Student’s opinion of course content is highly important as what they say on social media affects both current and potential future students. Any comments on social media about lectures, modules or social experiences are not only seen by friends at the university but with friends all over the UK and potentially all over the globe (eMarketer, 2013). If bad comments are made then this looks bad on the university and this could be extremely damaging when currently 49% of business executives believing that bad comments about them really damage the company’s reputation. Also if they are a first year then they could consider dropping out with an estimated 27000 UK students dropping out every year (Paton, 2013) and this would be bad for the university as well as the students if the issues aren’t addressed.

B. Societies and sports

Another benefit could be for a universities society and sports teams as they could attract more students through social media then through current methods with sport participation levels currently around 36% of students participating in sport (Sport England, 2012). Social media analytics could show that people aren’t paying attention to one way of advertising such as through the university’s Facebook page and this could change the way a society advertises itself within the university and make it more well-known and increase its members. Although due to add-ons such as ad block these adverts are not being seen any more as it is currently estimated that around 1 in 4 people use an ad blocker and that number is increasing all the time (Hill, 2013). As well as it being estimated that only 1% of people pay attention to Facebook adverts (Creamer, 2012).

C. Less need for questionnaires

Another benefit of using social analytics is that there would be less need for questionnaires at the end of every module and year in the university. Instead of asking students to fill out questionnaires you could use social media analytics and see what comments have been said and use those comments as the basis of what students really think. Also with the huge amounts of people who use social media, which in the UK the current estimates that around half of UK adults use social media (ONS, 2013), the amount of data received is likely to be greater through social media analytics then asking and hoping students will fill out questionnaires or asking students how they feel about the university.

Also with questionnaires being limited to a set of questions, sometimes a common problem among lots of students with the module or university could be missed simply because the question isn’t asked to the student. This leaves the university in
a bad position as it doesn’t allow them to act upon a problem simply because they don’t know about it.

D. Marketing insights

One of the biggest benefits of using social analytics will not directly benefit current students at the university, one of the greatest benefits will be the university being able to hear the opinions of potential future students through social media after open days seeing if there are any common issues (Petrocelli, 2013). This will benefit the university because they will hear what potential students thought of the university which they might not say directly to the university. This will also benefit current students as this may lead to changes which would benefit current students as well as potential future students.

II. GOVERNANCE, RISKS AND ETHICS

There are many times of governance issues with the implementation of social media analytics, which need to be recognised and addressed. In order to set a framework for its proper use, the range of threats associated with its use need to be recognised. However which frameworks are best to identify all the possible risks? Cobit 5 addresses risk and resource management as well as ethical issues such as privacy (Cobit 5, 2012). While ISO standard 27002 addresses the security threats (British Standard Institute, 2013). This section will identify and examine how each of these risks, ethics, security, privacy and sustainability can be a potential threat to the university through the use of social media analytics.

A. Data and Risk

The first governance issue data protection, the data collected by the university and analyzed shouldn’t be passed on to other companies so that they can exploit any information they attain. Not only is this a violation of the data protection act it could put student safety at risk.

There have been many successful prosecutions for violations of the data protection act (ICO, 2013). However the data protection act is not the only legal issue when dealing with social media. There are a range of other legal issues that could arise such as the Computer Misuse Act (1990), as well as other criminal and media laws (Kunczewicz, 2010).

1) Mistakes in Data

The next issue around using social analytics is the amount of false data that could be picked up and analyzed which could have a negative impact on the university. It is currently estimated that around eighty three million of Facebook’s profiles are fake (Kelly, 2012) and Facebook doesn’t automatically check any validity of any account created. Fake profiles are mainly being used by law enforcement (Sterbenz, 2013) and criminals (Laughlin, 2012). Although there is the risk of the university picking up on fake data on real profiles or fake likes misinterpreting how popular a comment really is. An estimated one third of people would lie on social media, (Warman, 2013a) there are always going to be questions about how much you can really trust the data on social media.

Analytics currently can’t detect emotions in comments made. Comments which are either ironic or sarcastic can easily be picked up as genuine comments, if the user doesn’t pick up the sarcasm then the comment could very easily be taken seriously (Evans, 2012). A tool is available to detect sarcastic comments though this won’t stop the problem entirely, it may lower the chances of picking up a comment as genuine but doesn’t picked up all of them up (Kleinman, 2013).

2) Data Misuse

When using analytics real care has to be applied. Analytics has its benefits and when used correctly can have real advantages. However when it goes wrong the consequences can be dire. Analytics may reveal things about students which they may not know themselves. Recent examples such as the Target pregnancy scandal revealed that data gathered can reveal things to people they may not know themselves (Hill, 2012a). The points system could easily be used on students’ profiles to reveal lots of personal traits they may not know, such as their mental state. For example if a student’s profile revealed they may be depressed, an email with counseling information could be sent out and cause offense. Which leads to the obvious question are there things that we as people have no business finding out? Just because we have the ability and the technology to find something out it doesn’t necessarily mean we should.

B. Privacy Issues

Ethical and privacy problems increase with their social impact (Moor, 2006). Recent examples such as Facebook place privacy failure have highlighted how ethical issues such as privacy can upset users (Mello Jr, 2010). This leads to the problem that students could easily say they don’t want their comments being used and say nothing online that they see could be used by the university as it invades their privacy (Haddadi, et al, 2012). Recent legal cases of photos on social media argue against that, those cases are purely related to images and not to comments and statuses (Anderson, 2013; Gill, 2013).

C. Ethical

1) Offensive Social Media

Unfortunately students do stupid things. These end up on social media quickly and can cause offense across the country and in some case the world (Evans, 2013; BBC, 2011). If for example a student puts on social media a comment that could be seen as racist, do you report it or ignore it?

2) Cyber Bullying

Also with the use of social media comes cyber bullying which raises another ethical issue. If it becomes apparent that a student is getting bullied online by a fellow student do you intervene? Bullying is common among young people with an estimated 60% of 18-30 year old suffering some form of abuse online (Turan et al, 2011).

D. Security Issues

With the use of computers comes the risk of hacking. All computers are vulnerable to it. Recent attacks such as those on Sony, Apple, Microsoft and the NSA have shown that major organizations aren’t immune from hacking and leaks. Sony’s hack was estimated to have cost the company $1.25 billion (Osawa, 2011). All companies dealing with personal data are
always going to be a possible target for hackers. Big organizations aren’t always the target and recently universities in the US and UK have come under attack for their data (Pérez-Peña, 2013; Warman, 2013b). So having a high level of physical and cyber security which is constantly assessed, as well as having a solid internal security policy is highly important.

E. Sustainability

For the use of social media analytics to be sustainable the university has to keep aware of how students are talking to each other. The face of social media changes all the time, companies such as Bebo and Myspace which were popular 5-8 years ago are now barely used (Arthur & Kiss, 2009). Even the currently most popular social media outlet, Facebook, has experienced a decline in the amount of young people using its site in favour of newer social media such as WhatsApp (Olson, 2013). Also if you fail to adapt to new IT and become complacent then it can really affect your organization, examples such as Nokia show that unless you constantly analyze and improve then you can struggle to get value for money (Lee, 2013).

III. GOVERNANCE FRAMEWORK

In order for this technology to be implemented a solid governance strategy needs to be in place. To stop threats from the outside as well as potential misuse by the university a sustainable and reliable governance policy needs to be implemented. It is also not as simple as using one framework which will cover all the issues with the implementation and use of this technology, different framework guidelines need to be used depending on what the risk is.

A. Data and Risks

To address the issue of fake data on social media figure 3 of Cobit 5 could be used as a real guideline as to how to address the risk (Cobit 5, 2012). A risk management strategy surrounding fake data needs to be implemented so that the technology can deliver real benefits and reduce the risk and resources needed when analyzing social media data. This can be done by training staff to detect fake data, checking profiles from the data, as well as using the sarcasm filtering tool available on any data gathered, allowing the university to reduce the risk of analyzing false data as genuine (Kliemnman, 2013).

When using analytics there is no guarantee what you will find out. The target pregnancy scandal showed this. Within a framework the ISO standard 27002 8.1.3 should be implemented, setting down an acceptable rules of use when using social media analytics. Making sure that it is used for the right purposes, as well as documenting any data gathered and making sure that the user is fully responsible for outcomes and address what the general aims are of using the technology (British Standard Institute, 2013).

B. Ethical Issues

Ethical issues are harder to address in any framework. However with the ethical issues such as the issue of cyber bullying in social media, a set of principles need to be set based around The Potter Box Model. The Potter Box Model is based around defining the definition, values, principles and loyalties (Carveth, Ferraris and Backus, 2006).

Each case will always have to be decided on a case by case basis by management and never just by the person using the technology. However if this approach is used to any issue that arises that is an ethical issue then the right approach can be taken depending on how serious the case is. If the issue is deemed serious enough then ISO standard 27002 6.1.3 should be implemented as the next logical step maintaining appropriate contact with the authorities and dealing with the issue (British Standard Institute, 2013).

C. Privacy of Students

With the privacy issue of social media analytics, consent should be given by students to allow the university to use the data on their social media pages. There are laws surrounding protecting the data once it’s collected; such as the Data Protection Act (1998). These laws need to be made clear and a framework based around being transparent with students would be the best option. This should be based around ITIL’s best practice service strategy. Using the four P’s of strategy: perspective, position, plan and pattern creating a policy of honesty with students (ITIL V3, 2007). If the university tells students what they are doing, then students can decide what they are ok with and adjust their social media activity if needed. It also encourages students to be more truthful and think about what is on their social media which would benefit them in the future when looking for a job (Hill, 2012b).

To stop anything that could be seen as offensive appearing on social media pages can now be more easily controlled using a program called SMC4 which allows comments and actions on social media pages to be addressed quickly and effectively and allow only relevant posts and comments on the university’s social media pages (SMC, 2013). This could also allow the university to remove negative comments so that potential students see what the university is happy for them to see. However this only covers pages owned by the university, the data protection act covers the university legally as according to section 2 unless a crime has been committed the data is still legally protected even if you don’t agree with its contents (Data Protection Act, 1998).

D. Security Issues

For internal security of data protection ISO standard 27002 6.1.1 and 9.1.1 need to be implemented into a governance framework. There need to be fully defined guidelines as to what data the user of this technology can access and what they can’t through set levels of authorization which is addressed in section 6.1.1. As well as making sure that the user only accesses what they are entitled though through implemented section 9.1.1 into the governance framework.

To stop external threats section 6.1.4 should be implemented allowing the university to stay up to date with security threats and changing its security practices if required. As well as implementing section 6.1.5 and be constantly
assessing security threats. With constant analysis of security, the threat of hacking will be severely reduced.

E. Sustainability

To address the issue of sustainability and value for money when using social media analytics the DMAIC cycle of six sigma needs to be applied (Six Sigma, 2013).

With this cycle the issue of how to keep the technology being beneficial and relevant to the university is addressed. This can be done through meeting at a set period of time i.e. every six months. Going through the process of defining the technology and identifying the goals of the technology, measuring its success, analyzing the success and see if there needs to be a change in strategy, improve the technology based on the measure and analysis and then control by updating any plans for the technology.

IV. CONCLUSION

Social Media Analytics could bring real benefits to a British University. There are lots of changes that could be made and the university could gain a real insight into what students truly think. This could then in turn improve student satisfaction levels of the British university and make it more attractive both in the UK and worldwide. The framework and governance needs to be solid as there are obviously lots of threats and risks when using social media analytics, however as long as its governed and used properly the use of social media analytics could be a real benefit to a British University.
V. REFERENCES


Abstract—In this paper will be discussed and introduced an emerging technology called NFC (Near Field Communication) for the purpose of improving and simplifying the experience of the students in University of Derby. This technology can be used in various devices such as smartcards and smartphones to facilitate payments, student identification, acquisition of library books etc. The purpose of this paper is to demonstrate the benefits and risks that NFC technology in general may emerge, as one of the main risks is the confidentiality and privacy of the students. Towards the end will be proposed, presented and discussed ISO 27002 framework in order to be applied against the issues identified in this paper.

Keywords—Near Field Communication, ISO 27002, RFID, Governance, Information Security

I. INTRODUCTION
Near Field Communication or NFC is a technology focused on wireless connectivity, short range (i.e. only a few centimetres). This is a technology that ‘born’ from combination of other contactless identification and communication technologies which enables connectivity between electronic devices. NFC enables bidirectional interaction in a simple manner among electronic devices, allowing consumers to make contactless transactions, access digital content and connect to other devices with a simple touch. This mobile technology will increase the comfort and speed in numerous processes such as payments without physical money, purchase tickets through the mobile phone anytime and anywhere, best loyalty schemes with coupons, Identity proof, vouchers and cards always on the go and many others (Curran, 2012).

II. BENEFITS FOR THE STUDENTS
With the implementations of this technology, the students would benefit in many ways such as ease of payments when shopping in university by using a smartphone or a smartcard equip with NFC. Borrowing book from library would be much more easier then the current system, instead of using the scanner machine to registry the book a simple touch with the smartphone or a smartcard would be necessary for the process to be done, even for a student to get registered for a lecture it would be more simple. For being intuitive any student could use it and is very versatile it means that it can be use in many ways even outside the University.

III. HOW IT ALL CAME ABOUT?
NFC is a technology that has emerged from the RFID (Radio Frequency Identification). RFID enables communication between two devices over long distances through radio: one of them brings a source of energy and acts actively seeking information on another device, which does not require their own power source to operate (Edwards, 2008).

The Near Field Communication, as the name suggests, limits the field of action of frequencies for a distance of up to ten centimetres. Therefore, must be quite close to the object so that there is data exchange - which makes it very safe. It is important to note that the data are obtained by the passive and source active source. Thus, other devices cannot access the information contained in any device that uses this technology (Curran, 2012).

The NFC was created to transmit data more securely. While RFID is the best option for tracking animals, for instance, NFC could be applied for performing banking transactions. This is because the scope of the RFID frequency could be used by people with bad intentions, trying to get data without authorization or cloning devices, this is the reason why NFC works for short distances (Edwards, 2009).

IV. HOW IT IS BEING USED?
This is a technology that can bring many benefits in people's lives, it must be in a gadget that is present 24 hours a day in the hands of users. Therefore, the best application found so far is the implementation of NFC in mobile devices.

In countries like Japan, the technology is being used in everyday bases: the subway system allows tickets to be purchased with the approach of the telephone handset to the turnstiles. Thus, common objects that people use every day are transformed into "smart objects" capable of storing and transmitting information through the tags (AdAge Global, 2012).

There are countless ways to use NFC. Many researchers believe that it should replace barcode and even credit cards. Thus, the consumers do not need to look for reading machines in stores, simply holding the phone to check the price of the product. At the end to make payment, just need to perform the same action on a device installed on the cashier (McCthie, 2004).

BMW introduced a prototype key that uses NFC. The ability provided by this type of key would be to check the
condition of the car, being close to devices with NFC. According to the company's engineers, the system applied in the key would be even more secure than in other portable devices (Mobile Payment Magazine, 2011).

Moreover, the technology can be documents, facilitating denial of access of adolescents to places such as bars and nightclubs, for example. With NFC, would be also possible to watch the trailer of a movie just by putting the mobile device next to the poster with the movie advertisement. It is estimated that NFC technology makes active part of everyday life for users in North America by the year 2015 (NFC Forum, 2011).

V. GADGETS WITH NFC

Expanding the field in the NFC, one of many models from Samsung like the Nexus S brings the technology already connected to the device running the Android operating system; it is possible to see that Google is willing to invest in this new way of data transmission (Google, 2012).

Rumours circulating in the internet that Visa Europe would be testing a payment system in subways, similar to Tokyo, using the latest model of the iPhone. With this, it is expected that the new generation of Apple gadgets - iPhone, iPod Touch and iPad - also backed the system (BGR, 2011). However, the information is not confirmed by Apple.

However, research conducted by Visa showed that 87% of iPhone users would be willing to buy hardware to be engaged in their devices, enabling the execution of payments via NFC (BGR, 2011).

This might accelerate the inclusion of the technology in daily use, transforming the way that people access information and products. The success of NFC is quite expected since the production cost of the devices that send data are relatively low (Ecma, 2004).

VI. GOVERNANCE ISSUES

Some possible scenarios for implementing NFC mobile payments and how it will work as an access card, among many others, require high levels of security. This leads to an extra care to ensure that NFC is a safe technology. When making a payment via mobile, in order to increase the security of transactions, the user is asked to enter a security key whenever needed in order to perform the trading. Thus, different types of possible threats to NFC communication are described below.

- Listens - As the NFC has a wireless communication interface, it is obvious that the threat of "listens" is a very important issue. The communication between the NFC devices is made through RF waves. An attacker could also use an antenna to receive the signals transmitted. This can have the knowledge needed to decode the data transmitted from the received RF signal. Furthermore, it should be assumed that needed to receive and decode the signal equipment is readily available to the attacker, since no special equipment is required. Modes of active and passive operation use different ways to transmit the data, and much more difficult to "listen" for devices that send data in passive mode. When a device is sending data in the active mode, the "wiretapping" can be made up to a distance of about 10 meters, while in the passive mode, the distance is significantly reduced up to 1 meter (Allah, 2011).
- Data Corruption - The attacker, rather than just "listen" communication, can also try to modify the data that is transmitted. In the simplest case scenario, the attacker just wants to disrupt communication, so that the receiver is unable to understand the data sent by another device. Data corruption can be performed by sending valid frequency spectrum of the data at the right time. The right timing can be calculated if the attacker has a good understanding of modulation and coding schemes used. This attack on a security system is not very complicated, but does not allow an attacker to manipulate the actual data (Curren, 2012).
- Data Entry - This attack occurs when an attacker inserts messages to exchange data between the two devices but this is only possible when the receiver takes too long to respond. The attacker could then send their data earlier than the valid receiver. The operation will only be successful when the entered data can be transmitted before the original device starts to send the reply. If both data streams overlap, the data will be corrupted (Allah, 2011).
- Man-in-the-Middle-Attack - The much known Man-in-the-middle attack is when two people want to communicate with each other, for instance Annie and John, they are tricked into a conversation of three, by an attacker Marie. Annie and John should not be aware of the fact that they are not communicating with each other, but both are sending and receiving data from Marie. Annie and John want to agree on a secret key that they will use to establish a secure channel. However, as Marie is in the middle, it is possible that Marie establish a key with Ana and another key with John. When John later uses their key to protect the data, Marie is able to "listen" the communication and manipulate the data that is being transferred (Cerroni, 2009).

VII. GOVERNANCE STRATEGY PROPOSAL

In this chapter, an introduction will be given to best practices for the management of information security through the ISO 27002 (British Standard Institute, 2005). Organizations and their information systems are increasingly being targeted by various types of attacks, including computer viruses, fraud, espionage, sabotage, etc. Virus and intrusion or denial of service attacks are becoming increasingly common, ambitious and sophisticated (ISO 27002, British Standard Institute 2005). Originating in the British Government, the BS7799 standard is the basis for the ISO 17799 that become ISO 27002 (IT Governance Institute, 2008). The Code of Good Practice ISO 27002 provides a framework for assessing the management systems of information security based on a set of guidelines
The ISO 27002 strongly uses the PDCA cycle of Plan, Do, Check and Act. Invented by Shewhart and later applied by Deming, the cycle consists of a set of actions in sequence, given by the order established by the letters that make up the acronym (PDCA) P for Plan, D for Do, C for Check, and finally A for Act. In Figure 1, illustrate the PDCA cycle as proposed by ISO 27002 for management systems security information.

The ISO controls framework enables information security professionals have a consistent and methodical approach to assess security processes in organizations, technology infrastructure or processes.

The benefits of information security is to prevent financial losses that the company may have, in the event of information security risks. For an information system to be considered secure, it must meet four characteristics:

- **Integrity** - The information may only be modified by those authorized and controlled manner;
- **Confidentiality** - Information will only be available for those who are authorized;
- **Availability** - Information should be available when needed;
- **Non-repudiation** - The use or modification of information by an authorized person must be irrefutable, i.e., the action cannot be deny.

The ISO 27002 standard is structured in twelve sections, each of these categories consists of information security, and each category has a control objective defined, one or more controls that can be applied to meet the control objective. A descriptions and implementation guidelines of the five out twelve sections are the follow:

- Information security policy
- Organization of information security
- Asset Management
- Access control
- Management of information security incidents

The objective of the information security policy is to provide guidance and support to the actions of the security management information on business requirements and relevant laws and regulations. Management should establish a clear and in accordance with the policy goals of the business and demonstrate support and commitment to information security by publishing and maintaining an information security policy for the entire organization (British Standard Institute, 2005).

The management of information security incidents should establish a process for managing business continuity to reduce to acceptable levels, the disruption caused by disasters and security failures, through a combination of preventive and recovery controls, reacting to the discontinuation of activities business. For this purpose, it is necessary to identify critical business processes, and integrate the management requirements of information security and business continuity with other aspects such as operations, suppliers, employees, materials, transportation and facilities.

That said, the standard can be as a starting point to develop a specific security management in an organization. It is important to note that not all controls and recommendations of the Code are applicable to all types of organization and there will be cases where additional controls may be necessary, although not part of this set of recommendations and controls.

**VIII. CONCLUSIONS**

According with research done, it can be conclude that the adoption of a new technology such as NFC in the University of Derby or any other organisation will bring new risks and will require big changes in business models and process as well.
(ISACA, 2011). For that purpose in this paper was introduce one of many frameworks to address governance issues. ISO 27002 is a very powerful framework as regards the security of information technology systems. There are many others frameworks such as COBIT and ITIL that combined with ISO 27002 result in a more cohesive framework.
IX. REFERENCES


Near Field Communication System In The University Environment

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Abstract— This paper contains information about the implementation of Near Field Communication system in the University environment. NFC technology ensure significant improvements of communication between students and University. NFC can be the perfect complement of University’s portfolio of products and services. It also gives the opportunity to future system expansion and functions upgrade. This paper describes process of system implementation, advantages and disadvantages of NFC and possible solutions to the problems.

Index Terms—Near-Field Communication, information exchange, university students, communication

I. INTRODUCTION AND BENEFITS

To meet the needs of students, universities are increasingly investing in modern infrastructure, new technologies and new forms of communication with students. The growing number of smartphones and tablets in the United Kingdom and the popularity of social networking sites such as Facebook, YouTube, LinkedIn, Twitter and Google+ makes it necessary to redefine the ways of communication between universities and students.

A. Near Field Communication

A technology that can be successfully used at the university is NFC (Near Field Communication), which is a communication standard for wireless data transfers at a distance of about 10 cm (Haselsteiner and Breitfuß, 2008). NFC technology allows two active devices embedded with chips transmit small pieces of data between each other via short range wireless connection” (Murira and Kiuba, 2012). NFC technology is designed to facilitate people’s lives and saving their time. The technology is intended for use in mobile phones, NFM module can be also placed in the ID cards, keyrings, stickers or posters. “It allows consumers to perform contactless transactions, access digital content, and connect electronic devices with a single touch. NFC devices are naturally interoperable, as they are based on pre-existing contactless payment and ticketing standards used on a daily basis by millions of people and devices worldwide”(Ullah and Goodrich, 2007). It involves a rapid connection between the transmitter (e.g. smartphone with built-in NFC module) and the receiver - tag, label or NFC sticker (located in any public place). Communication can take place in two configurations. Between two active devices (e.g. mobile phone and tablet) and between active and passive device (e.g. smartphone and NFC tag). “The modes are distinguished whether a device creates its own RF field or whether a device retrieves the power from the RF field generated by another device. If the device generates its own field it is called an active device, otherwise it is called a passive device. Active devices usually have a power supply, passive devices usually don’t (e.g. contactless Smart Card)”(Haselsteiner and Breitfuß, 2008).

B. Benefits

Ways to use NFC technology to communicate with students are almost endless. When the phone is close to NFC tag located on the door of the classroom, the screen can display the classroom schedule. The NFC label located at the offices of the...
lecturers can be programmed to transmit data about their duty hours and contact information. NFC technology also allows a quick confirmation of attendance at lectures and exercises. Students can sign up for the attendance by approximation of the phone to the sticker. NFC helps students receive rapid information, but also allows them to download the application for smartphones. As a result, students do not have to look for it in stores or on the school website. NFC stickers can be placed anywhere on the door of the office, the poster on campus, restaurants, and other frequently visited places by students.

With NFC, students can also: change the settings of smartphone, such as mute or turn airplane mode in the classroom; save contacts lecturers after they approach the device to the NFC tag; get information about the course after they approach the device to the NFC tag; initiate transmission of course-related multimedia, locate the phone on the map using NFC tags placed at university campus.

The NFC technology enables contactless payments. NFC technology is a convenient alternative for payment. Mobile phone can be used as a payment card, students can pay for goods and services in the same way, how they are using the credit card with contactless payment function (Ozdenizci et al., 2010).

II. EVALUATION OF GOVERNANCE ISSUES

The project assumes integration of NFC technology into the University environment, with safety procedures based on ISO/IEC 27002 information security standard. NFC as a data transmission system requires proper implementation, monitoring, reviewing, maintenance and improvement in order to meet safety standards.

NFC transmitters should provide information based on university website or database, such as: each department news or community news, information about events, course related media etc. These public information do not require special protection but access to those information and editing capability should be restricted and based on permission levels (Menken, 2012).

A. Advantages of NFC

The NFC technology ensure significant improvements of communication between stakeholders, but it requires proper implementation. An important element of the implementation of the system is to familiarize university staff and students with the features and capabilities of NFC. It also requires proper exploitation the advantages and awareness of the disadvantages of technology. (Warnick et al., 2013)

Unlike Bluetooth, or any other wireless communication system, “(…)no pairing code is needed, and because it's very low power, no battery in the device being read.”(Carter, 2009) NFC enables instant connection, with low battery consumption. It also makes it possible to receive and transmit data at the same time. The NFC has a great potential and flexibility of technology, which provides opportunities for the development of new features, applications and devices.

B. Disadvantages of NFC

There are a few main disadvantages of NFC, such as: short range, low bandwidth – which limits the use of NFC and growing, but still small number of devices that support NFC(Murphy, 2006). These disadvantages are not relevant in the case of implementation NFC technology into the University environment. The task of NFC is transmission of simple text information or tiny applications, so there is no need of high bandwidth. The problem is the limited, but growing number of smartphones with built in NFC module. Distribution of id cards with built in NFC module and replacing of existing, previously used cards, is a solution which will provide data access to all the students.

C. Risk of contactless payments

The NFC information system is designed to provide rapid, useful and helpful information for students. Along with increased needs can be enriched with new features such as contactless payments. “The biggest barrier to adoption of contactless payment is not the security, but rather the lack of education and user ability. Many consumers do not know whether they’ve got a NFC enabled device and not all retailers have educated their staff to provide proper support to customers”(Garner, 2010)

The greatest advantage of NFC technology - the wireless nature, is also the factor of very high risk, when it comes to contactless payments. NFC module may be a target of the attack, based on antenna for intercepting radio signals. In that case, NFC payment account can be blocked and money stolen. Contactless payments applications kept all the important details of the transaction in smartphones hidden files, that could be easily accessible for potential thieves. The risks associated with the possible theft of money is a major factor that discourages people. Implementation of NFC payments is currently not a good solution. Elaboration of safe standards and dissemination of technology takes time. Usage of NFC contactless payments technology should be consider after complete implementation of the project, as an additional option (Francis et al., 2009).

In summary, ease of use (all built in one phone / tablet) and rapid transactions (compared to cash payments) are the main advantages of NFC contactless payments. The risk of theft, account lockout, and other unwanted situations, a small number of devices that support NFC, fear of the new technology, which makes it difficult to implement on a large scale are the main disadvantages of NFC contactless payments.

III. GOVERNANCE STRATEGY PROPOSAL

To meet the guidelines of ISO/IEC 27002, implementation of NFC technology at university campus should involve analysis of university environment, zoning and scheduling of implementation process, software and hardware installation, testing of proper data transmission functioning and maintenance of the system (British Standard Institute, 2005).

A. The security policy

The security policy it the compatibility of information security with business requirements, legislation and regulations. It is a documentation approved by the University,
which should be published during the implementation of NFC system.

Organization of information security provides the possibility of a coordinated information security management. It describes the allocation of responsibilities for the information security, assigning duties to individual employees. System operators should be clearly informed of their responsibilities including safety procedures (Ao, Ren and Tang, 2008).

B. Physical and environmental security

Physical and environmental security is associated with protection of software and infrastructure against external and environmental threats. It is related to ensuring the protection of university servers from unauthorized access and safety of NFC devices, providing hardware needed for data processing, servicing of the equipment, monitoring of system infrastructure used on campus (Ao, Ren and Tang, 2008).

C. Data access control

Access control is one of the most important areas of security in ISO 27002. It enables system operators to control database access, registering and removing system users, control of user rights, password management and control of access. Network access control is a helpful device that can limit access to the system based on permission levels, vivificate the safety of devices connected to the network, control network connections and user authentication if it is necessary. Responsibility of the users is an important security issue. It concerns user awareness of responsibility associated with data access, including copyright, privacy policy, protection against improper use of information or use of unauthorized devices. (Menken, 2012).

D. Analysis of the environment

Analysis should include: defining the problem of the lack of rapid information exchange system to mobile devices and determining requirements: accessibility of technology and data safety. Technology involves the use of mobile phones and cards equipped with NFC modules.

E. The term of implementation plan and implementing zoning

Implementation of the system includes installation of NFC tags, creating data resources, safety procedures, training of University staff, implementation of ISO standards. These processes should be scheduled, divided into zones and implemented progressively. The important step in the implementation process is planning of NFC cards distribution to students or replacing of existing, previously used cards (Romero, 2012).

F. Selection and installation of hardware

It is important to choose suitable type of NFC tag, according to its purpose.Readable and well labeled tags, located in frequently visited places promote and encourage the use of NFC. Planning and construction of infrastructure for the system is not a difficult or time-consuming process. It involves planning of transmitters location (information points, information posters, entrance to the faculty, entrance into the classroom), programming tags features and tags layout and placement.

G. Testing and analysis of the proper software functioning of the entire system

Analysis of the proper hardware location and software functioning should take place after the complete implementation of NFC system in all areas. Tests should involve: the choice of tags location and their accessibility, data safety, proper functioning of the system, availability and correctness of data.

H. Maintenance of the system and software upgrade

NFC is an evolution of currently used methods of communication with students. The use of wireless data exchange is a longtime solution with the possibility of continuous improvement and functions expansion. It requires continual maintenance of the system and software upgrades to ensure data safety. Development and maintenance of system should also include: requirements for systems safety (each system update or modification of the existing data should be implemented with safety procedures) and improvements of safety systems - ensuring change control mechanisms and technical inspections as consistent process in the NFC system.

I. The purposes of the system implementation

The main objective of the project is implementation of the system to meet the needs of students, by removing the barriers of time and space in obtaining information and to providing powerful tools for improving communication between stakeholders. Upon completion of the implementation process the following objectives should be achieve:

- easy access to information,
- optimization of the transmitted information,
- ensuring rapid data access,
- proper functioning of the system in all operational areas,
- rationalization of processes that increases quality of students and university employee’s service,
- optimization of the data and information flow,
- significant reduction of the time needed for access to information,
- creation of a uniform access to information system for the entire university.

J. Future development of the system

Near Field Connection system gives the possibility of functions development and upgrade. In long term university NFC system can become the integrated information platform which provides rapid information to any place on University campus. It may offer contactless payment transactions, cashless payments on vending machines, NFC devices can be used as parking meters. Safety reasons are the main restriction on the NFC use. Future development of system infrastructure requires an exact follow of security policy. Implementation of new NFC features may also require new models of information security that focus on protection of personal data and contactless payments safety (Gurley, 2013).
IV. CONCLUSION

NFC technology is still relatively new. As the number of devices on the market and its supporting application development is growing, it will most likely form an easy to use and innovative way to transfer information to students and other users. It has certainly promising future (Miraz, Ruiz and Gomez-Nieto, 2009). However, NFC technology can’t replace completely all forms of data transfer and communication between the university, lecturers and students, because of its limitations and risks associated with its use.
V. REFERENCES


Hybrid Cloud Computing In The University Of Derby
A Study Into Its Effect On The Student Experience, Governance Issues, And A Proposed Governance Strategy

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Abstract— Universities are constantly looking into new technologies that could improve the experience they provide to students and lecturers alike. Hybrid cloud computing is making its way into IT architectures across businesses small and large, and Universities need to get onboard too. However, one of the problems with implementing a new technology into any organisation is ensuring that the proper governance is in place to prevent mistakes being made via the new technology. This paper will look into the potential benefits that hybrid cloud computing could provide to Universities, analyse the potential risks based on ISO 27002:2013, and develop a governance strategy that would nullify these risks.

Index Terms—Hybrid Cloud Computing, Universities, Governance, Compliance

I. INTRODUCTION

Cloud computing is a relatively old concept that is making its way into modern IT solutions. Cloud computing involves using an IT infrastructure that is external to the organisation involved to share files across the internet. These files could be anything from raw data, to media, to applications (Akamai.com, 2013). Primarily, there are two types of cloud computing: private and public, but hybrid cloud computing (also known as hybrid IT) is close to providing a feasible alternative (Geczy, Izumi and Hasida, 2012).

There are many potential benefits for a University to implement hybrid cloud computing, but there are also many risks. These risks mainly revolve around security, affordability, and proper management of data.

A. Understanding Hybrid Cloud Computing

Private Cloud Computing (PrCC) is a locally stored computing architecture that is protected by a firewall (Rouse, 2009a). They are primarily used for hosting services to users within the establishment for which they are set up.

PrCC is useful due to its scalability and affordability, and the effect that has on managed data centres. Resources can be accessed very quickly through cloud computing, and there are also no long-term concerns regarding system overloads so long as the system is properly managed (Blaisdell, 2013). The cloud also uses a pay-as-you-go model for costs, resulting in measurable, scalable outgoings for which you are never overcharged (Santos, 2012).

Public Cloud Computing (PuCC) is a type of cloud computing where the data is stored externally, via a third party service provider. Some examples of PuCC are IBM’s Blue Cloud, and Google AppEngine (Rouse, 2009).

Hybrid cloud computing provides a balance between public and private cloud computing as it involves storing some data locally, and storing some data externally via third party providers (Geczy, Izumi and Hasida, 2012). This enables managers to balance the security and cost of private cloud computing against the affordability and security risks of public cloud computing.

B. Positive Effects on the Student Experience

1) The Automation of IT Services

Despite the initial cost of setting up Hybrid Cloud Computing, it can offer many benefits. One potential benefit is the potential to speed up the automation of IT services. This reduces operational costs, and also leaves more time for IT personnel to concentrate on helping students with any issues they may be having (Santos, 2012).

2) The Flexibility of the Cloud

Cloud computing is very flexible. As bring your own device (BYOD) policies become more commonplace, employees and students alike will expect more files to be available through mobile technology. Previously this would have been a cause for concern, due to having to worry about coupling the software with the correct hardware. However, with PuCC, the cloud provider deals with the hardware platforms, while the users simply specify which application they would like to use (Staples, 2013). By using the cloud, any mobile device with a connection to the internet would have access to all of the files provided on the cloud (Blaisdell, 2012).

3) Cloud Bursting

One of the most noteworthy possibilities that hybrid cloud computing provides is the potential for Cloud Bursting. Cloud bursting involves an application that is stored locally, or on a private cloud, and runs perfectly under normal circumstances. However, cloud bursting allows this application to ‘burst’ into a public cloud when there is a demand spike, and either the local hardware or private cloud start to struggle with the increased usage. (Rouse, 2011).
This is a cheaper alternative to having to purchase hardware capable of handling the busiest periods of activity, due to cloud computing using the previously mentioned pay-as-you-go payment model.

Many students at the University of Derby have experienced the trauma of attempting to log into University of Derby Online (uDo) to hand in a piece of coursework on the night of a deadline, only to find that uDo is down. Cloud Bursting could make this scenario much less of a common occurrence.

4) Classroom in the Cloud

One of the biggest effects hybrid cloud computing could have on the student experience would be the ability to access all learning materials, anytime, anywhere. Students and lecturers alike would be able to access lectures, collaborate, and share ideas on a never before possible level. In a time where so much of day-to-day life is spent online, this could help to greatly improve students’ attitude towards learning.

IBM, one of the leading IT companies in the world, has also noticed the potential. Their ‘Classroom in the Cloud’ solution utilises the cloud to provide an online, social working and learning environment (IBM Sales and Distribution, 2013). This social environment enables students to learn in an immersive manner that suits their lifestyles, and lecturers to display their lectures and learning materials on a potentially global scale (IBM Sales and Distribution, 2013).

‘Classroom in the Cloud’ has already been tested by IBM at Birmingham Metropolitan College, and student feedback proved to be incredibly positive (IBM Software, 2013). This concept for a new way to learning is only made possible by cloud computing. Hybrid cloud computing would also provide universities with a means of picking and choosing which data would be made public, and which data would be kept private.

II. EVALUATION OF GOVERNANCE ISSUES

A. ISO: 27002:2013

The ISO 27002 framework has been adopted by large and small businesses all around the world. It focuses on information security, and by following its procedures, organisations can increase the security of their assets (British Standard Institute, 2013).

It is because of this focus on information security that it is the perfect framework to use whilst creating the suitable governance for cloud computing. After all, at its most basic level, cloud computing is just another type of IT infrastructure (Gupta et al, 2011). A large number of the risks that cloud computing can provide are based on the security of data, and the devastating effects this can have in terms of compliance. ISO 27002 details the various methods in which an organisation can prepare its staff, systems and suppliers by establishing the proper policies and processes (British Standard Institute, 2013). It even has an entire clause on supplier relationships, and how to maintain information security with these suppliers. This section in particular relates perfectly with some of the governance issues that cloud computing brings.

B. Data Protection and Security in the Cloud

One of the biggest issues with cloud computing is that the physical location of the data could be in a foreign country. As with all types of law, different countries have different laws regarding which types of data are considered personally identifiable information (Vael, 2010). Because of this, their laws on what information needs to be kept private could differ largely from that of the native law for the company using the cloud.

Another problem that needs to be considered is how liable the third party running the public cloud is in the event of lost / stolen data (Stackpole, 2012). There is an illusion that using cloud providers that have PCI-DDS data security are completely secure, and require no attention from the user. However, cloud service providers are only partially responsible for governance, and after that point it lies in the hands of the service user (Stackpole, 2012). It was stated in the ENISA 2009 report on cloud computing that you can “outsource responsibility, but you can’t outsource accountability.” (ENISA, 2009)

Data protection and security needs to be taken seriously when using cloud computing in a University. If it is not, then it could prove problematic for ensuring the security of personal details, and also ensuring the safety of students’ work as it is in transit to the cloud.

C. The Availability of Data within the Cloud

There are a number of potential issues that concern how available data within the cloud is. Firstly, the availability of data within the cloud can conflict quite heavily with compliance. With cloud computing, it is very possible for data to be stored across multiple geographical locations, and this may make it very difficult to retrieve (Vael, 2010).

There are a number of authorities that can demand data from an organisation at any given moment, with very little warning. For any organisation, it is of incredible importance that in these circumstances, all required information can be retrieved to avoid conflict with the law (Vael, 2010). As well as the geographical location of the data being a potential issue, the service provider may cause problems. For example, if the service provider were to suffer from a system failure, then any data they were in possession of would be inaccessible unless it was backed up in another location (Gupta et al, 2011). There are also a number of providers who reserve the right to withhold data from authorities (Vael, 2010).

Another concern would be the effect on disaster recovery. All data stored only on a cloud that is located off-premises would be unavailable in the event of the service provider encountering an error, unless a suitable recovery process was in place. On top of this, there is the chance that the data will never be recovered once the service provider’s systems become operational once more (Ernst & Young, 2011). It is also important to remember that since cloud computing relies on internet access, any internet problems will cause problems with the cloud.

The availability of data in the cloud could cause many problems if cloud computing were implemented badly.
Lecturers and students alike require constant access to many different types of files. Everything from lecture slides, to assignment submissions would be stored on the cloud, and losing access to these files could prove devastating. With many students requiring specialist software that would normally be accessed through the cloud, it could push back deadlines, and complicate the lives of everyone involved.

D. Ownership of Data within the Cloud

As mentioned before, data that is stored in the cloud is generally stored off-campus, potentially even in another continent. For an organisation, storing sensitive data through a third party has obvious risk factors. Because of this, there have been concerns about who actually owns the data, and what the providers of the cloud can do with the data in their possession (Bozdag et al, 2013).

Cloud providers can access data maliciously behind various potential ruses, such as improving security or monitoring performance. There are only so many rules that limit what they can do with this data, and it is possible that they will use or sell crucial data that their clients would have preferred to keep private. (Bozdag et al, 2013)

Another concern stems from the fact that cloud service providers generally sell their services to multiple tenants. This raises questions as to how they keep their different customers’ data separate, and whether or not they are separate enough (Ritchey, 2009). If the answer to either of these questions is no, then you have to question how vulnerable data is in the event of another customers’ data being attacked (Ritchey, 2009). Cloud suppliers that are known to supply to a number of organisations may become a high-value target for hackers, especially if one break-in enables them access to various different clients’ data. (Vael, 2010)

Intellectual property concerns, combined with all the sensitive data Universities keep on their students and lecturers means that data being stolen from a cloud would be very bad news.

III. GOVERNANCE STRATEGY PROPOSAL

A. Initial Planning and Constant Evaluation

The first step to implementing cloud computing is setting up policies and standards.

It is important to remember that cloud computing requires constant evaluation. On top of the initial implementation of proper policies and standards, risks need constant evaluation, and the performance of the cloud needs to be monitored at all times (Hsu, 2012). Following evaluation, new policies and standards must be set up. This allows organisations to keep up with the ever-changing nature of cloud computing, and also provides opportunities to re-assess any business objectives involving an organisation’s use of cloud computing (British Standard Institute, 2013).

B. Data Protection and Security Governance Strategy

By taking the time to research and select an appropriate cloud provider, it may be possible to ask them to ensure that they only store and process your data in certain areas (British Standard Institute, 2013). If the provider agrees, then a contractual commitment can be made so that they ensure that your data is always under certain jurisdictions (Gupta et al, 2011).

There isn’t much that can be done about cloud providers not being liable in the event of lost or stolen data. However, supplier agreements regarding information security requirements for both parties should be established (British Standard Institute, 2013). There are a number of things to consider; including each parties access controls to sensitive data, ensuring that each parties intellectual property rights are met, and ensuring that any policies are also agreed to by any of the cloud suppliers other parties, such as sub-suppliers (British Standard Institute, 2013). All of these policies should be made according to the potential security risks they hold.

C. The Availability of Data Governance Strategy

As cloud computing involves outsourcing entire IT systems, maintaining compliance can be difficult. However, by involving legal and contracts teams it is possible to ensure that the cloud provider’s service addresses your compliance needs. It is possible for a client to set up a ‘Right to Audit’ contract with the cloud provider, which enables the client to maintain its compliance and audit obligations (Cloud Security Alliance, 2009).

Before selecting a cloud service provider, an assessment should be undertaken into their incident management, business continuity, and disaster recovery policies (Cloud Security Alliance, 2009). Documentation on how the provider handles risk assessment should be assessed, as well as their back-up facilities. These assessments will show how reliable a cloud service supplier is in terms of information security, making it easier to plan for the user’s own governance strategies. (Cloud Security Alliance, 2009).

As stated in clause 12.3 of the ISO 27002:2013 document, a backup of sensitive and important data is incredibly important. A backup policy should be in place as part of a disaster recovery plan in the event of lost / stolen data (British Standard Institute, 2013). If an appropriate recovery plan exists for the event of a cloud providers cloud failing, then any damage and downtime would be extremely limited as you wouldn’t be solely reliant on one IT system.

D. Ownership of Data Governance Strategy

The first step towards ensuring that data remains secure, and not tampered with is choosing a trustworthy cloud service supplier. One of many steps required to decide on a supplier is ensuring that data held by the supplier should receive the same, if not better protection than if it was held by the client (Cloud Security Alliance, 2009). It is also important that the particular assets the supplier should and should not have access to are discussed, and then documented as is described in clause 15 of the ISO 27002:2013 document (British Standard Institute 2013). This way, the risk of data being stolen or tampered with is minimised.

One of the best methods of ensuring both the confidentiality and integrity of data in the event of theft is data encryption (Cloud Security Alliance, 2009). Through proper use of
encryption and key management, you can protect not only data already in the cloud, but also data in transit over networks. This is vitally important in cloud computing, particularly when protecting sensitive data such as a person’s credentials. The complexity of the encryption algorithm used should be based on the risk that the data in question holds in the event of it being stolen or tampered with (British Standard Institute, 2013).

The compartmentalisation techniques used by a service cloud provider define how private different tenant’s data are. Clause 13 of the ISO 27002:2013 document states that dividing the network into different network domains is one of the best methods to separate tenant’s data. This can be achieved physically, through the use of different networks, or virtually (British Standard Institute, 2013). Individual firewalls and encryption keys can then be applied to each tenant’s individual section of the cloud (Cloud Security Alliance, 2009).

One way of ensuring that a cloud service provider takes these policies seriously is the negotiation of penalties. A provider is likely to be more compliant with information security processes if they knew that there were penalties for each data breach that occurs in their system (Cloud Security Alliance, 2009).

IV. CONCLUSION

Hybrid cloud computing offers many advantages to Universities, ranging from basic IT functionality to revolutionising the way lessons are taught to students. There are many governance issues involved in cloud computing, partially due to it being a relatively new technology. However, none of the risks are unavoidable, provided the proper governance strategy is put in place.
V. REFERENCES


Building A Smartphone App For Supporting Communities Of Practice Amongst Students

A Governance Strategy Proposal

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Abstract—Communities of Practice are important for any group of people with similar interests who benefit from getting together and sharing ideas and knowledge about common areas of interest. Student communities of practice are vitally important to the learning experience, and this paper investigates some technologies that could be used to help support student communities of practice in the form of a smartphone app, and a governance strategy is proposed for the implementation of the new technology.

Index Terms—Communities of Practice, Cloud Computing, Crowdsourcing, CobiT, ITIL, ISO 27002, Corporate Governance, Information Security.

I. INTRODUCTION AND BENEFITS

A. Introduction

The term Communities of practice can be defined as a community of people/workers who share a common interest, that collaborate and share ideas to provide mutual benefits (Serrat, 2008). In this context, we can think of university students that share similar interests as communities of practice.

Students have always benefited from collaborations with each other, with the sharing of ideas and knowledge as a central part of university experience.

Although student communities of practice have somewhat reached into the online world (Facebook groups for example), it can be argued that the technology that we have in the modern world is not being utilised to its maximum potential.

Communities are still often divided by subject/year, with most collaboration occurring between students that are on the same course, and on the same year of their degrees.

It would be beneficial for students to collaborate and connect with other students from different years, as well as different degrees. For example, there might be an IT student who is interested in a similar topic to a Business student, and both might have much to offer each other in the form of sharing ideas, knowledge, and experience.

As we are now a nation addicted to smartphones (Ofcom, 2011), most of us carry around devices that contain technology such as GPS and 4G that have lots of potential to be utilized in order to help build larger communities of practice.

B. Chosen Technology

The 2012 Gartner Hype Cycle (Gartner, 2012) lists several emerging technologies that provide opportunities for implementing a new student experience.

Of these technologies, both crowdsourcing and cloud computing will be used.

The proposed service will be a smartphone app, provided by the University of Derby that will connect students from different years/degrees that wish to discuss and share ideas about specific subjects. This app will provide a cloud-based and crowd-sourced service, with the users providing the bulk of content (in a similar fashion to Wikipedia).

The following example provides a rough idea of how the app will work:

- A student who wishes to participate will install the app on their smartphone, and login with their student credentials.
- The student will browse and/or create a topic of interest (for example Codd’s Relational Model).
- An online database will manage these requests, and match up students in two different ways:
  - Firstly, students will have the choice to be moved into online communities such as chat rooms and forums, along with other students from the university who are interested in the same topic. This will allow them to discuss ideas and collaborate via the cloud.
  - Secondly, the smartphone app will use GPS technology to send the student an alert if there is another student (with the same interest) within a close geographical proximity (i.e. on the University Campus). This will allow both students to indicate if they are interested in meeting up for a discussion about their mutual interest. If both students give their consent, the app will display the location of the other student, allowing them to meet up.
C. Proposed Benefits

Whilst students already benefit from collaborating with one another, the use of ICT can be greatly beneficial with arranging F2F (face-to-face) meetings among individuals (Yin and Shaw, 2011).

Both face-to-face and online collaborations between students with overlapping interests will be beneficial to students by building bigger and more accessible communities of practice.

1) Sustainability

The definition of sustainability of an organisation is usually polarized in two different directions - one applying to the green agenda, and the other applying to the long-term prospects for an organisation (Self, Self and Chang, 2012). In the context of the second definition, the smartphone app will help to improve the sustainability of the University of Derby by supporting students in achieving better grades.

D. Potential Issues

Whilst the smartphone app may have obvious benefits, there are potential issues that are related to providing students with this type of service.

Firstly, the app encourages students to meet up with each other, meaning it is essential to consider all perspectives with regards to security implications.

Secondly, if the app is providing a service that is used as a learning tool, it is essential to ensure that it is delivered to a satisfactory standard, meaning that various sustainability and usability aspects need to be considered.

The confidentiality of student details may also be a security consideration.

II. EVALUATION OF GOVERNANCE ISSUES

A. Corporate and Information Governance

Governance failures can ultimately lead to the destruction of organisational value (Self, Self and Chang, 2012), meaning that it is essential to develop a decent governance strategy proposal for the implementation of any new technology.

To begin with, two examples of governance failures are investigated, and then potential governance issues for the new technology are identified.

1) Governance Failures

An example of a recent Information Governance failure is the 2012 BlackBerry Server outage, which left customers across Europe with no access to email. This outage, according to PC Pro (2012), was a repeat of an earlier incident the previous year, and that the resulting effect was that many customers were deciding to move to alternative providers.

The stakeholders affected in this issue are arguably incalculable; who knows what damage may have been caused to customers who rely upon their devices for crucial business communications, and what effect this could have had on the confidence of the public.

The failure contradicted several key Information Governance principles, including ISO 27002 s0.3 (British Standard Institute, 2005), which states the need for an organization to legally maintain and satisfy its contractual requirements. This example is relevant because it is a mobile consumer service that customer could rely on for work related communications, much like the proposed communities of practice smartphone app.

B. Choosing a Governance Framework

The previous governance failure example helps with understanding the importance of building and maintaining an effective and comprehensive governance strategy.

A suitable governance framework will help to identify the key risks, ethics, and compliance considerations.

Three different governance frameworks will be considered:

1) CobiT

CobiT, published by the ITGI, is a very comprehensive and detailed framework that covers a wide range of generic high-level perspectives that can be used as a framework for pretty much any organisation (OGC & ITGI, 2008). In summary, CobiT is a generic framework of what should be done from a high level perspective.

2) ITIL

ITIL, developed by the UK government, provides a framework for the best IT practices from an IT services management perspective (OGC & ITGI, 2008). ITIL focuses on two main areas - support and delivery. Whilst the ITIL framework might not be as generic, or high-level as CobiT, it is useful because it is more concerned with how the best IT practices can be achieved, and takes a less generic approach.

3) ISO 27002: 2005

The ISO 27002 standard (derived from the earlier BS 7799) provides a framework for what should be done, but takes a lower-level approach than CobiT. The standard consists of many rules and guidelines for best-practice that can be finely tuned to fit in with the needs of an organisation (OGC & ITGI, 2008).

4) Framework Conclusions

The three frameworks that have been investigated all provide a unique approach to building a governance strategy. Whilst it is perfectly acceptable to focus on a single framework, it is often beneficial to synthesise all three, with CobiT providing a high level framework that can be mapped to the service delivery aspects of ITIL, and the information security aspects of ISO 27002 (OGC & ITGI, 2008).

For this reason, all three frameworks will be used, and different aspects of ISO 27002 and ITIL will be mapped to the CobiT framework.

For the purpose of this report, not all governance elements can be considered, and therefore we will focus only on key issues with regards to risks, and ethics found in ISO 27002.

C. Risks, Ethics, and Compliance

The Kay interim review (Department for Business, Innovation and Skills, 2011) describes the importance for directors to consider the ethical aspects described in the Companies Act (2006) in order to act in the interests of the company as a whole. These include long term consequences, community impacts, company reputation, and fair conduct. For this reason it is essential to consider the ethical issues with regards to implementing the new technology.
1) Security

Section 09.1 - 09.6 of the CobiT 4.1 Framework deals with risk related governance issues. However, these can be mapped to ISO 27002, which provides the best supporting detail with regards to IT risks (OGC & ITGI, 2008).

The primary risk that the new technology may pose is the security of students, as the process of matching up students who are to meet in person (potentially strangers) requires certain safety considerations, including the verification of users.

There may also be potential issues with regards to online bullying, or what is now commonly known as “trolling” (BBC, 2011), as students will be communicating via chat and forums.

ISO 27002 p14.1.1 (British Standard Institute, 2005) provides a description of key information security processes from a business management perspective, the most relevant of which are:

- Ensuring the safety of personnel
- Predicting the impact of security incidents
- Implementing preventative and mitigating controls
- The final governance strategy proposal will be required to consider these key security elements.

2) Confidentiality

Another serious ethical concern with regards to the new technology is confidentiality. Governance failures such as the recent Sony customer accounts leak have had disastrous consequences, with millions of personal accounts being leaked (Tech Media Network, 2013).

ISO 27002 (0.3), describes the importance for following a set of principles, objectives and business requirements for information handling, processing, and storing in order to support its operations.

The governance strategy proposal will be required to consider the long-term confidentiality of student details.

III. GOVERNANCE STRATEGY PROPOSAL

A. Key Governance Requirements

The previous section identified the key governance considerations as follows:

- Security considerations for face-to-face meetings
- Protection against online “trolling”
- Confidentiality of student details

These three governance perspectives all deal with security. As individuals we balance this trade off all of the time in our day-to-day lives (Schneier, 2008).

The five major risks with regards to this security trade-off according to Schneier (2008) are the severity of the risk, the probability of the risk, the magnitude of the costs, the effectiveness of countermeasures, and how well risks and costs can be compared. The following section provides a guideline for the implementation whilst considering the balance between resources and risks, as described by Schneier.

B. Governance Strategy

1) Face-to-face meetings

The app allows for students to meet other students for face-to-face meetings. Because of this, it is essential to consider the two following aspects taken from ISO 27002 (14.1.1):

- Ensuring the safety of personnel
- Implementing preventative and mitigating controls
- In order to fulfil these requirements, it is recommended that the following steps are taken for the implementation of the new technology:
  - Students must be verified in order to arrange meetings.
    - I. Users must login with their student credentials before they can use the app
    - II. Students must use their phone to scan their student card before arranging meetings
  - III. Meetings can only occur on and around the university campus
- A record of all meetings will be logged on the server.
  - This will allow for an investigation into any reported incident that may occur.

These steps will ensure that non-students cannot use the system, and that all meetings occur within the safety of the university campus.

2) Online “Trolling”

In order to safeguard against incidents involving bullying or online “trolling”, there are two steps that should be taken:

- Users must login with their student credentials before they can use the app
- Users cannot appear as anonymous
- The app will have an incident reporting system
- There will be a moderator for the online/chat forums

Along with these considerations, the option of using a social media control management tool such as SMC4 would ensure that the inward and outward flow of social media communications follow the specified regulatory requirements of the organisation (Knowledge Capture, 2013).

These steps will help to prevent online bullying/trolling situations from occurring, and provide the student with support in any unfortunate incidents.

3) Student Confidentiality

As the app will require students to both login, and scan their personal ID cards, it is essential that these details remain confidential, and are kept secure.

This is important according to ISO 27002 (0.3), which describes the importance of following a set of principles and objectives for information handling.

In order to safeguard student details, the following steps should be taken:

- No sensitive confidential information will be displayed to others via the app
- The app login and verification system will connect to the university servers online, and the app itself will not store any personal details
The app must use a secure and encrypted login system to connect to the cloud.

IV. CONCLUSION

A new smartphone app has been proposed that will use crowdsourcing and cloud technology to help students at the University of Derby build bigger and more accessible communities of practice.

The CobiT framework will be mapped to the service delivery aspects of ITIL, and the information security aspects of ISO 27002. This will then be used to build a comprehensive governance framework for the implementation of the new technology.

ISO 27002 has been used to identify the main governance considerations, which includes both the security of students, and the confidentiality of student details.

ISO 27002 has helped to create a list of governance steps that need to be taken in order to ensure that these considerations are dealt with in the best possible way.
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Abstract—Laptops and tablets are common devices used in lectures by students and becoming more popular than the traditional paper and pen to take notes. With the poor battery performance of most laptops after the first 18 months of use, by the time students reach their 3rd year they are not be able to go through a whole lecture with one full charge of battery. This paper discusses the sustainability of bringing wireless power to a British university and the Governance Strategy to developing wireless power into universities.

Index Terms—wireless power, university, students, governance strategy, technology.

I. INTRODUCTION AND BENEFITS

Electrical power is used to charge electronic devices i.e. laptops, tablets and mobile phones. We are now entering wireless generation in technology, from wireless Internet for your computer to even a wireless kettle (Gonzalez, 2013).

New and different technologies are being tested and used to bring wireless power to personal devices i.e. smartphones. This paper will talk about the different wireless power technologies and how they can be implemented in a British university using Governance Strategy.

Though wireless power is an emerging technology it is not a brand new theory. In fact, Oral B has been using wireless power for their electric toothbrushes since the early 1990’s.

A. Types of Wireless Power

Wireless power is the exchange of energy without the need of physical connections (Goodman et al., 2013). Before 2009 there were three main methods of energy transfer; conduction, induction and radiation. In 2009 Magnetic Resonant Coupling (MRC) was introduced (Schwannecke, 2009) and it was set to be the answer to mainstream use of wireless power, but then in 2013, a new technology (that has yet to be named) emerged. This technology brought results (at least) 3 times better than the MRC results (Schreier, 2011).

1) Conduction
Conduction works by transmitting a current through wiring made of copper or aluminium (as they are highly conductive) and that current converts into power.

2) Induction
Induction is the most common method for energy transfer in the current market. It uses electronic waves to create a field to power devices in close proximity. This technology is used in wireless electric toothbrushes and more importantly by Samsung, using a pad as the primary source and with the phone sat directly on top of the pad, it transfers energy wirelessly. Power pads are a good way to wirelessly charge your devices as it “can send large amounts of power” but unfortunately only “over very small distances, often not more than a few centimetres” (Sutter, 2009).

Though the induction method has provided devices like Android smartphones a product that can charge their phones wireless, the flaw is that the device has to be close to Inductive Charging Kit (Plessis, 2013), having the phone even as far as 4cm away from the charging device will stop the smartphone to charge.

3) Radiation
The radiation method retrieves wireless power from picking up both electrical and magnetic fields. Get more info.

4) Magnetic Resonant Coupling
Magnetic resonant coupling (MRC) was the technology that people believed would be the solution to wireless power in everyday life.

MRC works by having a primary coil that creates waves making magnetic fields, it then induces a voltage to a secondary coil, which gives the device with the secondary coil power, which charges the device (Cannon et al., 2009). The beauty of MRC is that multiple devices can be wireless charged at the same time from the same source as long as they both have a receiver (Cannon et al., 2009).

The negatives of MRC are the results it produces. Tests carried out in 2006 showed that if the receiver is placed directly on the transmitter, it will supply a power of 1.68V. If the transmitter was only 17cm away, the receiver will pick up only 0.57V (Cannon et al., 2009).

5) Using Metamaterials
A brand new technology for wireless power was discovered and tested on the 11th Nov 2013. The concept uses metamaterials to capture many different lost wave elements (i.e. Wi-Fi, satellite, sound and even mobile phone signal) and use these waves to power devices.

When tested, the results were outstanding compared to MRC (which was the closest competitor). The metamaterial was able to convert the lost signals into 7V of power. To put that into perspective, a device charged by USB from a laptop only gets 5V (Hawkes, Katko and Cummer, 2013).
B. Benefits of Wireless Power

Once fully developed, wirelessly charging and powering your devices will have countless benefits to everyday life. With the ever-decreasing battery length of smartphones and the appalling battery life of laptops after 6 months of use (Pegroraro, 2012), wireless power means:

- People can no longer forget to charge their phones overnight
- Devices are no longer plugged into the wall causing accidents from people tripping over laptop cords (Lozowick, 2013)
- You can go all day without having to move because your device is running out of battery and you’re not located by a wall plug socket

If the metamaterial method for wireless technology does develop and become the main method of powering devices then there would be no additional cost to the organisations implementing the feature. Though the users will need to purchase a device with metamaterial built into it (WIMAR, 2013). This is the technology that will be referred to in the rest of this report.

C. Wireless Power on Student Experience

When a laptop is first bought, the battery on average lasts up to 6 hours (HP), but within the first six months of use your batteries time span start to be seriously reduced and by 18-24 months Dell recommends purchasing a new battery because of the very noticeable reduction in run time (Dell). Most university courses are at least 3 years so this means the average student would have to purchase an additional battery for their new laptop at least once during their course.

Wireless power will give students constant power during lectures so they will never miss out on note taking.

II. EVALUATION OF GOVERNANCE ISSUES

This chapter will discuss the corporate governance impact on wireless technology being developed in a university, including the governance issues and the governance frameworks that should be used to overcome these issues.

A. Sustainable Information and Corporate Governance

In any organization, when developing and implementing a new system of any kind, the current structure needs to be maintained as it is and the new system will only improve the organisations infrastructure, this is known as sustainability.

An organisations set of systems, principles and processes are known as corporate governance. Governance is the guideline companies must abide by strictly to ensure that the company is directed in a way that will reach all of their goals, while adding value to the company which in turn benefits all the stakeholders. A stakeholder is anyone from a manager, to an employee, an investor or a customer (Thomason, 2009). Corporate governance in universities is no different, the guidelines discuss university policies, budgets, etc. (AAUP, 1966).

B. Impact of Wireless Power in A University

Having wireless power using this metamaterials will be very sustainable for a university to implement as the technology uses wave signals that are already in the university, whether it be Wi-Fi waves or signal from mobile phone towers which means as long as the student has phone signal, they will also have power to charge their phone (Hawkes, Katko and Cummer, 2013).

As mentioned before, this technology is very new, having only been tested a month ago so the reliability of using metamaterials and the health risks are still unknown.

C. Governance Issues

To implement new technologies into a university a governance strategy must be implemented. A governance strategy is created around set governance frameworks. A company must select the aspects of different frameworks that will work best for their organisation. The governance issues must be identified for developing wireless power into a university.

1) Sustainability

Using metamaterial for wireless power means the university will be able to keep their current infrastructure in place as the technology only uses waves already in the area but the university will need to ensure that there are waves in all areas in the university and accommodate Wi-Fi or other waves in areas where the waves are minimal so students can power up anywhere wirelessly.

2) Risks

As with all wireless technologies, there are health concerns. Being exposed to all types of waves that are being collected by the metamaterials in your devices will cause concern to some students. As this technology is still brand new, tests for health impacts have still not been undertaken so students will be hesitant to use the technology (Biaggi, Gaddy and Lu, date unknown).

The fact that the metamaterial only connects waves that are already in the area and does not create new waves would suggest though that the students are not being exposed to any more short or long term health risks than they already are, but some may worry as all these waves are collected to one device.

3) Ethics

Ethics is another reason why MRC would not be feasible in a university environment. Apart from the poor results MRC give, it will also be a big problem if a university was to implement the technology (Cannon et al., 2009). The reason for this is, there are ethical concerns with students being exposed to the magnetic fields it creates. Currently there have been no short-term health risks found, but long-term health risks have still not been tested for yet. This may be a concern to all stakeholders, especially if a health risk is found after implementation.

4) Compliance

If using devices with metamaterials built into them is imposed on to students, there will therefore be students that will be excluded from the new technology because they may not
own the correct device. This is a compliance issue and is a concern if a university is trying to improve student life but excludes students that cannot afford the latest technology (Hawkes, Katko and Cummer, 2013).

Another aspect of compliance issues is if there was a student concerned about the health risks of metamaterial devices harvesting all the waves in the room, of course they will not own the device themself but the student next to them may do and the student would not know about it. The concerned student would have to speak to his peers in the room and ask if they do use this technology so he can move away from them.

From identifying the governance issues, ITIL and ISO 17799 have the best practices and would be the ideal frameworks when developing wireless power to a university.

III. GOVERNANCE STRATEGY PROPOSAL

When undergoing developments, companies ensure that all operating elements work in sync to one and other. This is known as Strategic Alignment. This alignment then goes through a management process called Strategic Governance (Kvavik, 2004). Using both strategic alignment and strategic governance is an organised way of developing a company’s new ideas while minimizing the risks.

Most corporations are in an ever-evolving industry that is technology driven and to stay ahead of the competitors an organisation has to become dynamic and upgrade their systems and technology too (Deloitte, 2012). When implementing a new system in a company or even just running a company, there are many questions that need to be answered to allow the company to move forward successfully and achieve their goals like:

- What are the legal requirements?
- How to plan a new development?
- How to minimize risks

The answers to these questions (and many more) are then put together and become a set of rules for best practices in the organisation. Best practices are defined by a set of governing frameworks (itSMF, 2005).

It is essential that all employees in the organisation knows the set of best practices because if only the managers knew what they were all the work the technical employees do will be unstructured and therefor vulnerable to risks. If only the employees knew the set of best practices, the work would get done but the projects potentially will not get done with the main business focus. To get the best set of practices every stakeholder of the company needs to work together to create them and implement them, including the customers, as this will give the company the edge of what their customers really want (itSMF, 2005).

There are many different types of frameworks to choose from that can be used to make a set of best practices. The best company strategies do not just use all of one framework but instead uses the best parts of different frameworks to create a tailored set of best practices for the organisation.

To develop wireless power into a university the frameworks a university should be using are ISO 17799 and ITIL. These work well together because ISO 17799 defines what should be done when developing and maintaining an IT system and ITIL provides the best practices of how it can be done from a service management aspect.

A. ISO 17799

ISO 17799 has been built from the BS 7799 framework to provide a standard for implementing information security management. It is used as the basis for security standards and management practices for an organisation. The best set of practices from ISO 17799 that will be used to implement wireless power in a university is problem escalation and business continuity management (British Standard Institute, 2005).

1) Problem Escalation

When a problem occurs there is a set hierarchy in which the right people need to be notified about the issue depending on their position and the size of the problem. In a university if a student wants wireless power they may encounter issues to do with the lack of waves in a certain area. If for example there is no Wi-Fi or mobile phone waves in certain area of the library, the student should inform the technical team who should then inform their managers and so on until the manager that can assign Wi-Fi to areas is notified.

2) Business Continuity Management

Business continuity management is to resolve interruptions in business activities and to minimalise business risks to stop major failures or disasters.

In universities, continuity management already exist for when the Wi-Fi goes down. So to implement wireless power, the continuity management is the same as the already set practices within the organisation. Fortunately, metamaterial can also pick up other waves like phone signals and sound waves so even if the Wi-Fi does go down, wireless power will continue to work.

B. ITIL

ITIL service management is a set of practices used to define the business processes of an organisation. The framework is customer focused and includes delivering and supporting IT services that are best suited to the business requirements. The framework splits into two; service support and service delivery (Cartlidge et al, 2007).

1) Service Support

Service support is the support of an organisations’ IT. It includes incident management, problem management and service desk function. These practices are vital for universities when implementing wireless technology in the universities. If an accident or a problem did occur when a student is using the new technology, then the set best practices are vital to knowing how to deal with the issues. Service Desk is an important function that gives all users of IT a central point of contact. Service desks logs, manages and resolves all incidents using service requests (Cartlidge et al, 2007). It allows issues to be managed and resolved in a fast and organised manner.

2) Service Delivery

Service delivery is the delivery of the organisations technology, whether it is new technology of just an upgrade.
Financial Management for IT services and Service Level Management are the key practices needed for developing wireless power into universities. Financial Management takes budgeting, financial accounts and charging requirements into consideration. As the metamaterial power is the technology best to wirelessly power devices, financial management will not have to worry too much about their budget, as the students will have the technology on their personal devices and they only need the waves already in the air from the university. Service Level Management agrees on and documents the IT service targets of the company, then tracks the progress and produces reports on the delivery against the agreed level of service (Cartlidge et al, 2007). A university implementing wireless power would need Service Level Management to ensure that all students are receiving the right amount of power through out the whole university.

The issue with using set frameworks is that the practices does not work in every solution.

IV. CONCLUSION

In summary, wireless power is still in a very early development stage, technicians have had a major break through last month with using metamaterials. When developing a wireless power system in a university I highly recommend using an ITIL framework with Service Support, this is because a Service Desk is a great way for students to report issues and for IT to efficiently organise and quickly resolve them. The technology is installed in the personal devices of students but there may still be ethical issues with using wireless power, as tests of long-term health risks have not yet been completed.
V. REFERENCES


Speech Recognition In The University Of Derby
A Study Into Its Effect And Benefits On The Student Experience, Governance Issues And A Governance Strategy Proposal.

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Abstract—This report analyses and evaluates the effect that Speech Recognition technology would have on the student experience within the University of Derby. It covers various advantages, the various risks it poses and a governance strategy to overcome these potential threats when implemented.

Index Terms—Speech Recognition, Governance Issues, University, Education, Student Experience.

I. INTRODUCTION

Speech recognition is a technology which has been researched into and improved over many years. It has been utilized in many modern computing situations to create solutions to various problems, usually involving communication, and control of IT equipment. More recently it has become much more mainstream, being implemented on many devices that most people use every day, such as smart phones and tablets. The most notable example of this is the speech recognition software implemented into the Apple IPhone, Siri. (Magid, 2013)

The utilization of speech recognition brings with it various benefits, such as making devices hands free. However, the implementation of speech recognition is one that requires much planning and research, as if not used and implemented appropriately it can bring various negative effects and spark various issues, such as data loss, accuracy and copyright laws.

A. Understanding Speech Recognition

Speech recognition is the ability of a machine, or software on a machine, to identify words and phrases in a spoken language, and convert them to a machine-readable format. (Rouse, 2013) This information can then be used and interpreted in various ways, such as controlling the computer, opening programs, moving the mouse, word processing and varying other tasks. For example, IBM created a command and control application, which when given a spoken command by a person, it would then convert the spoken words into computer commands, which the computer will then attempt to complete. (Kemble, 2013)

B. Effects and Benefits to the Student Experience

1) Students with Hearing Impairments

Currently in the University of Derby, if a student has a hearing impairment they are assigned a sign language interpreter who will accompany that student to lectures. This is to make sure that the student is getting a full understanding of what is happening and being said, so that they are not losing out on any information that they otherwise receive from the lecture. This method of teaching is not entirely efficient. If there is only 1 hearing impaired student in a lecture, the interpreter must be present. Considering that the average sign language interpreter has a salary of £20,000 – £35,000 a year, and the university is employing several of these interpreters, this is costing the University of Derby a huge amount of money. (National Career Service, 2013)

Speech recognition is an extremely useful technology that could be utilized to help hearing impaired students within lectures. In order to do this, a microphone will be placed in every lecture hall and room, which is used to record the lecturer’s voice. This will be input into a computer, which will automatically convert the lecturer’s voice to text using speech recognition software. The text will then be input into a document that can be viewed in real time as it is being created, using features similar to Google Docs. (Google, 2013) This document will be hosted on the university servers, and will be available through the University of Derby Online (UDO) blackboard system. Using their own device, or one borrowed from the university, students will then be able to access this document whilst in the lecture, allowing for the student to have a live feed of what is being said.

The implementation of this technology in this situation would affect the student experience in various ways. It will help students who suffer from hearing impairment to fully partake in lectures. This in turn benefits the student, as they are able to fully partake in lectures. However, the students aren’t the only people who will benefit. Seeing as the implementation of this technology negates the need for sign language interpreters, it will in turn save the university stakeholders a huge amount of money within their budget.

2) Students with Dyslexia/Dyspraxia

In order to further aid students, speech recognition software could also be installed into the computers which are located all around the university campus. Microphones would be available at IT helpdesks, which students will then be able to use in order to produce their work by using a word processing program such as Microsoft Word. Although a large amount of students wouldn’t need to use this, it would be extremely helpful for any
disabled students who find it difficult to either write, type or spell. This is extremely notable in students with dyslexia, where it will help to make sure words are correctly spelled, their work ethic isn’t diminished by having to worry about spelling, and removing the need to write or type (Ability Net, 2012).

This would benefit these students greatly, as it would allow them to stay and complete work within the university. This is a much better situation for various students, as they will no longer have to struggle with typing or writing, as the software will do it for them. It also benefits students who normally use their specialist equipment at home, as they now will be able to work within the university like most students, so they will have access to all of the extra resources and teachers that the university has to offer.

3) Creating New Resources

Linking back to the hearing impairments situation, the live feed which is streamed to the student’s device will be saved onto UDO. This document will not only be able to be accessed live, but will be archived for later use. This creates a whole new abundance of resources, which will affect the student experience by expanding the amount of material that they have access to. The material itself will be extremely useful, as it will be a word for word recollection of everything the lecturer went through on the day. The resources will allow the students to revise, reference and take notes on material that has been previously covered.

II. EVALUATION OF GOVERNANCE ISSUES

A. ISO 27002:2013

ISO 27002:2013 has established guidelines and general principles for security management within an organization. Information security is extremely important in establishments such as universities. The implementation of speech recognition involves new smart devices and other technology being utilized, as well as the use of the university servers for storing, updating and accessing various pieces of data. Considering that live recordings are going to be taking place within the university, intellectual property rights and various other problems may arise. Taking these factors into consideration, ISO 27002 is the perfect choice for a framework to base its governance upon (British Standard Institute, 2013).

B. Breaching Intellectual Property Rights

While most lecturers and staff at universities think the idea of recording lectures is a great idea and brings many advantages, some have previously brought up the issue concerning their intellectual copyright being breached. Seeing as the entire transcript of the lectures will be recorded and stored, some lecturers feel this may help students to plagiarize the lecturer’s material or ideas easily. (Skill.org.uk, 2007)

Following on from the previous point about lecturers not wanting their lectures recorded, recording and storing the data allows for the possibility of extensive monitoring. This monitoring could be done by the university itself, or by a third party who could gain unauthorized access by means of hacking. Although this isn’t the main reason for implementing the technology, this is something that it could potentially be used for. For example, lecturers could be monitored on their performance through the use of the data collected. This could bring up various ethical problems, with many lecturers and possibly students not wanting to be monitored.

C. Loss of Data

The files that are created from speech recognition within the lectures will be stored on the university servers. Seeing as the data will be stored in the university and accessible by students and lecturers, there is a potential risk of loss of data. These risks include theft, loss, neglect and human error. A recent report showed that universities have been a prime target for hackers in recent years, showing that over 478,000 records in United States universities were breached by hackers. (Information and Technology Services – University of Michigan, 2013) Although this is taken from the US, the problem is still at hand that universities are targeted, mainly for their sensitive information. If proper precautions are not put into place, loss of data could potentially be devastating to the university.

D. Unauthorized Access to files

Being able to access the streams/files online brings about another risk. If you are able to simply go online and find these transcripts of what has been said in lectures, there is a possibility that unauthorized users could gain access to the data stored on the servers. (Computer Hope, 2013) This would breach the intellectual property rights of the lecturer and the university, and would be a significant loss and breach of privacy.

E. Assets stolen, lost or broken

In order to do work on their own, students will have access to microphones that can be used with the computers available within the labs and library. There is a potential risk of these microphones being damaged, stolen or lost. This situation is also relevant to the hearing impaired students having to loan devices if they do not own a smart device themselves. This is especially relevant if there is no sort of protection put in place, which would make these assets a very high risk. The city of Derby has moderately high crime rate, being in the top 15 in Wales and England (discounting London) (thecompleteuniversityguide.co.uk, 2013). Taking this into consideration, security is a major risk that needs to be addressed.

F. Mobile Devices

Seeing as some student with hearing impediments or other disabilities do not have access to their own smart device, the university could loan out one temporarily for use in lectures. This however could cause problems. Smart devices have various ways of being compromised, such as getting infected by malware, physical damage, theft and people gaining unauthorized access. A report showed that 64% of surveyed organizations saw a rise in security threats, and over 70% of these blamed it on mobile devices. (Dimensional Research, 2012) If these security risks aren’t taken into consideration, it
could compromise the mobile devices, and all data that they have accessed.

G. Heavy Accents

Speech recognition in modern times has improved drastically. However, one of the major issues and most difficult tasks for speech recognition software to complete is the recognition of those with a heavy or foreign accent. (wiseGEEK, 2013) If the speech recognition program cannot understand the user’s accent properly, this has the potential to make the whole lectures transcript very inaccurate and unusable. Considering that a large amount of the University of Derby’s staff do not originate from the UK, foreign accents is a problem that would need to be resolved efficiently as if this problem is not addressed, it could potentially make a large amount of the resources created obsolete.

III. GOVERNANCE PROPOSAL

A. Planning and Monitoring

Before speech recognition is implemented into the university, the first step that must be taken is to outline various standards, guidelines and policies which this new technology will follow. Speech recognition will take a large amount of planning in order to comply with various guidelines which are outlined in ISO 27002. Most of the risks that have been outlined can either be severely reduced, or even completely negated if the correct policies are put into place and followed accordingly.

This however is not a task that only has to be completed once. Constant re-evaluation and feedback will be required by the university in order to keep the system up to date and secure.

B. Extensive Guidance and Information

By creating literature and informing lecturers and students on the reasoning of implementation of speech recognition, they would be much less likely to have a problem with being recorded. ISO 27002 recommends that organisations should maintain proof and evidence of ownership of documents. Intellectual property rights will be noted on every piece of data that has been recorded, so that both the students and lecturers know who owns the work produced. (British Standard Institute, 2013)

Literature that will be given out will also include the purpose of the speech recognition, and state that it will only be used for these tasks. This will put to rest any problems involving the idea of extensive monitoring. (Skill.org.uk, 2007)

C. Protection from Data Loss

In order to protect stored data from being damaged, lost or stolen, various policies surrounding this subject should be put into place. Regular backups of all of the data stored should be made, in order to guarantee that even if the main storage is somehow compromised, the data will still be available from other sources. ISO 27002, 12.3.1 states that these backups should be stored in a remote location, a sufficient distance from the main servers, and should be given an appropriate level of protection from external factors (such as dropping, damp etc). Backups should be taken frequently in order to reduce the impact of any disturbance to the main information storage. As well as backing up the information, storing it on secure hardware is a must. Constant updates and monitoring should be done on servers in order to make sure that the information stays as secure as possible, using anti-virus and intrusion detection systems as appropriate, as suggested in ISO 27002, section 12.4.1. (British Standard Institute, 2013)

D. Protecting Against Unauthorized Access

Unauthorized access brings with it various issues surround both security and copyright. In order to combat this, user access management policies outlined in section 9.2 should be used in order for students to be able to login, and only be able to access lecture transcripts that they are supposed to. Most universities have these sorts of security measures in place, such as the UDO system. In order to make sure that files are only accessible for certain users, precautions must be taken on where the files are accessible from. Section 9.2.2 of ISO 27002, user access provisioning states that authorization should be given to all students who are on the register for each lecture, so they will be able to access the online resources applicable, whilst all other users will be denied access.

E. Safety Measures for Devices

If proper procedures and strict policies aren’t put into place, the theft or loss of the universities equipment could potentially be a huge risk, costing a large amount of money. As recommended in 8.1.1 of ISO 27002, in order to reduce the risk of loss of these items, an inventory of assets should be implemented in order to track who currently has a piece of equipment booked out, and how long they have it booked out for. The whereabouts of each item should also be discussed, whether the student wishes to book it out to take home, or only to use within the university. (British Standard Institute, 2013) Each item should be classified and protected appropriately, in secure, locked areas within the university. When an item is loaned from the university, it should be documented appropriately, and the user should be given guidelines and information on how these assets are to be used.

F. Appropriate Smart Device Usage

With the ever increasing amount of risks such as malware and viruses involved with using smart devices, policies must be put into place in order to protect them. This will involve registration of the smart devices, and adding them to the university inventory, as recommended in 8.1.1 of ISO 27002. As explained in section 6.2.1 of ISO 27002, smart devices should have restrictions on software installation and what they are able to access. (British Standard Institute, 2013) This is extremely important as to not make them susceptible to any unnecessary ways in which external malicious parties could access or damage the devices, through means such as malware and viruses. The smart devices should also be constantly updated and kept secure with any patches which are released. The safety of the data also needs to be taken into consideration in case any problems occur. In order to comply with this, backups should be made regularly of any information stored on the devices, in order to keep the information secure. Software
and data is not the only thing that needs to be protected on smart devices, physical damage is extremely common. In order to combat this, appropriate physical protection will be provided in the form of cases and holders to reduce any potential damage caused to the devices.

**G. Training with Speech Recognition Software**

A problem which occurs with speech recognition software is the misuse and misunderstanding of how it works. Staff should have sessions in which they are trained with the speech recognition software. These sessions will be extremely useful, as a lot of modern speech recognition software allows the software to learn and develop itself to understand a user’s accent over time (Information and Technology Services – University of Michigan, 2013) Prior to employment, staff should be notified that this training will need to be taken, as noted in 7.1 of ISO 27002, they will need to know what skills they are required to learn and develop (British Standard Institute, 2013)

**IV. CONCLUSION**

Implementing and utilizing speech recognition would create a variety of benefits, improving the student experience for a large amount of people. Taking the risks and problems into consideration, the implementation of speech recognition is certainly viable as long as the appropriate procedures and policies are created and followed accordingly.
V. REFERENCES


Biometrics Authentication Within A University Environment

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Abstract— this paper will discuss if biometrics authentication methods when implemented at a University campus will increase productivity. Biometrics is used as a form of identity and access control. Around the university there are many different applications that have to be accessed by authorized personnel such as the library, computers and access to into the university. Factors that will be taken into account are the advantages of these methods and the disadvantages. The governance issues shall be looked at if they can be solved and what frameworks the university will use in order for these issues to be solved.

Index Terms—Biometrics, Information, Security, ITIL, ISO

I. INTRODUCTION

Biometrics according (Jain & Ross 2007) is the science of establishing an identity of an individual based on the physical or behavioral attributes of a person. Robb (2006) states that, the worldwide market for biometric devices grew 67 percent last year to reach $1.2 billion, analysts estimate further expansions to $4.6 billion by 2008. These are many different methods of biometric authentication which can be used that consist of around 12 different technologies. The most common biometrics authentication methods that are used involve using finger prints, face, palm and iris. Each of these is being used differently and in different places as each method does have its weak and strong points. The most commonly used physical attribute is the human finger print. In a test conducted by (Jain, Ross and Prabhakar, 2004) the way it works is that a fingerprint sensor captures an image of the ridge and the structure of the finger. The next method that is used is the iris the way this works is that a scanner scans the pupil and that will then will enable the system to recognize if the person is who they say they are. Behind the finger print and the iris is the palm print. They have also stated that human hands contain pattern of ridges and valleys much like the finger print but the human palm contains additional distinctive features such as principle lines (p.17). The last one that will be discussed is face recognition Jain, Hong & Kulkarni (1998) say that face recognition works by finding the similarity between the located face and the stored template. These are the main four biometric authentication systems will be discussed. Considering this will be implemented in the University of Derby there are aspects such as stakeholders. The different biometric authentication systems need to be of value to University of Derby as a result, how they will be a benefit to the students also on what additional uses they can bring will have to be evaluated.

II. BENEFITS OF BIOMETRICS

Although biometrics has been around for many years and with so many different methods even today it is becoming being implemented on the latest technologies such as smartphones. A study conducted Vrankulj (2013) has come to the result that by 2018 it is estimated that almost-unbelievable 3.4 billion users will have biometric features on their mobile devices.

Throughout the University campus we have many different sections where biometrics could be implemented. Biometrics is now a becoming an authentication method in many different places such as airports, banks and in big organizational headquarters. In the university of derby has many different aspects where biometrics could be implemented such as the library, currently the system involved is authentication by a user’s card. The student enters the library by scanning their card and also to rent books. This can be replaced by having a fingerprint scanner. This will benefit the students in various ways such as by placing the finger in the scanner to enter and the same process to rent a book. This will help the student and the library as it will stop large queues from developing as the process will be much faster. It will also help a student because they could be in a situation where they have forgot their card so they cannot take books, this way they always have a method to identify themselves ensuring that they can progress with their studies. According to Ratha, Connell & Bolle (2011) fingerprint scanning can provide a much more reliable and accurate authentication methods. This also stops is unauthorized use of lost, stolen or "borrowed" ID cards.

Biometrics is also not limited to just to use for conformation of identification it can also be used for making payments. O’Keefe (2013) states that biometrics can make payments a whole lot easier, more reliable, secure and beneficial than legacy payment alternatives. At the University Of Derby there are many different shops who have large amount of queues every day and sometimes students either cannot wait for long or they forget their money having a fingerprint scanner their will benefit the student because they can each time top their account from their credit or debit card.
and then can use the new system as a means of paying for items which could result in the university generating more profits.

The university of Derby attendance monitoring system is, a student will enter their lecture where then the lecturer will scan their card. Implementing a facial recognition system in each room will benefit the university lectures because they then will not have to go around scanning each individual student’s card which will save time since the new system will recognize who has entered the room and they will be automatically be marked as present. This will help the students also because their card is no longer required in order for their attendance to be logged.

Biometrics authentications has many different advantages to it because it can be used for many different parts of the university such as verification of identity which can be for taking a book out or even by monitoring attendance. The aspect of making payments is the most significant advantage because it helps speed up productivity.

Matyas Jr and Masaryk (2003) suggest that enrolling the users is a three stage process. Stage one will be acquiring the samples of students once this has been done the system creates the master characteristics which then will store as master template. This then means the student has been enrolled onto the new system and can be successfully authenticated or verified. The advantage here is that the university can take these details of students when they enroll and the process is quite fast and reliable.

III. EVALUATION OF GOVERNANCE ISSUES

When preparing to implement a new technology there are a number of governance issues that will have to be addressed in order to make sure that the new technology will not encounter any issues in the future (Thomson, 2009). In order for the new system to take place we need to ensure that governance issues are looked so that the correct procedures are taken. In order for the new technology to installed, the risks of what the technology will bring will have to be analysed so that there will be no issues. It is important that corporate governance is followed as Thomson (2009) states that corporate governance is known to be one of the criteria that foreign institutional investors are increasingly depending upon when deciding what to invest in, the issues that will be covered in this will consist mainly of security and productivity risks of biometrics. The reason that these issues need to be stated are because students in the university will need to know the potential risks of what could happen and how they need to store information in their accounts.

A. Security issues with Biometrics

Biometrics is a form of authentication and verification of identity. The risks that are involved with finger print biometrics according to Boukhonine, Krotov and Rupert (2005) are there could be an inability to enrol a small number of users, the performance deterioration over and the short term changes. A small percentage of the population may not be able to enrol on the fingerprint system. Certain ethnic group have less distinctive finger prints then other group which will make it difficult for them to enrol. The performance of some fingerprint systems is found to drop drastically over because of daily use.

There can be short term changes on peoples finger prints because of maybe their jobs they do that or maybe because they have hobbies such as rock climbing which could damage their skins. Harris and Yen (2002) explain how also that finger prints can be lifted from anywhere when certain procedures are followed enabling the hacker to access the data of the person whose finger prints he has made. Other issues are regarding the face recognition method. A hacker could access a picture of the person who they intend to copy this then will make the system match the person with the template, enabling the user to again access to data which does not belong to them (Klosterm & Ganger,2002). An additional issue is that a certain individuals can be a tracked without their consent as the biometrics will be used in more than one application and more than one location. The users can be tracked if the company looks for their data which can be located in their biometric database (Ratha, Connell and Bolle, 2001). Matsumoto et al. (2002) states there could be a situation where because the finger scanner will be used on a constant basis there could be a chance that the system may have an authentication error due to the system may heat up or maybe an external vibration to the scanner which is known as a fault based attack.

B. Threats of Biometrics

An attack to the authentication system is possible in many different ways such as an artificial finger can be made in order to access the details of the targeted individual (Matsumoto et al., 2002). Although this in a university this may not occur the possibility is still there. Boukhonine, Krotov and Rupert (2005 pp. 949) when using the face recognition system a hacker can play a person face using a laptop or a DVD player, The face will exhibit some degree of movement and the system requiring the face movements may be fooled however the active eye detection may recognize that the face shown is not a real one. People today have access to social media networks where they can access any images they want so if they print an image they can access the details of an individual this way.

Nanavati, Thieme and Nanavati (2002) had done an experiment with the iris scanner where they printed a high quality iris image and cut it out so that the intruder can present his pupil together with the fake iris to the camera. The system allowed them access due to the robustness of some systems.

An issue also could be that users who have want to use the system may not be able to enrol as the fail to enrol rate according to Matyas Jr & Masaryk (2003) is 2 percent for the fingerprint system and for the iris system it is one percent although these may be low rates it depends on the enrolment policy and the amount of people who will need to be enrolled onto their system. If the population of people enrolling onto the system is a large amount and these are the only methods of access the university stakeholders need to take actions and evaluate if it is worth implementing the system.

C. Productivity issues

The University of Derby stake holders need to evaluate how this will help the university and if it will be productive for the students. Harris and Yen (2002) stated that issues that may arise are that there may be a lot of inconvenience caused. This
will then upset the users who are going to be using the system. If the system is not going to be of benefit towards the students it is not worth implementing as the system should make life easier. With this being considered people will also have an opinion already on biometrics where they think this will not be suitable to them at all because of certain issues they may have had with the system. With the system being used on a constant basis also there is a big chance that the system may crash which rarely happens.

The biggest productivity issue that the university will have with this new system being implemented is that a lot of users will have to learn how to use the new system which will mean a lot of time being wasted whilst being used for different application such as the shop and library. The university stakeholders have to make the decision on whether they want to implement the system across the university as the cost of biometrics can vary depending on what type of system they decide they would like to install. With the finger print scanners they can be as low as $100 however the retina scan can cost in between $2000-$2500.

IV. GOVERNANCE STRATEGY PROPOSAL

When the university decides to implement the new system they have to comply by certain frameworks which will overcome issues that may arise during the installation process. Frameworks provide guidelines that the university can use to avoid issues that may arise in the future. Companies using frameworks can create strategies to avoid complications in the future ensuring they gain the success they want.

The main frameworks that will be discussed are going to be ITIL (information technology infrastructure library) and ISO 27002-2013. These two frameworks outline this issues of service delivery and security which are top priority issues that need to be overcome for biometrics.

A. ITIL

ITIL is a framework which is about the approach to an IT service management. It has been around for nearly 20 years and many different organizations have adapted it. It ensures to drive efficiency and consistency (Arraj, 2013). One of the issues that have been addressed was that users may not like it because of the inconvenience it may cause. ITIL address that because one of the benefits it has is that it will recommend solutions on whether the service will meet one or more business needs. The ITIL service strategy ensures that the service provider has the chance to understand the organizations current and future business needs. This will then help the university to see where they can implement biometrics and where they do need them at the moment because they can then set a future plan on what they require by a certain amount of time. Another advantage of ITIL is that customer’s expectation can be set and as a result they can become easier to meet through the use of predictable process which means that when the new technology is in place they can work on what the expectation levels are because some people may have a negative perception of biometrics so this will make things easier for the students increasing productivity as a result (OGC, 2001). The next issue that was highlighted was the amount it will cost for implementing biometrics into the university. The ITIL framework states that business can agree on upon realistic service levels that deliver the necessary value at an acceptable cost. This will help the university because they can work towards getting value for money.

The education of the system was another vital point that needed to be addressed because of the amount of people that would be using the system it would cause the productivity to decrease. With the ITIL framework state that measure the performance by repetition to see where the improvements need to be in order to deliver a more accurate and overall effective service. Student will use the system and the issues that keep coming up those will be addressed so that the students can avoid such complications from a rising again.

B. ISO 27002:2013

This international standard is designed for organisations to use as a reference for selecting controls within the process of implementing an information security management system (ISMS). This standard is also intended for use in developing industry and organisation specific information security management guidelines taking into consideration their specific information and security risk environment.

A security issue that had been highlighted was that unauthorised personnel could make fake finger prints which could give them access to valuable data (British Standard Institute, 2013). Section 11.1.5 has a method where this could be avoided as it states that there should not be any unsupervised pupils working in areas where data could be taken. It also states that vacant areas should be physically locked. The constant use of the biometric system has put into question as research conducted by to Boukhonine, Krotov and Rupert (2005) where it has been explained that with the daily use of the systems the performance levels drop resulting in no access to data, 11.2.4 has explained that equipment should be maintained in accordance with the supplier recommended service intervals. This shall allow the system to perform at the highest level on a constant basis due to regular services that will take place.

Another issue that had been stated was that because there will biometric use within different application people can be tracked without their consent (British Standard Institute, 2013).12.4.2 guideline say are that logging facilities and log information should be protected against tampering and unauthorized access. This will mean that all the time information has been logged for a student their information shall be protected at all times. Section 13.2.4 also states that confidentiality or non-disclosure agreements should address the requirements to protect confidential information using legally enforceable terms. Students will make sure that their information and data is secure and agreements can be put into place where all the information either gets destroyed or return to whom it belongs to.
V. Conclusion

This paper has discussed about how bringing in biometric authentication into the University of Derby will increase productivity and many other things. It has been stated what systems could work, what advantages they hold, how they will benefit the student, and also the governance issues that will have to be solved in order for the new system to be implemented. The conclusion that can be drawn is that although biometrics has been around for a long time and stated before that it is still a popular tool today as facts have showed, it is clear that the University of Derby can benefit from biometrics and in some places suggested it isn’t the right time to implement it. Students who go to the library will benefit from having biometrics as they will provide a means of accessing and taking books from their without using their cards, this will increase productivity for the library. Having biometrics as a form of making payments yet still needs to be tested to a point that they have made sure that they will not have reoccurring issues with the system because this can result in the university in making a loss of profits. Biometrics will become a normal form of authentication in the coming years but to implement it into a university people need to have more education on how it works in order for everyone to get the full use of biometrics.
VI. REFERENCES


Abstract—Every year Universities have thousands of students coming over from different cities and overseas to study and work towards a degree. However there has not been any device of any sort to help students in general with their experience at University. This report proposes implementing a pair of Google glasses for student use at Derby University. There are questions to be asked about how this new technology will work and how it will benefit the students in the long run. Its drawbacks will need to be outlined as well as its key aspects. This report will also discuss the governance issues which may occur and who will be affected by the implementation of this service for all the students in particularly the international students.

IndexTerms—Google glasses, University, Governance

I. INTRODUCTION AND BENEFITS

This Report critically evaluates the use of Google glass as an infrastructure technology for universities. It identifies that the critical governance’s issues are most popularly safety and security. It then demonstrates that the following aspects need to be considered for the governance of the Google glasses as it is introduced in ISO27002.

The technology which will be proposed to be implemented in the University will be Google glasses. These glasses have many features which students could use which range from translation all the way to navigation, helping international students communicate more efficiently as well as helping overall students to find destinations they want to visit through the GPS. This technology is advanced and has many key factors to it which can surely improve the student experience at the University. The technology will definitely fit its purpose in the University as it has many different functions which can help a range of students.

What aspect of the student experience it will affect?

The technology which has been proposed to be implemented into Derby University is Google Glasses. This technology has a variety of features which can benefit University students and even the staff. Firstly these glasses have a camera built into them which will enable users to take pictures and videos. This will benefit the students at the University as students can video lectures so that they can refer back to them when revising for exams. They can record lecture sessions with Google glasses playing an integral part of their university experience. Also these glasses have a translator in which the glass identifies the text using its camera and translates it immediately on the screen of the lenses, it even has the ability to listen to your voice and translate it. (Warman, 2013). Having a translator will definitely benefit international students at the University as it will enable them to communicate with other students and lecturers in their native language. The aim is that the students benefit from this new technology in many different ways and not just one feature. Google glasses also has a built in GPS chip which will help

University students and staff navigate to wherever they like to go. It can also help them find the University campus on their induction. (Voo, 2013). This technology is dependent on the Wi-Fi or mobile connectivity however Bluetooth would be the more efficient way of mobile connectivity as users can easily connect to their phones, and when paired with a smart device it can show social network notifications and will allow students and staff to communicate via the same channels as you would on the computer. (Voo, 2013).

Google glasses will affect the student in many different ways mostly being positive. With the translator, the international students will be able to communicate with lecturers and other students far more effectively which can theoretically improve overall grades and work efficiency as they will have a better understanding. (Gartner, 2013). This means that international students will not need to go to lecturers enquiring about what a certain phrase means.

II. EVALUATION OF GOVERNANCE ISSUES

In order to evaluate the governance issues of the Google glasses, the framework ISO 27002 will be the best framework to use. This framework is designed to improve the availability, confidentiality and integrity of any technology or data assets regardless of classification. Using this framework will ensure that the University will benefit from these Google glasses as it will improve internal efficiency. (Solhoff, 2012). This framework focuses on performing risk assessments and then making the appropriate changes to policies and controls. This is definitely beneficial for the technology being implemented in the University as the framework will help understand what they
key risks of the Google glasses are and eliminate them through a risk assessment. (Mortman, 2013)

A. Risks

On the other hand, as much as this technology is favorable to a whole range of students it also has its drawbacks and governance issues which need to be acknowledged in order to understand and eliminate them. One of the risks of Google glasses is security. Currently the Google glasses have no pin or authentication system which provides a threat to any student wearing them. Similar to cybercrime this technology can easily be hacked into. The Google glass has a root capability which can be enabled by attaching it to a desktop computer and running commands. For those cyber criminals who are extremely technical this will be easy for them to hack. This will than give the hacker the ability to take control of the glass’s output which means that the hacker could monitor everything the student is doing from the Smartphone in their pocket. (Arthur, 2013).

B. Ethics

Ethics will be a critical issue relating to the circumstances of using these Google glasses, this is because students at the University could be afraid that the Google glass is auto recording everything it can see or hear which will than create tension for students as they will panic that the images and videos recorded are being posted on the internet for all the world to see. (McGee, 2013). This will also affect lecturers and other university staff as well as students. Also just by getting Google glass to read a malicious QR code, an attacker could force a connection to a malicious Wi-Fi or Bluetooth connection. On the other hand Bluetooth connection tends to offer less security than Wi-Fi (If configured properly) however students may argue that many Wi-Fi connections tend to be interfered and hacked into easily. (Schwartz, 2013). Also another risk factor of these Google glasses could be the fact that translation could go wrong. If the Google glasses translate incorrectly it could affect many international students in a variety of ways. The major impact it would have is the fact that it will effect overall assignment grades for students, as the whole point of translation is to help foreign students understand the work in a more efficient way and help them to communicate suitably.

C. Safety and Security

Also Google glass makes it far too easy for hackers to gain access to student’s personally identifiable information, banking and credit card information, pins and passwords. Online security has now emerged as one of the biggest threats both to individual users so in this case University students, lecturers, Student union staff etc. and to business establishments. (Viswanathan, 2013). This is because users tend to forget to turn off their Google glasses while entering their pin numbers in a laptop or even at a bank. This creates a major issue as the glass automatically records what is being viewed and stores it in the memory for hackers to view. (Katikala, 2013). Google glass definitely comes with a risk. This wearable technology can come across as very distracting and can cause serious injury to any students. For an example if students were driving or just walking around dangerous equipment, if distracted by the Google glasses at the wrong time, could cause serious injury to himself or someone else. A glance up at the wrong time can be fatal therefore these glasses need to be location aware to cause less risk to the user e.g. students. (Enderle, 2013)

The image (Porter, 2013) above shows a user viewing directions through his google glass. Although this is helpful it is blocking at least 75 percent of the users eye vision which is a cause for concern as this can cause an accident as this is blocking the users view and they will not be aware of their surroundings.

1) Health and Safety

When University students will be using these wearable technologies for long periods of time in the day a potential risk of eye strain may occur. This is because it’s a prolong use of the technology which can damage and effect the eyes of the user. Whether it’s in the atrium, or in lectures, this is bad because it goes against the health and safety act. (HSE, 2013). Another issue which arises with Google glasses is theft. Since Google glass is not securely placed on your face, what is to stop someone from stealing it? Therefore it is important for the user to be fully aware of his or her surroundings. This is more likely to occur when users are reading the content on their Google glasses as this wearable technology tends to fill the lenses with lots of information and drops down on the lenses without User control. This can be very dangerous as mentioned above as it can cause serious injury to the user. Also the glass will attract many criminals due to its price. It’s an expensive technology and an extremely valuable item.

III. GOVERNANCE STRATEGY PROPOSAL

Based on the issues identified in the previous section, this section justifies the governance policies and procedures which will mitigate the impact of the issues above. The chosen framework which thoroughly relates to Google glasses is ISO 27002.
Security issues are one of the main factors which can cause tension between students at the University on a regular basis if not addressed in the correct manner. One of the ways to monitor the security issues of the Google glasses is by the University taking out a risk assessment procedure on the technology which will help to guide and determine the appropriate management action and priorities for managing information security risks and for implementing controls selected to protect against the risks. However the risk assessment should be repeated periodically to gain reliable and accurate results and to address any further changes that might influence the risk assessment results. (ISO 27002, British Standard Institute, 2005). The University will need to understand that there should be a sense of control when it comes down to the use of this wearable technology. Equipment should be sited or protected to eliminate the risks from environmental threats and hazards and opportunities for unauthorized access. Important data or information being stored by the student should be positioned and the viewing angle restricted to use to reduce the risk of information being viewed by unauthorized access. An example of this can also be privacy when a user could be recording someone or something without them knowing.

In terms of security policies, The University of Derby will need to approve the Google Glasses and that it is fit for purpose and can generally make the University experience better for students. The policies will than need to be published and communicated to the students and relevant external parties. At the highest level organizations such as the University of Derby should define an information security policy which is approved by management and which sets out the Universities approach to managing its information security objectives.(ISO 27002, British Standard Institute, 2013). When it comes to safety of students in terms of users recording and taking pictures without others knowing, this factor can be very terrifying for those who are being videoed as they do not know where and what the user of the wearable technology will do with the videos. For an example the victim maybe thinking that the video will be uploaded online which can be a serious issue. Therefore the framework 27002 implies that management so in this case head of year at the University or lecturers should approve the use of information processing facilities. Any use of these facilities for non-business purposes without management approval or for any unauthorized purposes, should be regarded as improper use of these facilities so for example recording, taking images without any students consent. Also if any unauthorized activity does come across and is identified by monitoring or other means, this activity should be brought to the attention of the individual manager in this case course leader or tutor and taken in for consideration of an appropriate disciplinary and legal action.(ISO 27002, British Standard Institute, 2005).

Sensitive information is being viewed, once used the content should be removed or modified beyond recognition. It is important that students use separate authorization each time Google glasses are used just to be on the safe side. Also any important information stored in the glass should be erased as stated above just so that no other user can look at it or view into it.

In order to reduce eye strain the University should follow the display screen equipment act which explains how to deal with health and safety within the University. If students do follow this they will eliminate potential risks which could damage their eyes. For an example strain on the eyes could be reduced by ensuring the contrast is at the correct level. This is why it is important for students to give their eyes a rest and take off the Google Glasses for a certain period of time. Also referring to the issue in the previous section regarding theft, in order to reduce theft the University should ensure students only wear the wearable technology in certain areas where CCTV and security is intact.

IV. CONCLUSIONS

Overall Google Glasses is a promising wearable technology which will highly benefit the student’s as well as the staff at the University of Derby. It has many features which will surely attract many students from purchasing, one famous feature being the translation as many international students will profit from it. If managed correctly using the ISO framework 27002, there should be no reason for why this technology should not be implemented. Yes there are many minor issues which need to be addressed but once they are addressed it will definitely attract many students and staff. The ISO framework will help eliminate all potential risks to users as well as teach staff members how to carry out policies and procedures which relate to this device.

When it comes to hacking and cybercrime Google Glasses has a strong bond with it. Google Glasses are easy to be hacked into by cybercriminals which the University will need to be aware off. Therefore if the ISO framework is implemented both students and the University will benefit from it. If personal or
V. REFERENCES


Governance Strategy For Introducing A Virtual Assistant Into A University Environment

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Abstract— Everyone needs help and guidance at some point in their life, university students are no different. A virtual assistant could be the answer to helping these students. Different functions could be implemented, each one helping a student with a different task. Although emerging technologies are exciting, there are many governance issues associated, which need to be evaluated. With a bespoke governance strategy, these issues can be avoided, leaving a university with a solid framework for a useful virtual assistant.

Keywords—Virtual Assistant, emerging technology, governance strategy

I. INTRODUCTION AND BENEFITS

Everyone needs help and guidance at some point in their life, university students are no different. With fresher’s needing directions, second years seeking placement advice, and final years wondering where to find dissertation resources, a little help can go a long way. Unfortunately, in the UK there is an average 18 students for every 3 members of staff (Complete University Guide, 2013), and is expected to increase with population rise. A solution to all these students needing help could be a virtual assistant. There are different types of virtual assistant. This paper refers to the virtual assistant as a friendly program that answers user’s questions, by referring to a backend knowledge base or running an associated function (Sullebarger, 2013). An example of an existing system which uses these features would be the IBM Watson supercomputer (Brown et al., 2010). The functions/knowledge (key aspects) that could be implemented is explored in this section, and how they can benefit the student experience.

A. Providing Resources

One aspect of the virtual assistant could be to provide resources on a desktop/tablet. This affects the study experience for students. Using emerging speech recognition technology, a student could ask the assistant for a link to blackboard, the digital library or even the CV builder (Moore, 2013). This would help students with time management. Instead of searching through countless webpages trying to find a resource, they can spend more time utilizing that resource, making the study experience more efficient. This idea is based upon the IBM Watson, which uses structured knowledge bases (Brown et al., 2010) to provide intelligent, personalized responses, from questions asked in simple English (Suchanek and Welkum, 2013). The speech recognition function also helps reduce the health risk of RSI (repetitive strain injury), with more speech and less typing (NHS, 2012).

B. Personalised Navigation

Another aspect could be to show students directions to a place. The virtual assistant could be accessed through wearable technology, such as Google glass (Welch, 2013). Students on the move can then ask questions such as “where is the computing section in the library?” or “where can I buy food with a £5 limit?”. Having directions provided on wearable technology can help reduce a student’s memory load, which is limited to five-seven chunks of information (Cohen and Quinlan, 2012). Reducing student’s short term memory load is very useful. Simple distractions such as student union events or bumping into a friend can remove content from the mind, resulting in having to start over (Carr, 2011). The ability to ask the assistant for cheap food options helps the student with the budgeting part of the experience, ensuring they don’t overspend (Gammell, 2010). The virtual assistant could also learn from the student’s responses, and offer them directions to new relevant places. The IBM Watson supercomputer is currently doing this, with an upcoming app that recommends customers which clothes to buy, based on their likes and dislikes (Barinka, 2013).

C. Enhancing the Social Experience

A student’s social experience can also benefit from the virtual assistant. Student unions could have certain access rights to the assistant and update certain responses (Nuance Communications, 2012). For example, a student might ask “which events are on today?”. The virtual assistant can then refer to the updated knowledge bank and provide an updated answer (Peters, 2012). This leads to a whole new way of promoting student events and informing students what’s on offer to them, making the most out of their student social life.

D. Assignment Help

Lecturers could also have access to a virtual assistant’s knowledge bank. Frequently asked assignment questions could be added or updated (Moore, 2013), for a student to easily access. This benefits both student and lecturer. A lecturer can’t be expected to be available to every student 24/7, where as a student doesn’t want to be restricted to times where their
knowledge might help. The virtual assistant can help with this problem, aiding the communication experience between lecturer and student (Hollick et al., 2007).

E. Announcements

The virtual assistant can also help keep students up to date. Students rarely read Unimail and sometimes relevant course changes or announcements are missed as a result (Rubin, 2013). The virtual assistant can display a message to the student about any unread urgent changes, such as a room change or a lecture cancellation. This potential feature could be accessed off site, whilst logged into the university extranet. This would prevent students wasting their time and in some cases transport costs (Ingram, 2013).

F. Translation

The communication experience can also be enhanced by using the virtual assistant. Cross Language information retrieval (CLIR) features could be implemented, allowing international students to translate assignment specifications or lecture notes into their own language (Dan and Daqing, 2010). A major example of this is Google translate, but there are many upcoming applications which can translate text from English to another language (Du, Huo and Sun, 2011). This feature could save students time, as they wouldn’t have to ask lecturers for simpler explanations. The CLIR feature also increases a universities reputation, showing that it provides resources to make international studying that bit easier. This could lead to more international students wanting to study at UK universities.

II. EVALUATION OF GOVERNANCE ISSUES

There are many types of governance issues that need to be evaluated, before the integration of a virtual assistant into a university environment. Since there are a variety of governance issues, which ones should be evaluated? A good way to do this would be to evaluate the key issues which many frameworks cover, since these issues are the most common and cause the most problems. Cobit 5 (2012) integrates many of the key frameworks (such as ITIL and the ISO standards). As a result, evaluating the key issues in Cobit 5 would be a good way to go. These issues are Ethical, Security, IT Value, sustainability and risks. This section will evaluate how each of these key issues could affect the integration of a virtual assistant into a university environment.

A. Ethical

The first governance issue is ethics. There are ethical issues associated with the virtual assistant’s voice. Users in the past have complained about a female only voice, stating that it’s discriminative towards one gender (Bosker, 2013). Apple had this problem with their virtual assistant SIRI and had to implement a male voice option (Bosker, 2013). Universities should learn from this, carefully designing the gender of the voice. Otherwise students could argue that the university is discriminative, which is against its code of conduct.

B. Security

Access rights are also a security governance issue. For starters, who has Access rights to the knowledge bank? This is important as access rights need to be carefully assigned to ensure only relevant data can be edited/viewed by the right people (Clinch, 2009). Assigning access rights is also good practice according to ITIL V3 (Bon et al., 2007). If this wasn’t in place, anyone could potentially change the data deliberately, which is against The Computer Misuse Act (1990). Even with correct access, the information going out to students also needs to be checked before it is released. This is to prevent inappropriate comments, which can offend students or staff, going against a university’s code of conduct.

C. IT Value

The next governance issue is IT value. With emerging technologies becoming more portable (Namboodiri, 2010) and computer processing power increasing rapidly (Mack, 2011), devices such as tablets, smartphones and wearable technology are quickly being produced. It raises the question, if there are so many devices, which are worth investing in? Smartphones are a great example. The virtual assistant could be developed on a smartphone app. The trouble is which operating system should it be developed on? Most people instantly think Apple’s iOS. Unfortunately, only 21% of smartphones owned run Apple IOS (Gee, 2013). In theory this means a university would only be catering to around 21% of students, which isn’t a good investment. The most popular devices (including their operating systems) fluctuate all the time (W3S, 2013), so universities have to think which would be best to invest in (sustainability issue). If they don’t financial resources could be wasted, which could have been spent on better virtual assistant features or other important projects.

D. Sustainability

Sustainability is the next key issue. The virtual assistant needs to be sustainable over a long term period otherwise it won’t be worth investing in. An example of a previous project that failed due to sustainability reasons would be the SARI project in rural India (Best and Kumar, 2008). The SARI project failed due to lack of technical support and new relevant content. It couldn’t adjust to future demand. If the virtual assistant doesn’t adjust to emerging technologies (both hardware and software) and to what the student needs, then it will become another project failure (Namboodiri, 2010).

The Cross Language Information Retrieval (CLIR) features are also a sustainable issue. If universities are planning on offering courses to more countries, then it will need to update the virtual assistant CLIR, so it can translate a new language. If they do not update this, then it could be seen as the university being biased to a particular culture or country, which is seen as discrimination (another ethical governance issue). Languages are also like a living thing, which grow and change throughout time (Haralambous and Klyuev, 2012). CLIR systems tend to come across out of vocabulary (OOV) issues, where new trending words haven’t been added to the bilingual dictionary (Chien-Yuan et al., 2012). The CLIR would have to add new words to its bilingual dictionary as they come into regular use,
otherwise it will become outdated (which isn’t sustainable), putting off students using it as a result.

E. Risks

The next governance issue is risks. The virtual assistant’s knowledge bank needs to be regularly updated otherwise it could risk misleading students. An example of this could be assignment changes. If a lecturer forgot to update the changes in the knowledge bank, the virtual assistant will be providing inaccurate information. This can lead to students potentially failing an assignment, missing a deadline or the added stress of rewriting work. Although only personal data is required to be kept up to date (Data Protection Act, 1998), ISO 9001 (2008) section 4.2.3 states that it is good practice to keep relevant information up to date (British Standard Institute, 2008). Finally there are associated health risks. If the virtual assistant’s user interface is designed with poor colors and displays poor text sizes, students are at risk of eye strain. The university would also not be complying with The Health and Safety Display Screen Equipment Regulations (1992), which is breaking the law. The virtual assistant’s voice volume is another health risk. If the volume is not at a safe level, it could damage student hearing, either temporarily or permanently. This is breaking the law, as it goes against The Control of Noise at Work Regulations (HSE, 2005), which the university must comply with.

III. GOVERNANCE STRATEGY PROPOSAL

In order to ensure that all aspects of the virtual assistant’s lifecycle (development to implementation) run smoothly, without any of the above governance issues occurring, a governance strategy will need to be put into place. There are many existing frameworks and guidelines available which can help do this. Since no single framework is 100% necessary for an individual strategy, it is good practice to take and apply only the relevant guidelines from these frameworks, creating a bespoke framework for the virtual assistant as a result.

A. Ethical Guidelines

The first issue to solve is the ethical design of the virtual assistant’s voice. Prior to previous complaints with Apple’s Siri, the industry de facto standard is to create a male and female voice option. Both Google now and Siri have both male and female voice options (Bosker, 2013; Dobie, 2013). Since they are the leaders for current mobile virtual assistants, it would be good practice to follow this de facto standard, in order to prevent this ethical issue with the universities virtual assistant.

B. Security Guidelines

The next issue to solve is security. Who gets access to the virtual assistant’s knowledge bank and particular virtual assistant functions? Adding the relevant sections from ISO 27002 can solve this problem. Firstly, section 9.2.3 can be applied to the access rights of the knowledge bank (ISO 27002, British Standard Institute, 2013). This section has guidelines on managing privileged access rights. Since the knowledge bank is where all of the resource content is stored, it is considered as a privileged access right (Haidong and Jianhua, 2006). The guidelines advise that access rights to privileged resources should be allocated on a need to need basis, with every change recorded on a log. These rights should expire as soon as access is no longer required (ISO 27002, British Standard Institute, 2013). Applying this to the knowledge bank would prevent anyone untrustworthy from changing its content. Since the log tracks changes, any deliberate misuse can easily be found (Hommes, State and Engel, 2012), as a result that user can be prosecuted under The Computer Misuse Act (1990).

Section 9.2.1 & 9.2.2 can be applied to the virtual assistant’s functions access rights. This section has guidelines on managing/updating unique user ID’s for different roles (ISO 27002, British Standard Institute, 2013). In this case, the user’s role would be what course the student is on, which affects which virtual assistant function can be used. Each course could have certain permissions, with student being assigned a unique ID, to access that courses allowed functions and content (Dongmei and Zhaoxia, 2009).

C. IT Value

In order to ensure financial resources are not wasted, the university needs to choose which device is best to develop the virtual assistant on. The university can follow guidelines from ISACA’s Val IT framework. This framework has a section called investment management (ITGI, 2006). It recommends an organization to weigh up the business requirements (what the university wants the assistant to do), what the consumer wants (which devices the student own and want the assistant on), analyzing the alternatives (emerging technologies) and deciding an acceptable risk level (sustainability for developing each device). Following these guidelines can help the university see which device is going to bring the most benefits to students over a long term period (good IT value). As a result, the virtual assistant should be developed on the device which shows the best value.

D. Sustainable Guidelines

The next governance issue is how to ensure the virtual assistant will be sustainable, to what students will require. Following an iterative design process can help a university do this (Nielsen, 1993). An iterative design process treats a service as an ongoing process, constantly changing and adapting it to what the end user requires (Bowen et al., 2010). The ITIL V3 framework has iterative design principles, in its continual service improvement section. This section recommends regularly following a 7 step improvement model (ITIL, 2007). The key concepts of this model are Identifying, Defining, Gathering, Processing, Analyzing, Presenting and Implementing.

This can be applied to the virtual assistant. First identify the virtual assistant’s functions. Next measure the benefits of each function to students and see how the data should be gathered. User centered design principles are seen as a good technique, so asking students what features they like/dislike and what could be added, could be a way forward (Iqbal et al., 2009). Afterwards the data needs to be processed and analyzed in order to find trends (what students collectively want). A useful
way to do this is through business intelligence software, such as SAS (2013). Finally, presenting the data to the right people is crucial. This is so goals and plans can be implemented sooner, so students can benefit quickly. Following these steps once a year can help solve the sustainability problem, ensuring the virtual assistant’s functions are useful and kept up to date with student needs. The same process can also be applied to the CLIR OOV problem.

E. Risk Guidelines

In order to solve the health risk issues, the university could follow a guideline in the Ten Guidelines for User-Centered Web Design (Katz-Haas, 1998). The eighth guideline is about legibility. It states that text should be easy to read, have an adjustable font size, and also be a color which doesn’t have poor contrast. Following this guideline would solve the health problem of eye strain, allowing the university to comply with the Health and Safety Display Screen Equipment Regulations (1992). It also helps the university comply with the Disability Discrimination Act (1995), ensuring that university resources can be clearly read by anyone, regardless of disability.

IV. CONCLUSION

A virtual assistant is an exciting emerging technology where new functions can easily be added and installed, which can provide a lot of useful benefits to students. Although there are multiple possibilities, universities must take into consideration the associated governance issues that may occur with each function. Following the above guidelines can prevent these issues from happening, leaving the university with a solid framework for a useful virtual assistant.
V. BIBLIOGRAPHY


MOOC In University Of Derby

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Abstract — Report proposes massive open online courses (MOOCs) technology for University of Derby to increase the level of students learning experience. To introduce MOOCs report has identified the key benefits to prove its usefulness which include more flexible, accessible and customizable approach towards education. Further report mostly focused on key drawbacks, ethical issues and risks that could influence MOOC’s integration into University’s environment. The identified issues include many e-learning related problems such as lack of communication, plagiarism, online harassment, implementation risks and dropout rates. Finally report suggests the idea of new MOOC platform with a brief development and implementation guide.

Index Terms — online learning, MOOC problems, massive open online courses, MOOC, MOOC integration.

I. INTRODUCTION

Traditional learning model has been evolving continuously and during this time more technologies deeply penetrated into this domain (Blackwell et al., 2013) including online learning that transforms higher education significantly (Leslie, Wellesley and Jason, 2008). Online learning is a new growing form of education that suggests a new method to deliver education in general (Lahti, Hätönen and Välimäki, 2014). A few years ago a new phenomenon – massive open online courses (MOOCs) technology has emerged that improved distant learning significantly (McAuley et al., 2010). This report focuses on particular University and provides a brief research based summary of the key aspects that are related to MOOCs including development, implementation, challenges, risks, benefits and guidance for prevention of the major issues. The objectives of this report includes identifying advantages with disadvantages of MOOCs, analyzing University’s strengths and weaknesses and producing a feasible method to integrate MOOC to University of Derby existing educational model.

A. Massive open online courses (MOOCs)

Massive open online course is e-learning facility that opens high quality educational materials to everyone on a global scale (Ryan, 2013). In contrary to traditional learning, massive open online courses are not restricted to any number of students (Ryan, 2013) and provide more customizable, flexible learning methods (Bruff et al., 2013). Due to emerging and currently used technologies e-learning courses (MOOCs) has shown a significant growth of students taking online courses: “In the US, the number of K-12 students taking an online course has risen 6600% in the last decade”. Understanding the advantages and need for online courses the educational system rapidly changes: “86.5% of all US based higher education institutions offer at least one online offering”. Moreover, e-education in some higher education institutions is surpassing the traditional way of learning as article “We took 160 years to build up a - student body of 47,000 on our campus and in 10 months we recruited 300,000 people online. That’s the speed of change”. To date MOOCs come into two flavors: xMOOC follow an “instructivist or behaviorist pedagogy” (Bond and Leibowitz, 2013) and cMOOC was named for “connectivism, the learning theory that underpins their pedagogy” (Bond and Leibowitz, 2013).

B. Key Benefits of MOOCs for on-campus students

E-learning has been advancing in a quick pace into worldwide society (Leslie, Wellesley and Jason, 2008). This section will explore some of the key benefits and advantages over traditional learning that MOOC systems provide. In a traditional learning system students are bound to University’s or College’s schedule and location (Işık and Güler, 2012). For this case, MOOCs augment delivery of education for students by providing flexibility, customization and accessibility which students finds encouraging self-paced learning (Bruff et al., 2013). Another important aspect of on campus education is the quality of lectures and materials. In 2013 University of Vanderbilt (Schmidt and McCormick, 2013) has started offering online courses using Coursera MOOC. During the practice University has identified major benefit using massive open online courses – significantly increased lectures materials due to collective efforts of staff and students. The University of Exeter is developing MOOC based courses through FutureLearn platform and complements Schmidt and McCormick in terms of improving educational materials - “the educational techniques and technologies used in MOOCs can also be applied to on-campus blended learning and distance-learning programmes, potentially improving our existing modules” (University of Exeter, Date Unknown). While developing, integrating and utilizing MOOC’s technology students become a part of new system and technology which offers closer collaboration between course provider and students to improve currently used teaching methods, techniques and materials which benefits to overall students experience (Schmidt and McCormick, 2013). Traditional educational system for on-campus students in most cases does not provide any opportunities to broaden student’s knowledge in different subjects where they have not enrolled (Peril and Promise, 2000). As The Evollution (Date Unknown) states
MOOCs provides this educational feature and in more flexible manner:” they provide students the opportunity to expand their knowledge and pursue their interests without dedicating fixed periods of time to fit a college or university schedule”. At the moment, especially in United Kingdom tuition fees have soared significantly (Adams, 2013) from approximately £3000 to up to £9000. By implementing MOOC system University of Derby would enable much cheaper or free of cost courses as MOOCs can be accessed by anyone from any place where internet connection exists (Ryan, 2013). Furthermore, online learning methodology can augment existing on-campus teaching. Blending online teaching with traditional learning on campus has shown a significant change in number of passes for on campus students, for example, in 2012 San Jose State and edX conducted a test where some contents and needed methods from online course were incorporated into a for-credit campus based course. The test showed a significant changes – students pass rate increased from as low as 55% to 91% without online component (Fowler, 2013). In Massive open online courses students are provided with variety of different education (and communication) related experiences “to students, rich Interactive user experiences, lectures, activities, readings, assignments and exams, to opportunities to connect and collaborate with others through threaded discussion and use of social networking” (Pullagurla, 2013). As MOOCs provide students with communication features such as interactive forums, every participant builds online community and shares ideas which can expose students to diverse range of ideas that can stimulate further interest in a particular topics (Ryan, 2013).

C. Impact on student experience

The chosen technology would impact most of university’s stakeholders including teachers and students (Young, 2013). By producing and providing massive open online courses University of Derby would make a significant impact on students learning experience from many aspects including shared high quality materials, helpful community and courses flexibility (Stuchlikova and Kosa, 2013). Students would be more involved into whole development of courses which could benefits for both – Students and University (Schmidt and McCormick, 2013). While using MOOC system students could experience diverse learning methods with more support from lecturers and other students (Stuchlikova and Kosa, 2013) as teachers through proposed technology are able to provide enriched communication functionalities (Miyazoe and Anderson, 2013). Augmenting University’s learning model would offer more possibilities to explore and study related and unrelated domains and thus provide students with additional knowledge (The Evollution, Date Unknown).

II. EVALUATION OF GOVERNANCE ISSUES

MOOC is a very challenging and complex technology (Voss, 2013). For this reason report has identified and summarized the main problems that lie behind MOOCs including limitations and ethical issues. Since MOOC is the proposed technology for University of Derby, report also identifies the risks involved as implementation of chosen technology would have a significant impact on University itself (Voss, 2013) so before taking any actions it is a must to understand variety of outcomes that can be encountered.

A. Limitations

MOOC’s problems are mainly related to lack of face-to-face contact with lecturer, ineffective assessment system and lack of decent feedback for further student’s development (Sergio et al., 2013).

1) Interaction

Interaction in educational system plays a significant role and online teaching platforms are not capable of providing such an efficient communication environment where in contrary traditional learning does (Fowler, 2013). To prove such a statement research was conducted in a few higher education institutions to compare face-to-face and online-only learning outcomes according to final results: “In Virginia, 32% of students failed or withdrew from for-credit online courses, compared with 19% for equivalent in-person courses” (Fowler, 2013).

2) Assessment

Difficulties in assessments area appears due to thousands of students taking courses (Daradoumis et al., 2013). It is impossible for a single teacher to assess student’s assignments and exams without any particular tools and methods. Initial MOOC’s evaluation tools are multi-choice quizzes, short-answer questions and other similar methods that use automated software (Cooper and Sahami, 2013). The second method of evaluating students is peer assessment where students, teachers or teaching assistants do the assessment. By assessing in such a way students lacks communication with professionals and the feedback they get is limited to minimum due to number of students (Daradoumis et al., 2013).

3) Validation and Plagiarism

E-learning systems including MOOCs struggle with validation and plagiarism issues which by Cooper and Sahami (2013) was marked as one of the most widely discussed topic concerning online learning platforms. To address this issue some of well-known MOOCs attempts or will attempt to integrate automate detection software systems to deal with this particular issue which shows that MOOC’s technology has some critical problems that needs to be addressed.

B. Ethics

1) Completion rates

Although MOOC’s integration is accelerating, the ethical issue appears in a context of whether internet is the right technology to provide education, especially if it can possibly be adapted as a complimentary or even alternative method to traditional education system. Educational technology specialist Phil (2013) after analyzing courses completion rates from variety of MOOCs concluded that “The average completion rate of xMOOCs is 7.6%, with a minimum of 0.67% and a maximum of 19.2%”. Also e-learning learning method was reported to have a significant gap in dropout rates compared to traditional learning. Findings of research (Rostaminezhad et al., 2013) have shown the dropout rate in online learning courses between 20% - 80% roughly averaging approximately 40%.

2) Licensing and Piracy
Licensing and Piracy must be taken into consideration before implementing and using any kind of software and certain teaching materials to prevent breaching the laws: “An institution that makes software freely available to staff members and students may be violating terms of such agreements. It is important for institutions to familiarise themselves with the terms of licensing agreements before they provide software to students and staff, even if its for training and educational purposes” (Mpofu, Date Unknown).

3) Hacking, harassment and related issues

Another ethical issues that might appear: online harassment, theft, hacking and similar issues that need to be addressed by educational organizations and create policy, set of tools and action plans to prevent from such incidents (Mpofu, Date Unknown).

C. Risks

1) Funds

Concerning the risks of investments, production and integration of MOOC to educational entity varies a lot. The time efforts, staff and money funding for MOOC project can be different, according to courses quality, volume and other factors. As DeJong (2013) states, building e-learning courses for students costs varies significantly:” Some are cheap, like self-produced off-the-cuff lectures delivered in front of a webcam and uploaded via an open source platform like Google’s Course Builder. However, MOOCs that professionally shot and edited and then spliced with interactive features can cost on the order of a quarter-million dollars”. To produce a professional MOOC such as leading Coursera investments can reach millions as, for example, first round of investment raised $22 million and second $43 million according to Kolowich (2013).

2) The future of MOOCs

Despite a quick MOOC’s development into our society this technology does not show any firm signs to continue spreading successfully in the future. Gartner (Date Unknown) has proposed a hype cycle for technologies that illustrates the growth of new technologies which are labeled as very promising technologies. One of the experts used Gartner hype cycle and adjusted it for MOOCs technology. According Tapson’s (2013) diagram, the peak of inflated expectations will be reached at the very end of 2013 and MOOC’s technology will suffer the ‘through of disillusionment’ stage in between 2014 and 2015. After 2015 the technology will start slowly moving forwards better integration into our society. The prognosis gives a brief understanding of the risk the MOOC system can possibly have which makes a clear assumption that this technology is unstable and Universities and other educational institutions should consider this fact before integrating this technology.

3) Following future education

Another problem may occur in near future which would have a huge impact on all the stakeholders including students lower students experience (compared to other Universities) and University itself. Leading Universities like Stanford and Harvard follow the newest trends and best practices and there is a chance that at some point educational system will change the form and some of the Universities may be left behind, in case, they haven’t embraced MOOC’s technology on time(The Evollution, Date Unknown).

III. GOVERNANCE STRATEGY PROPOSAL

This section mainly focuses on proposing governance policies, derived from governance frameworks, which need to be developed before incorporating MOOC technology into University’s educational system.

A. The need of MOOC

The key problem in chosen University’s educational system limits student’s experience while studying on campus. Currently existing courses are not flexible, schedules are strict and in most cases students are not able to choose courses from different subjects. This situation influences students from many aspects including lower motivation, lack of eager to learn and experience different areas and diminished creativity.

B. Governance strategy

Since report proposes a new MOOC for University of Derby, there is a must to provide a strategic guide in order to implement and develop chosen technology efficiently and use its potential maximally.

It has been noticed that the most popular and innovative MOOCs are established by collaborative efforts, for example, Coursera involved a few Universities at the beginning (Coughlan, 2012a) and edX platform was established by Harvard and Massachusetts Institute of technology (Coughlan, 2012b). For this reason report suggests for University of Derby to establish a partnership with Universities that have similar aims to achieve and preferable with those that can offer MOOC-related knowledge derived from practice and experimentations. Each partner should contribute significantly to the project and develop MOOC towards high quality teaching and learning facility. Despite MOOCs still being new technology MOOCs have already shown many variations from variety of aspects including business model, assessments and partnership options (Voss, 2013). Since MOOCs have practised many different methods and techniques in different domains, the proposed platform could take an advantage of that and consider the best practices to be utilized in the system. Furthermore, the report suggests creating MOOC which primary focus would be on quality, which means that every course should consider integrating the best ways to present materials, teach and evaluate students to that particular course. Since main focus is proposed the quality of courses, large part of suggested courses should be paid to involve more motivated students and increase pass rates which was noticed in Coursera where students paid $30-$100 fee and pass rate increased to even 74% (Koller et al., 2013). Although proposed MOOC would be available for anyone to use, report suggests a bit different approach towards community of students. By involving different techniques and rules (such as previously mentioned fees), MOOC should target student groups more specifically and create courses around the community which actually is motivated and willing to seek deeper knowledge.
from Higher education institutions. For further development of governance strategy report suggests University to conduct a deeper research on this particular topic, as report produced only a brief guide.

IV. CONCLUSIONS

Report has identified many benefits that MOOC technology provides along with the key limitations, ethical issues and risks that might be encountered while incorporating MOOC into educational institution. The chosen institution is University of Derby which is suggested to integrate MOOC’s technology with other partners (Universities) to provide high quality and efficient courses to attract motivated students from around the world. Report also identifies a brief strategy of how new MOOC technology should be implemented and developed in chosen University’s current educational system.
V. REFERENCES


Işık, A. and Güler, İ. (2012) Comprehensive Comparison Of Traditional And Distance Learning Master Programs. Procedia. (31). p.120-123.


Abstract—Universities are under pressure to meet rising student expectations, demanding the latest technologies and approaches to teaching. As an emerging technology, Google Glass offers countless benefits to both students and teachers. However a number of governance issues must first be dealt with before the device is implemented into the existing system. Using the framework guidelines suggested Google Glass could provide the foundations for a sustainable future tool for learning and teaching in universities around the UK.

Index Terms—Google Glass, Students, Teaching, Governance, Privacy.

I. INTRODUCTION AND BENEFITS

Google Glass, introduced to developers in 2013, is a wearable device capable of recording, processing, sharing and displaying information using the latest voice-activation, prism display and gesture control technology (Houghton, 2013). Google Glass was developed to reduce the time between intention and action for all users (Reed, 2013). It allows users to record and share real-time, eye-level footage to other devices, search for information using Google’s existing search features, receive and send e-mails, messages and phone calls on the move, and to display a range of information through the development of new Google Glass applications (Bohidar, 2013).

The unique appeal of Google Glass is the way it uses a simple interface to deal with complex issues, and how it allows users to continue dealing with everyday activities while being present to enhance experiences and provide essential information when required (Houghton, 2013). In a university, this provides students and lecturers with the ability to deliver and process information in new ways: creating more complex and engaging course content to meet with rising student expectations (Grossman, 2013; Heinze, 2013).

A. Student Expectations

New student expectations have called for more personalised and flexible teaching methods to be adopted within universities; capable of delivering high quality teaching at “any time and place convenient to the student” (UHR, 2012). With increased tuition fees across the UK, it is now essential that each student’s individual needs are also understood and addressed (Adams, 2013).

These new expectations do however coincide with new advancements in personal computing, for example the development of Google Glass, aiming to “reduce the time between intention and action for all users” (Reed, 2013). By combining these new expectations with the latest in personal computing, universities can ensure that students remain satisfied, by delivering flexible and personalised teaching to each student.

B. Recording Opportunities

Google Glass offers users the chance to record and share real-time video footage as though it is being seen “through the users eyes” (Vallurupalli et al, 2013). This provides unique benefits for students as they can learn through the eyes of their teacher/experts, for example, medical students can view operations from the operators view, history/geography students can become part of a real-time archaeological dig and art students can view museum pieces from around the world (Gittlen, 2013; Heinze, 2013). This provides students with more engaging material, allowing students to become familiar in a practical environment and to relate theories to practical uses/behaviours.

The ability to record and share real-time video footage also provides students with the unique ability to become more engaged and productive within their learning environment. For example, students no longer need to take detailed notes as they discretely record and review footage later; a long-desired tool for journalism students (Gatens, 2013; Roscorla, 2013). This allows students to become less focused on writing and retaining information, and more focused on understanding and learning the content being provided.

C. Access to Information

Google Glass also provides the ability to search and process information quickly using Google’s search engine facility (Daly, 2013). This enhances the student experience as more dynamic discussions can be presented in lectures and seminars (Gatens, 2013). Students will also feel more confident in their approach, knowing they have the support of Google Glass and Google’s additional services to backup any arguments made.

Students therefore also have the ability to learn in “any place, at any time”, using their own innovative and searches. This access to information could change the way teaching is approach in the future, as topics/content could change with accordance to the information produced during discussions/lectures.

D. Working in Groups

In addition to real-time streaming, Google Hangout allows students to discuss projects in a variety of ways: through text, images and real-time video footage. If applied correctly,
students could use this to organise group work and long-distance reviews with their teachers (Google, 2013). By using Google Glass, students can also receive Hangout messages, phone calls and emails “anywhere, at any time”, allowing for a more dynamic and productive learning environment, as students are always connected and can always share and search for new information (Burke, 2013).

E. Equal Opportunities

Due to the voice-activated technology used to control Glass, students with physical disabilities can now engage in studying with more confidence and efficiency (Popescu, 2013).

Those with learning difficulties also have the additional ability to record lectures, allowing for more focus on understanding the material and for review and analysis at a later date (Gatens, 2013). This also applies to students with cultural or language difficulties as information does not necessarily have to be understood and recorded immediately, translation and clarity can be made from the recording.

II. EVALUATION OF GOVERNANCE ISSUES

Introducing Google Glass to the university environment meets the student’s expectations for flexible teaching, capable of delivering material at any time and place. However issues do exist if such technology should be fully integrated into the university. Using ISO 27002 (British Standard Institute, 2013) and COBIT 5 (2013) framework recommendations, the following issues were identified as potential governance issues.

A. Privacy Risks

Due to the discrete physical appearance of Glass, the ability to record discretely is viable. Currently, recordings last ten seconds and requests additional input for further recording use; however this will change to allow for an ‘always on’ recording function, resulting in unavoidable and unconsented recordings being shared and stored online (Gunning, 2013; EPIC, 2013) Google has attempted to rectify this by integrating a red light to inform others that the Glasses are turned on; however how it does not indicate that the glasses are recording (Holly, 2013).

(Dotson, 2013) suggests that people exist in a gamut between “fully private, partially private and mostly public” scenarios. Each scenario permits different behaviours, for example people act different at home on their own than in a workplace. When wearing Glass, everything could be recorded, and therefore the way people behave will change to account for this. In a classroom environment this could become extremely problematic as a comfortable environment is required for productive learning; in some cases teachers may object to being recorded compromising the effectiveness of using the device (Gatens, 2013).

B. Security Risks

In addition to unconsented recording, it is also important to consider the integrity and security of the data being stored on the device.

1) Data Security

All of the data from Google Glass is automatically backed-up onto Google’s cloud server (and in many cases to the users Google+ account) which increases the data’s integrity, however if Google’s servers were to become breached, very private and potentially life threatening data could be released easily (EPIC, 2013; Martin, 2013). For example, while ‘always-on’ recording is activated commonly visited locations, passwords, acquaintances and other recorded information (such as private meetings, paper-based information) could be accessed through the cloud servers, allowing someone access to every detail of someone’s life. The chances of this happening are however minimal as Google is seen as a secure and highly-rated company across many countries and industries, with various security precautions in place to prevent such threats (ANI, 2013).

2) Theft

These factors also apply to the device being physical taken/stolen from the user. With no means of official authorization (such as a pin-lock screen) the data could become available to anybody with access to the device (Arhur, 2013). Google has patented an anti-theft system to disable the headset using eye tracking technology, which could provide a suitable solution; however this is yet to be official released (Martin, 2013).

C. Social Implications

Advancements in technology have altered the way people behave in society, communication styles have rapidly changed with introduction of mobile devices, and therefore the introduction of wearable computers is likely to continue this (Miller, 2013).

Research dating back to the 1960s shows the importance of establishing and maintaining eye contact when engaging in conversation (Phillips, 2013). Since the introduction of mobile devices it is said that adults maintain eye contact for around 30-60% of an average conversation, compared to the 60-70% expected. Although the physical distraction of checking messages on a mobile phone has been removed, users are still able to avoid eye contact by focusing on the Glass’s screen (Miller, 2013). Google did however consider this when creating the device, and position the screen just above the user’s right eye to avoid such situations (Sullivan, 2013).

However despite efforts to ensure that the user remains engaged within conversation, other people may feel insecure around someone wearing Glass. Research suggests that the main concern is whether or not they are being recorded and whether or not the user is paying attention or not (Sobers, 2013; Dotson, 2013). This could cause problems within a classroom environment as students must feel secure and comfortable in order to learn effectively (Gatens, 2013).

A solution to this would be to restrict the use of wearing the device to certain scenarios; however for those with disabilities and with the proposal of Google Glass becoming the next prescription lenses, this may not be feasible in the future (Gunning, 2013).

D. User Risks and Ethical Choices

According to research carried out by (Martin, 2013), Google Glass could contribute towards eye fatigue and cause visual confusion. This is due to the eye piece being fitted so
close to the right eye, a requirement of the prism technology used to create the visual display (Prigg, 2013).

Users therefore must evaluate the risks associated with the use of the device and plan appropriately. This could create problems within a university environment as the technology may become so integrated it becomes hard to provide a choice to students.

Users must also accept responsibility for their actions when using the device, and acknowledge the potential consequences of the information they collect (even if the information was unintentionally recorded) (Gunning, 2013). The university will also need to monitor these risks and ensure that the devices are being used correctly to comply with the Health and Safety at Work Act (1974).

III. GOVERNANCE FRAMEWORK PROPOSAL

The governance issues discussed above require planning and action before the implantation of Google Glass can commence. Using the ITIL, COBIT and ISO 27002 frameworks, amongst other UK legislation, the following governance framework guidelines will attempt to address the issues discussed above.

A. Privacy Risks

ISO 27002: 18.1.4 (British Standard Institute, 2013) outlines the privacy and protection guidelines for any recordings made allowing individuals to be identified. In general, consent is required before recordings are carried out; as stated in the Data Protection Act (1998). However in some cases recordings can be made without consent, providing they are for personal use. Due to the academic context, it is likely that recordings will be for personal use, therefore teachers must understand their own ethical and human rights for being recorded and should ensure that all teaching material used in lectures is referenced to avoid copyright infringement (Copyright, Designs and Patents Act 1988).

Problems may arise however when dealing with students wearing Glass with prescription lenses installed or for disabled students. According to the Disability Discrimination Act (1995), these students should not be ‘substantially disadvantaged’, and in many cases this refers to need for more time to understand and record lectures (Dyer, 2013). Recording using Glass therefore seems a viable and effective option for these students, and allowances should be made for these students.

B. Security Risks

Security risks are always going to be a problem when implementing a new type of technology. Three frameworks: ISO 27002, COBIT and ITIL provide guidelines and advise on dealing with these risks.

1) User Authorisation/Access Rights

Most universities already have strict authorisation policies in place allowing for various access rights depending on the user and their requirements. This is in accordance with COBIT: DS5.2, DS5.4 to DS5.6 and ITIL: Information Security Management guidelines (COBIT, 2013; ITIL, 2013).

The difficulty with Google Glass is that the majority of the devices will be belong to the individual (and bought into the university), therefore the only authorisation which can be controlled by the university is access to the universities network/internet. Unless the device is owned by the university, in which case records should be kept to identify users and the relevant training/user accounts created per device (or per use of device) to meet the guidelines put forward in COBIT section DS5.4 (COBIT, 2013).

A BYOD (Bring Your Own Device) policy should therefore be created/update to ensure the above framework guidelines are considered. ISO 27002 takes this further and suggests that training should also be provided, teaching users about security threats and prevention methods (British Standard Institute, 2013).

2) Network Security

Network access can be restricted depending on the user (for example, teachers may have access to all websites, and students only have access to certain websites). COBIT: DS5.20 suggests this is essential for ensuring that the universities network remains secure from unauthorised users downloading viruses or malware onto the universities system (COBIT, 2013). As the majority of users will connect their Glasses to the universities network, it may also be beneficial for the university to expect more demand (given that the Glasses will be activated throughout the day).

3) Anti-Theft Protection

With data, privacy and the network now secure, physical theft must now be considered. In accordance with ISO 27002: 8.3.1. Due to current lack of authorisation for accessing the Glasses, it is essential that all devices are stored in secure and safe environment, under the supervision of administrations/technicians, as suggested by ISO 27002: 11 (Arthur, 2013; ISO 27002, British Standard Institute 2013).

4) Maintenance, Surveillance and Recording

In addition to the above, records should be kept for each device (and/or user) detailing the condition of the device and any events or issues to meet the guidelines put forth in COBIT: DS5.7 (2013). This reduces the chance of any problems occurring and acts as another deterrent for untrustworthy users.

Fortunately, maintenance (on a software/operating system level) is automatically managed by Google; and therefore the devices should only need to be checked and general maintenance carried out (for example, resetting the user accounts, reinstalling applications) (Matteson, 2013). By recording any issues and monitoring the device maintenance the university will also be performing management/risk assessments, as suggested in ISO 20000 (British Standard Institute, 2012).

C. Social Implications

In addition to the training received when the devices authorised, additional training should also be provided to teach users how to react in social situations (for example, maintaining eye contact in conversations) (Miller, 2013). By doing this, the university minimises the potential for people and users becoming alienated by the devices; and therefore protects
the comfortable environment required for productive learning (Lupton, 2013).

D. User Risks and Ethical Choices

The previously mentioned BYOD policy, should also reference tools for the user to determine whether a certain act or behaviour is suitable or not (for example, when it is suitable to record) to meet the guidelines suggested in COBIT: DS5.8 (2013). By doing this the university is also teaching the user to build ethical understanding, building on the work of The Critical Pedagogy Theory. (Amsler and Canaan, 2013)

IV. CONCLUSION(S)/RECOMMENDATIONS

Google Glass offers not only advanced technological features, but also the chance for a new approach to teaching to be established, meeting the expectations of students to receive quality and flexible teaching. Following the guidelines discussed above, and considering existing policies, universities will be able to meet these expectations with ease and create the foundations for a more sustainable approach to teaching and learning for the future.
V. REFERENCES


Social Networking In Education

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Abstract — In a day and age where Social Media is such a common part of the everyday life of a student from communicating with friends, connecting with others, and sharing multimedia content. It is an untested market that can play an integral part of a student’s life to ultimately improve numerous areas for those at the University of Derby. This paper will look at exactly how the implementation can outright effect the students of the university to benefit their experience. The question over whether the benefits of introducing social analytics would be worth the cost and outweigh the issues that arise such as governance ethics and compliance. Social Analytics is a technology that is emerging as a very common practice within organizations that has thus far been overlooked in the education workplace. This paper will justify the reasoning behind the impact that it could potentially have if introduced.

Index Terms—Governance, framework, technology, implementation.

I. INTRODUCTION

It is becoming increasingly difficult to ignore the up rise of social media. It is no longer that the purpose of social media is to socialize with friends and microblogging. The world is ever evolving and with it, the way we use technology to influence man. Social media has grown to such an extent that it is a commonly used technology to broadcast news; promote a brand or a cause; and even start up a business (Gordhamer, 2009).

So in a world where this technology is having such an impact on the everyday life in society, how has social networking not had more of an impact in an essential part of life, education? It does not seem unreasonable to presume that this technology can be implemented in educational institutes, especially when social media and the internet is indefinitely accessible.

This paper introduces Social media, also known as Web 2.0 as an emerging technology which can be implemented into the university infrastructure in order for students to reap the benefits of which are not yet available to them. Firstly we must delve into the area of Social Analytics to dissect it and identify exactly what Social Analytics is and what the key aspects are.

With the implantation of a new technology there are understandably governance issues that must be considered. This is an area that is looked at in depth with a proposed strategy that will allow the technology to be introduced whilst complying with the inevitable risks. A suitable framework is essential for the success of introducing a new technology and will assist the implementation of the chosen technology (Gordhamer, 2009).

A. The influx of social media

The regular age of students moving into higher education is of 17 and 18 years, with this age bracket resulting in a majority figure of 42.7% with 43.8% being the total percentage of students combined age groups between 19 – 29 years old. (HESA. 2013). With this in mind it would be valuable to note the statistics related to those of which regularly use social media. The introduction of new technology to the university would require the knowledge that it is related to the target market to analyse whether it would be of use to them. Social media has grown in a rapid manner with the most active group being teens and young adults. Lenhart et al. (2010) claims that 93% of teens aged 12 - 17, and similarly 93% of young adults aged 18 – 29, are regular users of social media. From these figures it would suggest that the target audience for this technology, which in this case are the students of the University of Derby, would be inclined to use social networking and would adapt to it in reasonable fashion.

B. The Benefits of Social Analytics

Web 2.0 has brought about an argument that states the sites that are linked to social networking introduce a form of informal learning (Lockyer and Patterson, 2008). This theory is based on the pattern that is apparent from how social media is used such as the interaction between peers which enable them to share ideas on a subject, and providing feedback to one another which ultimately encourages students to engage with each other, all processed outside of the normal educational environment.

There are a number of benefits that arise from the idea of informal learning and from introducing social networking into the education system. First and foremost with the principle of this technology being network based it means that it is extremely accessible. This is now very much the case with the availability of much faster broadband speeds and network connectivity wherever you go with the use of 3G/4G in conjunction with smartphones (Hung and Yuen, 2010). Students will no longer have to come together to the university to acquire learning material, and in advanced cases, be able to view lectures and seminars from home.

Informal learning plays on learning in an informal setting, for example a student carrying on his study in the comfort of his/her own home. Russo, Watkins and Groundwater (2009) has depicted that there is a sense of calm among those using
social media to learn giving them encouragement to participate within local existing communities. This is an aspect which students tend to shy away from when being in the physical presence of fellow students which would most probably make them reluctant to participate at all.

Social networking drives the ability to communicate with everyone, be it though instant messaging, email, and voice and video chat. The advancement of communicating methods has given a breadth of flexibility and opportunity. Lockyer and Patterson (2008) analyses network based learning, how teaching itself can be performed solely over a network with the use of video chat. She examines a subject delivered to students, of which was performed on a weekly basis. From doing this students were able to present their work while being able to give and receive feedback. Students were able to share multimedia content though a social application and communicate with one another through forums and threads. Throughout the class there was constant activity. This was all conducted by current available technologies. This resulted in the realisation that with the use of modern day technology, students are much more flexible and can acquire the information required at any given time.

The access to an education based social network also has non-technological benefits to the student, more so benefiting to their own personal traits and skills. A study conducted by (Connolly. 2011) suggests that students tend to use social media to become well established with peers to reduce shyness and to get a better understanding of their backgrounds. This would help in cases where group activities are required, getting to know one another can help build a relationship much quicker as well as being able to develop leadership skills, planning and organisation, which would ultimately promote social change and democratic engagement. This will also help their communicating and socialising skills which would be very useful in the long run, primarily in the workplace, when interviewing and giving presentations.

II. EVALUATION OF GOVERNANCE ISSUES

When preparing to implement a new technology there are a number of issues that need to be addressed in order to make sure there will be no issues in the future. First of all the governance issues need to be looked at to make sure that the new technology is following the correct procedures. In order to do this it would be beneficial to look at the risks that are involved with social networking in education. By identifying these risks it would give a clearer picture as to how these can be avoided and what measures can be introduced which can assist this.

Introducing social media into education is a highly sensitive operation due to the sensitivity of the data that is being handled and the repercussions that could result from the mishandling of such data. The importance of corporate governance can be measured by the affect that it can have on stakeholders if not followed correctly (Lazonick and O’Sullivan, 2000).

A. Risks of social networking in education

According to Beer and Burrows (2007) there is a concern regarding the property rights of intellectual content due to the fact that the distribution of online content does not hinder the propriety rights. This is crucially important as content that has been distributed over the internet would make it possible to alter the content and be redistribute, and not necessarily be of correct information. From the social network applications that are available that are commonly known to students of university’s such as Facebook and YouTube, the control over these applications is extremely limited from education institutions (Kirkpatrick, 2013)

The web has seen a rise in social websites that promote self-produced content, through such sites as YouTube, and ‘wiki’ sites with Wikipedia being the most notable. Such sites are reliant on users to contribute to the content which in many cases are vastly edited to the point where it is almost opinion or presumption (Selwyn. 2007).

There is always a risk of personal information becoming public when using social media websites. First of all there is a lack of security control which limits the influence academic personnel can have when trying to secure certain information. With students having to upload personal information about themselves, any leakage of their information can be in conflict with the Data Protection Act 1998. Cain (2008) particularly it would violate the processing of data on identifiable living people, and the protection of one’s personal data.

Social media websites are originally used by the users to socialise and micro-blog to friends and family, this will always be a distraction when in regards to using the sites for educational purposes. A study conducted by (Boogart, 2007) discovered that there was a definite trend in the number of students that regularly use social media sites to be linked with lower grades as opposed to those that access these same sites. With student’s current involvement with social media being informal and used primarily within their own time, it would be a contrasting change to be expected to use and accept the same technologies as learning tools.

Regular use of social networks between students and educational personnel would raise questions regarding the extent of a student’s relationship with their teacher and what is deemed appropriate behaviour, ultimately, where should the line be drawn? There have been many a case where action has been required due to inappropriate content between a student and a teacher, this will be a risk that will be apparent with the regular use of social websites for educational purposes (Cain. 2007).

Mixing a technology that is used as an informal tool for socialising to a form of education may become complicated in the respect that the image a student presents of one’s self may not necessarily be an image an educational institute may approve of (Cain. 2007). This is an area of consideration that the university must ask of itself, are they willing to mix the nature of a student’s personality and outside life with the tools that they use to educate their students? Cain (2007) has discovered that universities across the UK and USA already take actions to keep the image of their institutions ‘clean’ and to protect the identities of the students themselves by mandating ‘sterile’ profiles, or banning social media profiles, such as Facebook, altogether.
The archiving of the content that is produced within social applications can cause implications. This is due to the fact that even though the many of the content is produced through blogs and wikis, archiving and distributing such content may not have the permission of the creator of the content (Day, 2003).

**B. Sustainability**

Implementing a new technology into the university needs not to just make in immediate impact but it needs to be affective in the long run. Morwood (1998) describes business continuity by declaring that the technology could effectively fail, or in worst case scenario, the business itself could derail, without the consideration of the sustainability of a new service.

Social media has the functionality to update all the time meaning it is possible to keep it up to date for a considerable time. The fact that social media sites are application based as opposed to software based means that the university will not necessarily require to purchase or install software to introduce this technology (Anderson, 2007), this will then put the emphasis on the fact that the social applications will be functional in the future with updates being applied to the applications by the owners.

An area that is very important for the continuity of this technology is the fact that Web 2.0 is completely network based and requires an internet connection. If this network goes down then it would detriment to the functioning of the service. But it is not only the university that would require to maintain an internet connection. The idea of informal learning is based on learning in informal environments therefore to receive the data they must have a running connection. This could become a damaging for the university and would be difficult to rectify.

**III. GOVERNANCE STRATEGY PROPOSAL**

It is important to set a strategy guide for the university to follow in order for each stakeholder of the institute to know what their role is with the new service and how exactly to use it. Introducing frameworks is imperative for the success of the company which provide many benefits. A strategy proposal will direct a business is the direction that is best to follow and tend to state timescales to help the business to meet (Braganza and Lambert, 2000). First and foremost it does not require the involvement of experts to provide strategic help, which ultimately means that there is not a need to pay for extra services. Johnson and Scholes (1993) proclaims that introducing strategic governance frameworks benefits non-profit organisations in an otherwise competitive environment. This paper will look at the different strategy governance frameworks that are most appropriate for the university to implement for the use of the proposed service. It is not only one framework that could be proposed for the implementation of this service, multiple frameworks may apply to the success of the service; it’s just a case of identifying the most suitable.

**A. ITIL**

One of the areas that the university need to look at is the management related to the service before it is implemented. When a brand new service is introduced into a business it is imperative for the different stakeholders to realise their roles and how to handle the service itself (OGC, 2001). For this reason the practise that is most appropriate for this area of technology would be the Information Technology Infrastructure (ITIL). The university is a non-profit organisation, for this reason it would be beneficial for them to have a practise that helps reduce costs but allows for maximum productivity (Johnson and Scholes, 1993). This is where ITIL is most valuable. The purpose of ITIL is to guide organisations to introduce IT tools to promote modern day change which facilitate sustainable growth which will save money. This is even more important when considering that web 2.0 is an ever evolving technology that update on a regular basis, it is imperative that the university is able to keep up-to-date with these changes to be able to apply these changes whenever they are needed.

In addition ITIL can lay the necessary foundation of which is required for the implementation of a new service. The university can benefit from having a timeframe that they can apply and follow in order to meet targets and regulatory compliance requirements. One of the main issues that could face the university with this service is the result if ever the service went down and halted processes. ITIL is an effective practise that calculates risks to reduce the time to restore the service as efficiently as possible with its incident management system (Arraj, 2013).

ITIL will only accommodate the delivery of the new service to maximise efficiency but there is also a need for practises to secure the service. With this being the case, the fact that ITIL can be adapted and used in conjunction with practises such as ISO 27002 (Arraj, 2013).

**B. ISO 27002-2013**

The university requires the need to implement an Information Security Management System (ISMS). ISO 27002-2013 will be effective for the requirements of the university to implement web 2.0. This standard is designed to give guidance to organisations that are implementing information security controls by considering the environments that it is required for and the potential security risks and threat that could prevail as a result from lack of security (British Standard Institute, 2013).

The use of social media in education is a sensitive subject due to the sensitivity of the personal data that is handled and the public exposure from using this technology. This makes the subject of security very important. Section 12 of the refers to the control of transferring software, stating that transferring data needs to be defined and documented. There will be regular transferring of data and software between students and academic members of staff. This will allow for safe transferring and identifying the proprietors of data which will prevent copyright and plagiarism laws.

The main security issue regarding using social media is confidentiality with possible exposure of personal information. Sections 13 and 14 of the refer to control over both messaging and confidentiality, respectively. This will protect the identities of the students and will keep the communications private between the relevant parties. More specifically regarding secure application services on public networks identifies
exactly how the university should go about ensuring correct authorization procedures are followed, along with keeping integrity, a level of trust, and liability attached with fraudulent transactions (British Standard Institute, 2013). These areas are all very important that are of huge importance and should be of the interest of the university to follow.

Applying a combination of the ISO 27002 standard with ITIL will benefit the implementation of social media for educational purposes which will guide the development with clear justification of this governance strategy.

IV. CONCLUSION

Web 2.0 is still a reasonably new technology that is still in early development. This paper has identified the obvious potential that this technology possesses of which can be of huge benefit to the university and in education itself. There are still risks that threaten the success of the technology and are resolvable in time and can be done with an efficient and effective governance strategy using the practises proposed. Web 2.0 has a place in education but questions are being asked over whether it is developed enough at this stage in time.
V. REFERENCES


Abstract—This study is will demonstrate whether the use of NFC technology will benefit the stakeholders of the University of Derby. NFC is a growing technology which is a contactless method of performing daily tasks in a smarter and efficient way. This paper explores the ways in which using NFC technology can either add value or hinder the students of the university within a wide range of areas. By critically evaluating the sustainable governance issues on the technology, the risks and impact it has on business practices there will be an evaluation. How this technology will work is that there will be an embedded NFC chip in smart devices as well as NFC capable smart cards. This will enable to stakeholders to purchase goods, loan university equipment, pay for parking and pay for the university transport. The governance issues that will be discussed includes whether the proposed technology is legal, safe and reliable for the stakeholders involved. The identification of three governance related questions will be answered in order to justify the outcome of the NFC incorporated technology.

Index Terms— NFC, Student Authentication, Risk Management, RFID, Mitigating Factors

I. INTRODUCTION

With the current advancements and growth in technology it is possible that the use of technology can add value to its stakeholders. Therefore, Near Field Communication has the capabilities to have a positive influence on how the University of Derby stakeholders handle routine daily tasks. The key are in which the technology will benefit the stakeholder is identification and authentication. NFC has the capabilities to provide this, Chen et al. (2010) states that NFC has the capabilities of proposing authentication and identification that can simplify NFC as an infrastructure (p.83). Other areas in which the technology would make an impact are is when purchasing items, loaning books, car park payments, paying for travel to and from the university campuses. This technology would enable the stakeholders to access a variety different things by utilizing the capabilities of NFC. This technology is also a service that the students will be able to make use of. According to Agrassla (2012) an IT service is a way of delivering value to stakeholders by facilitating the outcome to what the customers want. Thus, the NFC technology can add value to the stakeholders buy meeting their daily demands.

A. Benefits

Smartphone usage is continually growing based on the technological advancements in mobile technology. The research of Joo and Sang (2013) states that mobile usage has significantly increased in many parts of the world including Korea due to the fact that there are many things that can be achieved through the use of smart devices (p.2513). This compelled the choice of selecting NFC technology as a means to improving various aspects of university student’s experience. The reason being is that NFC can be integrated in smartphones that would enable intelligent and sophisticated transactions to occur. With more people having access to smart devices such as smart phones the integration of NFC would benefit a wide variety of students. This is an advantage as more students will benefit from the advancements of NFC as it is more accessible.

NFC enables short range communication between two compatible devices. The study of Triggs (2013) states that NFC requires at the very minimum one transmitting device and the other device to receive the signal. Active NFC devices are both able to send and receive data which allows them to communicate with each other. How this technology will be implemented to benefit the students will be an incorporation of NFC into the all smartphone devices. Smart devices are not the only tool that has the capabilities to make use of NFC. Smart cards are also able to be used in NFC transactions as a proof of identity. Juntunen, Luukkainen and Tuunainen (2010) suggests that identification of users can be recognised using NFC. We are at a stage where everything is becoming smarter and NFC technology is growing within smartphone devices. A benefit if NFC that it has a fast connectivity rate even though the range it is capable of is short. Triggs (2013) states that although NFC is limited in terms of range it makes up for that with the speed of connection.

Shen, Wu and Lee (2013) have proposed that with the use of RFID coupled with NFC technology that it can significantly improve the learning environment of students. Furthermore, due to the smart features of NFC technology, it the ability to automate attendance, locate students, and provide student feedback in real-time. The use of NFC technology in devices is beneficial as it has the capability of combining a number of important things into one device. This is portrayed in the study of Carter (2012) as it suggests that the use of NFC in smartphones have the abilities for being multiple important
items that we need for our daily living. The research suggests that NFC can compensate for travel passes, wallets, credit cards and proof of identification. What NFC is currently doing at the moment is identifying people and things connected to those people like a bank accounts or IDs to a computer. RFID is the technology behind NFC that is a short range, low powered wireless link that allows data to transfer between two devices.

Furthermore, as well as improving learning environments for students, NFC can also benefit the stakeholders as a means of a payment method. Tan et al. (2013) suggests that the advancements in mobile technology has enabled more sophisticated methods of payment. The students will be able to benefit from paying for services, goods and bills including parking tickets with a mobile devices or smart cards. This is because mobile technology is taking advantage of wireless and other communication technology. Simplicity is another advantage of NFC technology according to Madlmayr et al. (2008). Transactions are initialised automatically by touching a reader or another NFC device. Likewise, Madlmayr et al. (2008) states that NFC has the ability to add more functionality to a smart mobile device by using it as a credit card or contactless bus ticket.

II. EVALUATION OF GOVERNANCE ISSUES

A. Justifying the Governance Framework

There are many different factors that need to be in place in order for the new technology to be implemented within the university. Calder and Watkins (2005) state that IT governance is the framework for the leadership, organisational structures and business processes, standards and compliance of the standards which ensures that the organisation information systems support and enable achievement of its strategies and objectives. Furthermore, corporate governance can be referred to a set of systems, principles and processes that a particular organisation is governed, (Thomson, 2009). There are certain aspects of the technology that needs to be looked at before any implementation is to take place. This is to ensure that the integration of the technology will give maximum benefit to the users whilst ensuring that the technology is secure to use. There are certain governance issues that need to be taken into consideration for the implementation of the new technology. This relates to the certain questions that will be proposed regarding the confidentiality, integrity and the availability of the students. The technology that is being proposed involves personal data of students therefore it is required that the governance issues include security elements, sustainability of the technology, risks and theft.

1) ISO 27002

There are fundamental issues that need to be addressed before any implementation of the emerging technology. It is required that the governance issues are thought about to reduce security threats against the stakeholders. There are certain frameworks that are able address these issues which will be discussed in the governance strategy proposal section. There are certain guideline and reasons for this as it is important that stakeholder information are kept safe and secure. Calder and Watkins (2005) states that all organisations face risks from one sort to another on a regular basis. Therefore, risk management is a discipline that exists to address the issues. This has raised certain factors that would be discussed including threats, risks, and the confidentiality, integrity and availability issues relating the incorporation of NFC in the University of Derby. Calder and Watkins (2005) states the ISO27002:2013 (British Standard Institute, 2013) identifies three sources for establishing an organisations information security requirements. These are the risks that the organisation continually face. Another issue is that the risks arising from compliance and contractual requirements forced on the organisation in each of the authorities in which it operates. Finally, the set of principles, objectives, and requirements for information processing that the organisation has developed to support its operation. This is critical in the current context as safety and integrity of information of the stakeholders of the university is vital.

2) ITIL

The best practice framework depicted in ITIL are important as it addresses issues relating to the effectiveness of governance of IT activities on the delivery of the technology as a service, OGC (2001). In addition, a management framework is necessary as a result everyone involve will know what to do. Best practices also provide benefits including improved efficiency, less reliance on experts, fewer errors and increased trust in business partners. For the successful implementation of the NFC technology within the University of Derby these issues would need to be addressed. Furthermore, OGC (2001) suggests that the implementation of best practices should be appropriate for the organisation. The issues raised in the sections below will have to be addressed before implementation of the technology in the university. This is to ensure that the technology is complying with governance standards and to make sure that information is kept secure.

B. Confidentiality, Integrity and Availability

In order to benefit the university students experience it is advisable to know the governance principles. Calder and Watkins (2005) suggests that security is a very important factor when personal information is people are involved (p.74) identifies confidentiality as ensuring that the information is accessible to only those who are authorised to have the access. This could be a major issues as students of the university may pass on their devices to friends for them to use. This is violating the confidentiality of the technology and is a governance issue that needs to be addressed. By protection the accuracy and completeness of information and processing methods by protecting against unauthorised modification relates to the integrity factors. This will overcome the chances of other people making and amendments to someone else’s account. Another key governance principle that was depicted in Calder and Watkins (2005) is the availability of the technology (p.74-75). This ensures that authorised users have access to the information when required.

C. Risks Involving NFC

Combining a wireless communication technology like NFC with applications such as payment or identification can increase
possible privacy and security risks. Madlmayr et al. (2008) raises the point that attacks against an NFC device may not be noticed by the victim and the attacks can be performed anywhere. Payment functionality can be abused by attackers which can lead to privacy issues. Consequently, the integration of both technology and the applications needs to be both secure to protect the device and the stakeholder.

The ease of use of NFC technology can indirectly introduce a security or privacy concern. Cavoukian (2011) suggests this by stating if the NFC request is an attack that is trying to make a data connection to an untrusted service or to share unwanted or threatening content, or to a Bluetooth pairing with an attacking entity. Subsequently, these threats can result into risks such as phishing for personal data from an attacking internet site as well as deploying unsolicited peer-to-peer malware that can produce unwanted leakage of personal data.

**D. Threats**

NFC is vulnerable to certain attacks which can lead the stakeholders involved suffering from loss of data and privacy fears. Madlmayr et al. (2008) denial of service may arise because the user may touch an NFC device on a reader with an empty tag (p.644). This will still cause a reaction from the device even if it is an error message and will still occupy the device. Therefore, there needs to be a mechanism that is controlled by the stakeholder to turn the device on and off the NFC read/write functionality.

Modification of data can occur when someone else uses a device to modify information that is being sent by the user. NFC (2013) states that jamming devices will be able to intercept and delete information that was sent.

There are various frameworks that allow businesses and organisations to improve an areas to make the organisations successful. Areas to improve could be security issues, improving reliability of systems and an improvements in management of IT within the organisation. Having discussed the issues of the incorporation of NFC in the University of Derby, there are frameworks that could mitigate the pitfalls of NFC technology.

**III. GOVERNANCE STRATEGY PROPOSAL**

**A. Justification of Strategic Policies**

To ensure that the development of NFC in the University of Derby, relevant frameworks will be used to mitigate the issues stated above. Governance frameworks are important to an organisation like a university as it is able to provide ways to combat governance issues.

There are particular frameworks that are targeted to eradicate the governance issues relating the incorporation of NFC technology in the university. Steinberg et al. (2004) suggest that risk management integrated framework is a way of identifying potential events that may affect stakeholders, manage risks and provide assurance relating to the meeting the demands of the stakeholders involved or who may be affected by the emerging technology. Steinberg et al. (2004) states that achieving the goals of the risk management framework is based on four categories. The first is strategic which relates to high level goals associated with and supporting its objective. This is how the use of NFC will be used to add value to the stakeholders at the university. The use of technology is not always the answer to make things better as failures can occur with the use of IT. Therefore, it is imperative that the strategy of the risk management framework targets these issues. On implementing the NFC technology it is required that it is used effectively and efficiently otherwise the student will not benefit from it. This is related to the operations as the technology is a resource that the stakeholders will be able to make use of. The emerging technology must comply with applicable laws and government regulations.

Mendonca and Basili (2000) states that measurement framework is able to measure all that a user needs to achieve their goals (p.484). This is important as the NFC technology is in place to improve the stakeholders in what they need the technology for. This framework will enable the stakeholders to benefit from the technology as it measures what their goals are in a consistent way.

**B. Solving Confidentiality, Integrity and Availability issues**

Threats to the technology are often external which includes hackers or even suppliers, (Calder and Watkins 2005). However, it is beneficial to the university to identify the possible vulnerabilities and threats of the technology. This would enable more focus to eradicate those threats from occurring. There is a need for information security as it is a way of protection against threats, (Calder and Watkins 2005). This would maximise the benefits that the stakeholders can gain from the technology as information would be secure. ISO 27002 (British Standard Institute, 2013) further emphasises that appropriate control rules, access rights and restrictions for specific users of the technology must be assigned. This would allow the designated user to access their own information, thus conforming to availability.

**C. Overcoming risks of NFC**

ISACA (2011) states that there are concerns about NFC technology however there are ways in which there risks can be avoided. One way of ensuring safety is for appropriate safeguards to be implemented as well as privacy and governance programs from the financial providers. In addition, in terms of protection of identity, a two-factor authentication will add to a more effective identity protection for the stakeholder and a high identity assurance to the organisation. Data classification during the transactions and storage of data is also an important issues. The university should distinguish data that is personal and sensitive and ensure that appropriate mechanisms are in place.

**D. Minimising the threats of NFC**

Threats from attackers can be serious as people’s personal information is at risk. To deter these things from happening, (ACMA 2013, p.17) suggests that a way to deter attacks on the NFC system is to develop best practice guidance to deal with encryption of NFC signals (p.17). This will seek to increase the security features, thus ensures that such threats from attackers
are eradicated. This will be beneficial as the stakeholders will be able to fully access and make use of the technology. Moreover, the university should be able to define an information security policy that has been approved by the management of the university. These will set out the universities approach in managing its information security goals, (ISO 27002, British Standard Institute, 2013). Subsequently, information security policies must addresses requirements such as business strategy, regulations, legislation, contracts and the current and projected information security environment. To be able to meet the demands of the stakeholders of the University of Derby the information security policy must be supported by specific policies which would enhance the implementation of NFC technology.

IV. CONCLUSION

For the implementation of NFC technology in the University of Derby it is required that the governance issues that were stated earlier are addressed. This was done by using various frameworks that was related to the issues as a way of mitigating the various governance issues. This would successfully reduce and fully eradicate the threats from occurring and enable the incorporation of the technology. The analysis of the framework also ensures whether the technology would add value to the stakeholder involved.
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A Critical Evaluation Of The Strategic Governance Issues Involved In Implementing Social Networking Technologies Into University Teaching And Learning

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Abstract— online communications are constantly developed and rapidly evolved allowing for the creation of new forms of media. This form of new media now allows for the creation of new forms of messages and online experiences that may lead to interpersonal online interactions across networking channels and the formation of virtual networking communities. Technology, economics and public policies that underline all forms of education have shifted to include using emerging technologies. Educators now need to implement new strategies for their teaching and learning. However, these events bring a plethora of strategic governance issues. The report identifies the following governance issues involved with implementing social networking technologies. The governance issues involved are a consideration of business ethics and plagiarism, cyberstalking with an emphasis on cyberbullying. Information security with an emphasis on data protection, privacy, and confidentiality as well as compliance and value. The report will then identify an appropriate governance framework that mitigates these issues. The emphasis is not on proving the validity of issues but on the provision of a secure structure that guides the implementation of the technologies into H.E. teaching and learning.

Index Terms— Communications, Emerging technology, Higher Education, Governance issues, Media, Social networking.

I. INTRODUCTION

The purpose of this report is to present a critical evaluation of the strategic governance issues involved with implementing social networking technologies into H.E. teaching and learning. Social networking has rapidly become prevalent in society and individual’s use of online media and online applications has grown in popularity in recent years (Calvert & Pempkek & Yermolayeva, 2009). The report proposes implementing social networking technologies into University teaching and learning. However, before this implementation can be done there are questions to be asked about using social network technologies.

There are a wide range of governance issues that have a major impact on implementing social networking technologies but what are these governance issues. It is crucial to understand why governance issues are important to the developing and implementing of new technologies. While research shows the benefits and the disadvantages in using social networking technologies (Collin et al, 2011) it is also important to have a full understanding of how the use of the technologies in a H.E. context can provide other learning options for students and academics. There is evidence showing that social networks have been around a long time (Goble, 2012) but the use of emerging technologies is now bringing its own concerns. It is due to the aforementioned that the emphasis is on developing a governance strategy that assists and guides the process of implementing the correct framework because this can resolve many of these governance issues.

A. Key Aspects

Social networks are reliant on the effective communication between people and their commonalities (Serrat, 2008). Serrat (2008) defines commonalities as common characteristics which enable online user’s the opportunity to create social networks based purely on their characteristics or commonalities. Online communication tools allow users opportunities to create their own private or public profile. This communication tool also allows them to view and use social networks for the facilitating and sharing of knowledge. This event may lead to effective collaboration between a variety of online users. While it may also lead to the creation of social networking relationships and the sharing of online network connections (Espinoza et al, 2008). The online communication forums are varied and multifaceted and many individuals and organisations use online forums and social networks as part of their daily life (Digizen, 2013). Recent research suggests that students use social networking to communicate with their peers (Digizen, 2013). This form of online communication enables and allows for academic and social integration among students (Bartle, Dorum and Pennington, 2010). The Investopedia website (Investopedia, 2013) mentions that ‘social networking is the use of internet based social media programs that enable connections to be made across a broad spectrum’. Social networks have been around since the 1970’s. Goble (2012) mentions that bulletin boards were prevalent at that time and they were online meeting places. The bulletin boards ‘allowed users to communicate with a central system where they could download files or computing games and post messages to others’ (Rheingold, 2008). Research suggests that social networking technologies have become widely used for the posting of online messaging and this practice is mainly among the younger people (Collin et al, 2011).
B. Affected aspect-social and academic integration

An aspect of the student experience that could be affected involves social and academic integration (Osterman, 2000). Students face new and exciting challenges and are required to show an acceptance of academic responsibilities (UOD, 2013). There is evidence within previous research showing that a sense of belonging and cohesion with a particular University (Osterman, 2000) is a requirement for many students allowing for them to properly function within the learning environment (Bartle, Dorum and Pennington, 2010). Students who have started and settled into this environment rely on using social networking to acquire new friendships and relationships with other students (Collin et al, 2011). Previous research shows students go through an emotional change during this period of integration (Valentine, 1955) and research in psychology by (Maslow, 1943) shows that individuals need to fulfil basic steps before they can progress. He suggests that all individuals have social needs and it is these social needs that are important for a sense of belonging because they provide a sense of security while keeping individuals safe (McLeod, 2007).

C. What are the Benefits

There are a broad range of benefits to social network use. However, as today’s online and networked media environment rapidly change to involve digital complexity and web liter cy there is a need for students to have an understanding of what is meant by digital and media literacy (Collin, 2011). As Collin et al., (2011) point out there are a number of components to digital and media literacy and students need to develop knowledge and skills to participate and stay safe in this digital media environment (Collin et al, 2011). Media literacy involves the development of skill and knowledge to use computers. This allows opportunities for creating content and access to software programs, web browsers, visual literacy and communication tools (Collin et al., 2011) providing students with choices and options in how they learn alongside traditional teaching (Hay, 2010). Research suggests social networking services aid and support the learning of media literacy (Collin et al., 2011). Perkel (2008) suggests that technical literacy can be developed by using online services such as Myspace that allows the creating and sharing of content as people can create a personal profile by learning and using code which leads to individual identity and self-expression (Perkel, 2008). This event has an effect on building and strengthening of social relationships as common characteristics begin forming allowing for collective identity and well-being (Perkel, 2008). A collective identity improves student engagement particularly for students who do not feel comfortable in expressing themselves face to face and prefer the use of social networks to communicate (Collin et al, 2011). Students can network with others, establish a web presence and upload a curriculum vitae with a covering letter on social networking sites such as LinkedIn (NUS, 2013). Communication links between students and educators improve because this tool enables them to post messages, assignments and online content. Lecturers can respond and engage in online group discussions (Digizen, 2013). Social network engagement enables collaboration which allows for social identity which in turn allows for maintaining emotional engagement (Gemmil & Peterson, 2006). Thus attempting to find a balance that allows for the effective use of the technology is now a priority.

D. What are the Disadvantages

The aforementioned theoretical perspectives discusses many benefits of social network use. However, Lederer (2012) points out that some educators have suggested that the use of social networking sites have an overall effect on students learning as they can be a distraction. These communication tools provide many students with opportunities to stop paying attention in class thus learning can be affected. Lederer (2012) points out that some educators have mentioned that students might be discouraged from expressing themselves in real life situations as social networking use provides a safe haven. There is recent evidence and research showing the use of social networking for cyberbullying and online harassment (Macdonald & Roberts-Pittman, 2012). Ultimately, learning can be affected by social network engagement. However if educators have strategies in place for learning engagement then concerns can be resolved.

II. EVALUATION OF GOVERNANCE ISSUES

This following section evaluates the governance issues that have an immediate impact on social networking technologies implementation. ISO 27002:2013 is incorporated and discussed as this implementation brings security concerns. Ikeepsafe.org (2013) provides a cyber-ethical framework and components of this are used because cyber-ethics are vital in business as they cover all areas of IT usage within business. A service is being provided and ITIL best-management practices is incorporated and discussed because a service has to show that it brings value to a business (ITIL V3, 2007). Government legislation is discussed as this covers law.

A. Ethics

Individual’s social and moral duty toward living in society and participating in the act of learning are important aspects to understanding their behaviour (Chambers & Chambers, 1850). For instance the issue of plagiarism within a University context can be seen as theft. An event such as this breaks the University code of ethics. There is recent evidence showing that the use of social networking can be problematic because plagiarism is a concern (University of Derby, 2013). Social networking allows individuals to share their ideas, thoughts and materials (Rheingold, 2008). Many H.E. establishments use recognised detection systems that check for plagiarism. The UOD uses a system known as ‘Turnitin’. This system checks submitted assignments against other works (University of Derby, 2013). If plagiarism has been committed then heavy penalties can be attributed to the individuals concerned. However, if individuals who participate in the act of learning follow the University code of ethics this may elevate some of the issues of plagiarism.
B. Cyberbullying

Cyberbullying is an issue because it is a fast growing trend (Webster, 2004). Being involved in this activity includes hurt, harassment, abuse and aggression of a victim via the use of technology (NCPC, 2013). This act can 'constitute criminal behaviour’ and students who participate in cyberbullying other students or lecturers can cause anxiety and stress and in some ‘extreme cases has led to suicides’ (Webster, 2004). Academic research mentions that students who have been cyberbullied have quit or dropped out of University due to the feeling of resentment (Childnetinternational, 2013). Current academic research on the issue of cyberbullying shows this to be an ongoing problem because it reaches a wide audience (Webster, 2004). There are currently ongoing campaigns cyberbullying to prevent cyberbullying (Social Media C4, 2013). Thus educating people and making them aware might help with this concern.

C. Information Security

Information Security is an issue because individuals engaging in the use of IT need to be made aware of the dangers involved (Gotsafeonline, 2013). Some dangers include viral infections and malware within media or downloaded files (Gotsafeonline, 2013). Online content can be leaked due to the lack of physical contact (Harris, 2009). The lack of physical contact can lead to the building of false profiles which can lure many into a ‘false sense of security’ (Digizen, 2013). This can lead to personal information being given out that gives cybercriminals (Digizen, 2013) opportunities to steal and use nefariously (NCPC, 2013). By paying attention to the use of secure information and being discreet with media files and other online users might prevent security issues (Social Media C4, 2013).

D. Privacy and Confidentiality

Engaging in social networking means that personal and private information has to be provided. However, ‘social networks do not necessarily guarantee the security of information that has been uploaded to a profile’ (Privacy Rights Clearing House, 2013). The issue of privacy has been discussed in a previous report in the New York Times that discussed a glitch within Facebook; this glitch led ‘to online user’s private information being disclosed’ ( Wortham, 2010). Within a H.E. context all personal and private information must be safeguarded and only shared with staff for University related purposes only (UOD, 2013). Information can be used but only when consent has been given (UOD, 2013). To elevate concerns a H.E. setting has guidelines in place that complement their code of ethics. Following these guidelines will help with privacy and confidentiality concerns.

E. Copyright and Trademark Infringement

Social networks and communication uses of the internet have now become an important part of people’s lives (Gemmil & Peterson, 2006). Therefore it is important to understand the issues of copyright and trademark infringement (Adler, 2011). This is important in the globalised world of interconnectedness and collaboration (UOD, 2013). Educators need to consider their online position with regards to copyright and trademark infringement laws when using or posting any online content (Anderton, 2013). Issues might be solved if users follow cyber-ethical standards of online behaviour.

F. Compliance

Compliance laws need to be adhered to as they prevent risks and mishaps. As seen from both Enron bankruptcy case and (Oppel Jr. and Sorkin, 2001) the WorldCom bankruptcy case (Romero and Atlas, 2002) compliance should be an important priority. Previous research on governance and compliance of IT specifically in H.E. suggests that IT compliance issues need to be resolved before leading to overall success. By developing policies and by communicating them in H.E and adhering to these policies can prevent risks and mishaps.

G. IT Value

IT is seen as a commodity (Carr, 2003). However, De Vera and Murray state in their report the Art of Listening (2013) that ‘you need to be intentional and have a larger vision’. Create develop and align smart objectives that allow for the tracking and monitoring progress of project and determine there are no competitors of this technology in the market. When proper ICT strategies and goals are implemented then customer and business value can be recognised.

III. GOVERNANCE STRATEGY PROPOSAL

The following section proposes and justifies implementing a governance framework. This framework will involve various components as each issue brings its own concerns of dignity and individuality. The speed of internet communication and development of new technologies allows users to do many things that have formed new shapes and discussed as urgent in the internet age. As such, involving various components that are relevant can mitigate these issues.

A. Ethics- Cyber-ethics and Plagiarism

To avoid the issue of plagiarism introduce a set of disciplined rules. Individuals who are using IT must follow the guidelines (ikeepsafe, 2013). Individuals are required to use appropriate and ethical behaviour, moral duties and obligations pertaining to the use of online environments and digital media (ikeepsafe, 2013) none adherence to the rules could result in IT privileges being revoked.

B. Cyberbullying- Cyberstalking

Introduce cyber-ethics rules that enable plans for exhibiting a responsibility and following netiquette when communicating digitally (ikeepsafe, 2013). Educate and make users aware of the effects of online actions. Put controls in place to prevent cyberbullying that includes the use of social media capture (Social Media C4, 2013). Social media capture allows for the reservation of all electronic evidence (Social Media C4, 2013). By making online users aware that electronic evidence can be traced back to the individual concerned for appropriate action to be taken may help with these issues.
C. Information Security-Risk/Fraud/Accidents

To overcome many issues that are shown in ISO 27002 in Ch. 16, 16.1.6. develop a knowledge of security incidents. Determine the business requirements for information security as this allows for the implementation of commonly accepted information security controls and aim to prevent accidents or risk of fraud (British Standard Institute, 2013).

D. Compliance and IT Value

To overcome many of the issues of compliance as shown in ISO 27002 Ch. 18, 18.1.4 identify legislation applicable to the business in order to meet requirements of the business. Complying with legislation enables value which is important for customers and stakeholders. Include ITIL best-management practice which looks at customer and business value. Business value will be measured in the success of the project (ITIL, 2013).

E. Student privacy and confidentiality

To overcome many of the privacy and confidentiality issues there are guideline set in H.E. Involve a privacy officer who is responsible for providing the guidance to managers, service providers and specific procedures that should be followed. (ISO 27002, British Standard Institute, 2013).

F. Student online security

To overcome many online security issues encourage and raise awareness through educational campaigns as best management practice throughout the University (Hogben, 2007).

IV. CONCLUSION

It can therefore be concluded from this critical evaluation that social networks are widely used and many organisations require but lack a social network strategy (McNamara, 2010). Research shows that social networking provides benefits but the use of this technology brings a range of concerns (Hay, 2010). There is evidence of governance issues involved with implementing social network technologies as discussed within. Therefore, this report recommends that organisations should implement ICT strategies that allow for the acceptance of new technology and leads to business longevity while solving issues because this is crucial to their overall success.


Biometrics

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Abstract—This report will reflect on how different types of Biometrics could be used to simplify the problems that students and staff of University are facing. Advantages of biometrics are going to be stated in relevance to students of University of Derby. Governance Issues like risks and ethics are going to be evaluated and also the framework is going to be introduced which is going to be suitable to overcome these issues.

Index Terms—Biometrics, framework, students, risks, types

I. INTRODUCTION

This report is going to reflect on the use of Biometrics for students and also different types of it. This report is also going to include the impact of Biometrics under Corporate governance on University of Derby. Issues such as aesthetics, compliance and risks are going to be evaluated that are presented by the integration of Biometrics into the University’s environment. Biometrics is identified to be the technology and science that establishes identity of a person depending on their behavioral, physical or chemical attributes. The demand of biometrics in modern society has gone up because of the need for large-scale identity management systems which work accurately in order to show the identity of a person in the context of a number of applications. (Jain, Flynn and Ross, 2008). Biometrics is usually used for two reasons, which are system Verification and identification system. Verification system occurs when a person’s identity is validated by comparing the biometric data that had been captured with the biometric template which is stored in the system database. The main purpose of verification is basically to receive positive recognition where the plan is to stop numerous people from using the same identity. One-to-one comparison is used in this system to decide whether a person’s identity is valid or not. Identification system occurs when a person is recognized by the search of all the templates of people in the database for a match. So one-to-many comparison is used by the system to establish a person’s identity. (Jain, Flynn and Ross, 2008).

A. Biometrics types and their benefits to students

Biometrics has two types; physiological biometrics and behavioral biometrics. Physiological biometrics consists of iris scan, retina scans, fingerprint, hand scan and facial scan; this is known to have more accuracy when compared to behavioral biometrics. Behavioral biometrics consists of user action, voice recognition, signature recognition and stroke recognition. (Coats et al., 2007). To improve the student’s experiences at the university the following biometric systems will be implemented.

- Fingerprint scanning – This system involves the use of fingerprints taken from a person’s hand. This process is known as fingerprint recognition. In this process a person’s finger is placed on a scanner and then scanner takes images of fingerprint. The use of ridges and valleys which are found on the surface tips of a finger are used to identify a person. (Kizza, 2013).
- Hand print recognition – This system takes a picture of the palm and side of person’s hand. This then analyses the thickness, width, contour of fingers and length of the hand. (Kim and Solmon, 2010, p.155).

Here are few advantages of Biometric authentication system:

- It improves security so no one can use other person’s identification of any form.
- People don’t need to worry about losing their ID cards or no one can borrow other person’s card to get access to something.
- Minimizes the risk of ID fraud.
- No other person can get access to your system apart from you. (Quest Biometrics, 2005)

There are loads of cases in where biometrics could be used for the students of Derby University. Currently students have to have a username and password to login to university’s computers. These passwords could be copied or seen by other people and also could be passed onto more people so this arises the security issue for this particular method. To overcome this issue, few of the biometrics types can come in handy such as using a hand print recognition method. Using the hand patterns, length of fingers and width of hand is going to identify a person and then login to their account. This will increase the security level as that specific student has to be present in order to login to the computer so no other person can use that student’s detail in order to get access to their account. Hand print recognition could be used to enter the university library. At the moment to get into library students have to swipe their ID cards, so any one can use other student’s ID card to get access to library even if they do not have the authorization to do so. So with the use of hand print recognition, this problem can be solved because that specific student has to be present there in order to get into the library so there won’t be any risk of an unauthorized person to get in the library. Printing is another sector where hand print recognition or finger print scanning could come in handy. At the moment when students print their work out, all of their work comes out in printer which piles up and then students have to look for their work and find exact amount of pages which is time consuming and different student’s work can get
mixed up or get lost. So by using either of these two biometrics technologies, this problem could be solved because print would only print when a student scans their hand or finger so printer would identify the student and print their work only so students don’t have to worry about their work getting mixed up or getting lost. Fingerprint scanning system could also be used to take attendance. At the moment University of Derby uses ID scanners to take attendance, with this fingerprint scanning system, student only need to scan their figures when they enter the class room or lecture. So student no longer have to carry their ID cards to every lesson.

II. GOVERNANCE ISSUES

This section is going to be about corporate governance issues. Corporate governance consists of processes, principles and systems by which a company is ruled. Corporate governance supply the guidelines which show the way of controlling and directing the company in a way that it can achieve its objectives and goals which would work out good for the company’s value and it would also benefit all the stakeholders in the long term. (Thompson, 2009).

Biometrics is a broad technology that has loads of benefits and various drawbacks. Biometrics is just like other technologies that deal with issues like risks, ethics and compliance. Biometrics has three normal disadvantages:

- Cost – Cost is one of the main disadvantages in most biometric systems. In this case fingerprint scanning and hand recognition are costly. Hardware for both of these biometric types must be installed at every location where they are required for authentication.
- Accepting unauthorized person – This error is caused by the scanning of various hand and finger characteristics and then compared after that. There is also possibility of thieving some other person’s characteristics by lifting a fingerprint of a person from a glass. (Ciampa, 2008).
- Change of characteristics – If a person is a rock climber or works at a place where their fingers and hands r used frequently with rough material such as gym weights and other rough accessories from the gym, there is a chance of their hand and finger characteristics changing. So when they scan their finger and hand on scanner, it might not authorize them even though that person is a valid user. (Schneier, 2009).

A. Corporate governance Risk Issue

There are several risk issues involved with the use of biometrics system. One of the main risk issues that is related to Identity and Authentication is biometric systems falling victim to two types of failures, a false positive and a false negative. False positive occurs when a system falsely identifies an invalid user as a valid user, so an unauthorised person could get access into the system by pretending to be someone else. A False negative occurs when system fails to identify a valid user by failing to match a valid user with the stored template, so a person is denied the access to the system even if they are authorised.(Hoang and Caudill, Date Unknown).

Another big risks is spoofing and Mimicry attacks, which could be dangerous where an artificial finger can be implemented which would deceive a fingerprint biometric sensor. There also pictures and speech synthesis tools which could miss lead the face and voice recognition system. Server side- Fake template risks could be another issue. Biometric templates are centrally stored in server based architectures, so threat comes from an imposter who can insert a template of someone else’s name in the system. Another risk factor is enrollment, administration and system use risk. If enrollment, administration and system procedures are poor, then it increases the system’s risk factor. During the enrollment process, biometric templates and raw biometric data could be compromised and database could be either changed or filled with inaccurate data. So weak system administration procedures could lead to changed system configuration files with increased FAR, which would make false recognition much easier and it would weaken the security. Noise and Power loss risk can also take place. This occurs when a biometric sensor is flooded with noise data such as changes into the temperature of a fingerprint sense or materials on the surface of a sensor, which could result in failure of biometric devices. (Dimitriadis and Polemi, 2004).

B. Corporate governance Ethic Issues

The use of biometric technology can result in many ethical issues. People might have concerns about the personal privacy, which would include the protection and use of personal biometric data. The public authority organisations argue that the technology weakens the human rights for secrecy and privacy. It is an interfering matter and is capable of making some serious effect on own freedom and democratic rights. (Shaikh, Date Unknown).

When talking about ethic issues related to Biometrics, there are two related issues Function creep and informatization of the body. Function creep is a term that is used to describe the development of a system. This occurs when data is collected for one specific reason and then is used for another unauthorized reason. Function creep symbolises a serious break of the ethical principle where an agent is required to be honest and take responsibility of the actions they make. Looking at from a political viewpoint function creep seriously breaks public’s trust and tends to destroy belief in biometrics systems. Function creep is the main issue which consists of the most problems that relate to data protection and privacy in biometrics applications. There are two different situations when it comes to analyzing function creep in depth thunder biometric systems. First situation is when biometric identification is not just used for the purpose which the system was implemented for, but beyond the limits of its purpose. Second situation is when biometric identification is used to produce extra information which is not as such related to identification. Informatization is another issue which is related to ethics. This occurs when a person’s physical and behavioural attributes are shown. There is a saying that says that the human body is
turning into a passport or a password because of biometrics. (Tistarelli, Li and Chellappa, 2009).

When relating function creep with security then loads of times security is built for one purpose and then later on it is found to be used for another purpose. An example of that could be a driving license. Driving license is originally made to show that a certain person has the ability to drive a car but now driving license had taken a second application which is to verify a person’s age to show in clubs or bars etc. (Schneier, 2010).

Ethic issues also involve privacy issue which could be a big factor when introduced to the University of Derby. People might be worried about their data being used for other reasons than the reasons they were acquired for. Some people also speak against biometrics because of their cultural or religious reasons. People also wonder where all of their biometrics data is stored whether there is a big database that has all the date or if it’s safe or not, so this creates large amount of questions in people’s mind. (Wilson, 2013).

C. Frameworks

The frameworks which could be used for the use of biometrics in University of derby environment are going to include ISO 27002-2005, Prince2 and ITIL. ISO 27002 is a Code of Practice which offers strategy and uses words such as ‘May’ and ‘Should’. It offers best practice in Information Security Management and systems interoperability, which is an internationally accepted framework. It also supplies guidance on how to put ISMS in practice that is capable of certification, which an external auditor can refer to (Calder, 2009; British Standard Institute, 2005). Prince2 is known to be an approach that is global and also manages projects successfully. It is broadly adopted by different sectors, countries and industries. It is used to deliver projects many industries such as construction, telecommunications, banking, Pharmaceuticals and IT. (Hinde, 2012, p. 1). ITIL offers a consistent set of finest practices for IT Service Management. These finest practices consist of a series of books which give guidance on managing quality IT services and facilities which are needed to support Information Technology. (Meyler, Fuller and Joyner, 2008, p. 26).

III. GOVERNANCE STRATEGY PROPOSAL

This section is going to be about the governance strategy proposal to overcome the problem and also the framework that is going to be applied in order to achieve it. The framework that is going to be applied for the strategy proposal is ISO 27002 (British Standard Institute, 2005). This particular framework consists of different component and each component has different objectives.

- Risk treatment and assessment – This section is divided into two objectives, which are Security risk assessment and Treating security risks. Security risk assessment should be performed by assessing the risks which have been mentioned earlier. Then comes Treating security risks. This risk treatment effort should be undertaken to lessen the risks that have been identified with the use of appropriate technical, physical and administrative controls. Keep monitoring people who use their fingerprints to get access into library and whether each time they get access, the finger prints come out to be the same in order to lessen the risk of spoofing and mimicry attacks. Making sure that the Biometrics templates matches the person who is trying to get access into the system. Making sure during the enrollment procedure is stricter. Making sure that the data does not get compromised from the biometrics templates and this will decrease FAR. Making sure that the surface of the fingerprint and hand scanner is very clean so that there are no distributions in processing a person’s finger and handprints. Monitoring every person that uses the system in order to reduce the risk of false positive and false negative.

- Organization of Information Security – The objective of this particular type is to manage information security within the organization’s overall administrative structure. There should be a document which includes information about security policy. This document should be approved by management and given out to all the employees. This should be carried out in a way that all the information of students must be protected which comes under confidentiality agreement. Responsibilities should be taken by people who are willing to disclosure the information of people. Action should be taken if the agreement is broken in which information could be destroyed. Having right to monitor the compliance with the agreement. If someone breaches the agreement then expected actions should be taken into account.

- Compliance - this section ensures compliance. To protect the personal information, suitable procedures and policies should be made which are going to be consistent with regulatory, statutory and private needs. To prevent misuse of information, users must be aware of their permitted access. Users must be aware of monitoring in such place of university that they can easily detect an unauthorized access from a person. There should be a log on warning on the system when students and staff scan their fingers or hands to get access to the system.

- Access Control –This objective of this particular section is to control the access to information. Access control policy includes the rights and rules given to each person in the university based on their profiles. There should be a steady management of access rights across networked environment. Controls should be separated to different sets of people such as the administration, request, and authorization. Each user must be given written statements which tell them about their access responsibilities and rights. If a user has changed roles then the access rights should be changed for them immediately. Staff should be monitoring the access activity history. They should observe when the user was last authorized access and when the user was...
last denied access by scanning their fingers or hands. (ISO 27002, British Standard Institute, 2005).

IV. CONCLUSION

This report has given an overview of Biometrics. The aim was to underline the benefits and drawbacks of Biometrics by introducing it to the University of Derby’s environment. The research has shown that Biometrics is a very broad technology which is growing rapidly. This technology can bring loads of benefits to the University of Derby’s environment. Students and staff can find this new technology very useful. The types of biometrics which University can use have been defined which are fingerprint scanning and handprint recognition. As listed, there are various risks and ethic issues which need to be looked at. Framework which has been introduced should be taken into account in order to overcome these risks and ethic issues.
V. REFERENCES


Social Networking Analysis

Governance Of Social Networking In Education

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Abstract - During the past few years, social networking has been adopted, and it is now popular. It has become part of life as it has even shaped human interaction in all fields. It has shaped the landscape of interaction in the field of politics, health, business, especially marketing, and even education. Especially in learning, online social networking is shaping the approaches of teacher-student interaction in learning institutions. However, there are many governance issues that arise from this adoption. This paper inquires on the concept of social networking, its benefits, social networking related governance issues in learning institutions and strategies that can be used to develop sustainable social networking adoption in institutions. These issues are privacy, legal, false knowledge, trust, miscommunication and time management. Governance strategies include exploration, discussion, provision of ramification, making social networks multilingual and moderation.

Index terms: social networking, governance, education, social networking sites.

I. INTRODUCTION

This section gives an introduction of the various dimensions of social networking, which this paper inquires on. They include (1) Social networking, (2) Education and networking, (3) Governance and (4) Use of social networking in higher education and its benefits.

A. Social Networking

Social networking surrounds the idea that describes how people interact and knows one another. With social networking, people know each other, interact, share and increase world connectedness. Today, social networking is very much applicable in many fields including education, health and politics. Due to this, social networking is crucial and affects the way people communicate nowadays. It is noted that the development of the web 2.0 technology gave birth to this new way of interaction; and today, this is seen on interactive websites in the Internet (Zaidieh, 2012). These networks are labeled as social because they allow friends to communicate and study together. Moreover, this interaction continues to strengthen ties. Using these networks, people share a wide range of material-text, video and photos. The most famous social networks are Twitter and Facebook. Blogging engines are also another class of social networks. Examples are Blogger and Word Press. These sites offer interactive and direct discussion and have offered a way of making decisions.

B. Education and Networking

One characteristic of online social networks is that it brings together people in a domain of common interests. It provides an avenue for people.

A research done by Dalsgaard (2010) showed that, when Facebook was used as an education-social space, it showed that a set of students engaged in Facebook discussed class work. This was possible by the use of a Facebook page that was specifically used for class discussion. Especially in higher institutions of learning, social networks are handy in ensuring transparency among students (Dalsgaard, 2010).

C. Governance

In the face of social networking, governance means the way the social networking infrastructure can be used in decision-making and its implication. It is concerned with the way such social networks are developed, adopted and its effects to the users. More often, it is concerned with taking the challenges of social networking implementation, risks and uncertainty, and addresses them (Willard, 2009).

II. USE OF SOCIAL NETWORKING IN HIGHER EDUCATION AND ITS BENEFITS

There are many uses of online social networking in higher learning. Demographic studies show that youngsters, who are frequently referred to as digital natives, dominate the use of the web 2.0 technology (Hamid, Chang and Kurnia, 2009). However, Hamid, maintain that care must be taken when introducing these technologies because of the different levels of interest, experience and student expectations. Educational activities that are possible by the use of online social networking are possible on blogs, wikis, photo sharing, video sharing, podcasting, online discussion boards, social bookmarking, social networking sites, instant messaging.

Zaidieh (2012) identify the benefits that results from the use of social networking in education.

A. Flexibility

Social networking expands on when, where, what and how people learn. It responds to different groups of learning and their different expectations-time is also a factor. Although
classroom learning enhances emotional understanding, online learning motivates students to complete tasks (Zaidieh, 2012).

B. Repeatable

Learners should be given a chance of repetition because response depends on personal limitations. The traditional methods of learning are devoid of this. Online learning gives a learner an opportunity to get the content immediately or later (Zaidieh, 2012).

C. Accessibility

Students are able to get content anytime and anywhere. Besides, the materials can be read, edited and updated. Students are also able to do selection, which suits their present needs (Zaidieh, 2012).

D. Transparence

When students are given a chance to express themselves, they are confident, and colleagues are able to know what are the thoughts of others.

III. GOVERNANCE ISSUES RELATED TO ADOPTION OF SOCIAL NETWORKING IN EDUCATION

Most issues of governance towards the adoption of social networks come in the form of challenges. This is because, the technology comes first, and introduces issues that were not controlled in some framework e.g. law. For example, because Twitter cannot deal with legal violations on the social media, its ‘Terms of Use’ is open stating that ‘must not, in the use of Twitter, violate any laws in your jurisdiction (including but not limited to copyright laws)’ (Ossian, Date Unknown).

A. Privacy

Like in the social sites, social networks used in learning allow users to share much information about themselves. However, most users are not worried of their privacy. But it is not well understood how secure their information is, and who has access to it. Besides, it is not known who is responsible in educating the users on how to exercise their rights of privacy. It is quite saddening that the type of technology used may be putting conditions on the users. For example, some social networking sites would require that users enable cookies, with which cookie diggers can collect personal information from the user’s devices, and track the user of his/her surfing patterns (Berzy et al., 2010).

B. Real friendship

In any social network, a person has many friends. However, one does not know the strength of the tie that exists in this friendship. This is because users are not honest with the information about themselves. On the other hand, even in educational social networking, there may be cyber-bullying among students (Berzy et al., 2010). This brings to the question, what is the quality of each friendship in a social network?

C. Legal issues

Another issue to be dealt with relates to law. Implementers of the educational social networks should have in mind that laws also apply to the social network’s arena. For example, what happens if a third party content is shared in the network, who owns the content, such as the a user profile, could any pots be conspired defamatory towards those who are the recipients (Ossian).

D. Taking up time

It is noted that people spend a lot of time in online social networks, which may affect their health negatively. For example, it is estimated that people spend over 5 billion minutes daily in Facebook. This is because visiting such sites becomes addictive (Berzy et al., 2010).

E. Miscommunication

Although E-learning provides flexibility, it does not give an explanation that is achieved in face-to-face interaction. Students struggle to express their ideas in writing, which proves to be challenging than their oral presentation, which they have used frequently in the past. In social networking, miscommunication normally results because:

- The interaction using online social networking lacks voice tone, body language and inflection.
- Without physical interaction, communication between cultures is hard because messages may be understood differently.
- Communication styles between different ages e.g. between parents and the young.

F. False Knowledge and Subjectivity

Especially in blogs, it is obvious that, users remain subjective. Therefore, readers should be advised that the content might be false or inaccurate. It is worth noting that when sharing online social networks, the accuracy of the information shared depends on the code of conduct of the person who is sharing. The social network does not have a strict quality filter to do this. Therefore, those who depend on the knowledge from such networks should be keen (Berzy et al., 2010).

G. The Most Connected Survives

Students with greater access to the internet, and those who are savvy to using the social networking technologies, will benefit a lot than others (Berzy et al., 2010).

H. Trust in Digital World

Social network relations develop quickly than the traditional ones. The learning curve of developing intimacy on the social networks remains high. Online trust on the social sites grows very fast, and when one is comfortable with his/her friends, one may decide to give personal information. In fact, a couple of this information, like phone numbers and home address, to wrong people may be harmful (Berzy et al., 2010).

IV. GOVERNANCE STRATEGY PROPOSAL

It is observed that not all social networking sites can be adopted in the education arena. We have noted that some sites will lead to time wastage and no constructive support. However, as the academicians continue to research on the
strategies that are relevant to introduce social networking in the educational sector, the educational community stands to grow its collective body of knowledge. This section will discuss guidelines that can deploy social networks in the educational sector (Klopfer et al., 2009).

A. Use Best Alternatives
   Due to a growing concern on privacy, many teachers stopped using social networking sites in class. This is a short-term solution. Educators are advised to use the right sites. For example, Ning, which is an online platform for organizations, people and communities to create social networks, provides a way of quality interaction between the teacher and student, while minding their privacy (Ning Mode Media, Date Unknown; Klopfer et al., 2009).

B. Explore
   Educators should spend time and play around with existing educational social networks, which give them time to choose. Most of them are online, thus easily accessible (Klopfer et al., 2009).

C. Discuss with friends
   Talk with other educators to find out what online social networks are good. If you cannot find close allies, attend conferences to hear from those who have used other networks (Klopfer et al., 2009).

D. Use of Moderation and Filtering
   Intelligent systems can be used to monitor those who are changing the usage intent of the systems, for example, the materials that are exchanged between the users (Moreno and Molina, 2012). Further, instructors should moderate posts from their students and check on the accuracy of contributions. Using human interaction is hard. Therefore, hard filters should be used to monitor what is shared. Code of conduct of the users should not be trusted whatsoever. However, such systems should give the users to do flagging and report any sharing that is not appropriate on the network.

E. Make it Public and Private
   Due to privacy issues, official sharing should reveal identity. However, other sharing, and where identity may lead to compromise, anonymity is crucial. Such sharing should be done without revealing the user’s identity.

F. Make it Multilingual
   Even in education, social networking should embrace multilingualism. This is important in social literacy, and in creating learning communities and student groups across the globe.

G. Provide all Possible Legal Ramification
   Because laws also apply to the social network’s arena, implanters must provide for a possible legal redress to what is considered illegal in the network. In social networking sites, this is normally done as “Terms of Use” (Ossian, Date Unknown).

V. CONCLUSION
   Social networking has been accepted and adopted in the recent past because of their benefits. However, it has been a challenge and posed issues when it is applied in the educational sectors. Nevertheless, as noted, simple strategies need to be put in place to address this.
VI. REFERENCES


Utilizing Bluetooth And RFID Technologies For Implementing Digital Identification Systems

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Abstract – this document focuses on critical evaluation of sustainable information and corporate governance impact of Internet of Things and Bluetooth technologies on University environment. Key points of this paper are detailed insight of why there is need for such technology, how it should be correctly deployed in an academic environment in order to improve efficiency, reliability and integrity of digital identification system and further issues related to other areas of university. Further readings of this journal conclude detailed critical evaluation of Sustainable information and Corporate Governance impact of above described technologies, in terms of the Information Governance strategy that needs to be develop to guide development of the technologies into the University environment and portfolio of products and services to meet the needs of students.

Index Terms—RFID Technology, Bluetooth, Internet of Things, governance strategy, information security

I. INTRODUCTION

Bati and M et al, have conducted a research on discovery why student attendance is becoming neglected and suggest that certain steps should take place in current academic digital automated identification system such student attendance monitoring to deliver possible, yet effective changes. (Bati et al., 2012). This document is focuses on some of the key areas of improvement where digital identification systems could be potentially implemented, including other areas of university settings like access control and library book borrowing system. With introduction of fully automated and digital attendance system, students are less likely to become capable of misusing the system or gain ability to exploit it. One of the key factors that can affect students’ decision to attend their agreed sessions is that without ability of exploits to system, students are more aware of effects this can have on their overall attendance. Most of universities have a regulation and compliance polity that every student has agreed to comply with when they have signed up to study at a certain university (University of Derby, 2013).

Another area of improvement is an outdated library borrowing system. It is amongst many of the factors which have certain impact on student willingness to return books. Not that students are indolent but it happens that they tend to forget or just don’t have the time to spare due to their busy schedule. This journal also focuses on potential implementation of already mentioned RFID technology into library to improve efficiency and reduce the number of students being charged for books overdue for return.

Lastly, this report exposes issues related to access control using traditional security methodology and how IoT can improve on and reduce human interaction in order to achieve safe environment for both staff and students at university settings.

The principle of work written in this paper is to theoretically combine Internet of Things technologies current and future hardware to create a bespoke extension for academic bodies to improve on current issues associated with the areas of services such as attendance monitoring, library book borrowing system, student access control and more. The overall objective of this journal is to propose a solution while following Information Governance Strategy that needs to be developed along the university technology product implementation to guide the development and incorporation of the technology into University’s portfolio of products.

II. THE NEED FOR TECHNOLOGY ADVANCEMENTS USING INTERNET OF THINGS

A. Student Attendance Monitoring

Most of UK schools and Universities collect statistics about student attendance by either using traditional scanning or paper based system. There are three major issues related to the current attendance monitoring methodology.

- Time Consuming - Student ID cards require to undergo lengthy process of scanning.
- Paper Based - There are limited resources and such waste of it is not ecologically sustainable toward emission reduction as more paper is consumed with each year (Dockai, 2013).
- Error Prone - Data recorded by humans can often be incorrect due to human nature of error. This causes significant integrity increase (Harvey, T, 2013).
B. Library Book Borrowing

Similar issues surround Library book borrowing system. There is the similar scanning process of borrowing books, where each book needs to be scanned using its associated bar code before student is permitted to take the book away.

Another issue with the current system is that books can be rather difficult to find. They often require sorting and librarian needs to learn the layout of the library before he can be able to guide student to its requested material.

C. Access Control and Localisation

Another possible area of proposed technology implementation is access control. Nowadays students are often required to ask to either wear ID cards or present them were necessary. Some students also require access to special laboratory and require to have their cards on them at all the times. This process is rather monotonous and lacks of efficiency in access control and does not always work for unauthorized access area.

III. OVERVIEW OF INTERNET OF THINGS

By combining technologies such as advanced RFID and Bluetooth together, interconnected devices can be made to guide us to efficient ways of living and overall a better life style.

Bluetooth is a short range communication technology allowing two devices to connect and communicate together. It can be used to send data such as voice, files, video, images, etc. (Bluetooth, 2013).

RFID known as smart tags is an intelligent tag technology created to replace traditional bar codes with capability to record, send and receive data. Used widely in areas like travel industry for bag monitoring, medical environment for patient monitoring, zoo for tracking animals, supermarkets for product tracking and more.

IV. TOWARDS A DIGITAL LIFE VIA INTERNET OF THINGS

There are two possible ways of implementation into academic settings. By using a smartphone and its Bluetooth capability or by implementing RFID tag on the back of the smartphone, if it is not already built in. Or by using standard student cards which can be fully integrated inside for better aesthetics. By using Bluetooth, a student would be required to acquire a small app which will be university specific, such as colours to meet in-house style, logo, images, etc. This application would allow students to register with the application using their university details such as IT or other relevant information.

For university of derby students, they would be required to insert their Student ID and Library code.

One of the areas of improvements this digital identification system would deliver is reduce risk of student misusing the system by making the entire process fully automated where possible. Currently, at university of Derby, a scanning method is used to collect student attendance records. Student is able to scan cards of their own and their friends, therefore allowing to record other attendance as if they were present during the session.

With the proposed solution via smartphone and Bluetooth, only one registered student at the time can be used on a device at a time. That is, student’s phone Media Access Control is associated with the student ID and Library code. MAC address is a unique device ID or a number which is used to uniquely identify devices on a network or a device in general. This number is hardware imprinted and is always unique (Pacchiano, 2011).

Alternatively, to fully atomise the system, implementing the digital identification via RFID can be used instead. Tags can be either attached the smartphone or any other personal belonging.

By implementing digital identification system using second methods, attendance monitoring will have additional features such as monitoring students presence but also how long has they been present or whether a particular student has left the room or is still inside. This implementation can be certainly beneficial as University can record data with accuracy and minimal interaction required. Rooms will need to be equipped with special sensors that can communicate with RFID so that they can collect the data and generate lists at the end of each session. The data collected by the room sensors can then be automatically sent directly to the attendance office. This feature will introduce integrity as data is recorded with maximum accuracy, and security as data is automatically transferred to safe location on the University servers.

The above image shows the process flow by using RFID technology to implement student attendance monitoring. Process is simple and requires no human interaction due to fully automated functionality.

Use of RFID technology can be further deployed in Library Book Borrowing system. Each book, newspaper, Magazine, etc. can be RFID tagged. This way, books can not only be...
easier to find, but also there is no further interaction required when students want to borrow a book. For example, student simply selects a book from the shelf, and walks out from the library. RFID can also be further use to deny or permit student exit from the library if they are found by the sensors in the room that they are carrying a book that is only used for reference and therefore will not open exit door or gate of some sort. This implementation delivers benefit of speed, accuracy, and lets students focus more on their study rather than be worried about returning books.

Another area of university that could certainly benefit from the technology implementation is access control monitoring. Most of the universities require students to wear or present their ID cards to where required, for example library or specialist computing labs. Most of the access control monitoring is tedious as it requires human interaction. That is, students must slide their cards or scan their cards to get access to certain part of the building. Security has little or no control over the people that enter the premises as well and this leads to several security threats such as unauthorized access or even terrorist attack. Either of those compromise safety of staff, students and other employees. Using RFID technology, access control would become almost an invisible process where computers deal with all the heavy work load. For example, imagine already mentioned library, someone want to access library but he is not authorized student to gain access. The access door or gate would simply not open because they do not carry appropriate tag. Another example, library scenario, student attempts to walk out from library with a book that is used for referencing only, gates will not open and librarian is alerted. Simply put, doors open to authorized users without having to compromise on security and significantly reducing time of access control monitoring as there are no cards to scan or swipe.

V. INFORMATION GOVERNANCE

IG is a communication activity for coordinating human being to achieve collective goals through collaboration. In general, IG is a set of rules, policies and practices that enable business and organization bodies to guide them on decision making during product or service development and also allowing them to manage corporate information. In addition, Information Governance allows organizations to create a standardized method for control of their documents and information assets throughout entire life cycle.

A. Key Benefits of Information Governance

- Discovery and Delivery of valuable data assets
- Ability to increase productivity and profitability
- Reduction of risks leading to reduction of cost
- Appropriate disposal of non-record content according to compliance
- Operational Efficiency

B. Evaluation of Governance Issues

One of the main issues associated with the use of Internet of Things is the data handling. It is critical that data is handled correctly with compliance with law. The most critical assets in this case is the students and employees data. Data is certainly a value here, but it is the people that need to be governed here in order to guide them to appropriate creation, use and disposal. The proposed governance strategy will guide university with appropriate stages to successfully implement the technology with accordance to compliance with law and framework. Another key issue will be the acceptance of the new technology. It is essential that the technology is not in the way of student or members of staff in order to perform their daily tasks and activities. Therefore staff and students will be required to undergo learning curve in order to accept the technology.

VI. GOVERNANCE STRATEGY PROPOSAL

As with many service or product implementation, a justified framework should be developed as it can guide the development and implementation process of proposed technology. Many organisations are realising that it is a necessity to establish a formalised environment for information governance by using internationally recognised framework rather than creating a new one or doing things at random. There are various governance frameworks available for businesses and organisations as a guide, which can be used to identify governance issues associated with the organisation and its practices of running business. COBIT, ITIL and ISO 17799 are currently well established and known governance frameworks. For implementation of the digital identification system, a COBIT is a framework to be used as it combines some of the models and approaches found in other frameworks such as ITIL and ISO (Search Compliance, 2013).

Fig. 2. Diagram showing all COBIT processes. Source: COBIT® 5, figure 17. © 2012 ISACA

A. What are the drivers?

- Improve University product and services
- Enhance Student Living
- Provide Cost Effective Education at High Standard
B. Where is University now? (Student attendance, access control, book borrowing system)
   - Slow/lack of speed efficiency
   - Error Prove/human error
   - Not Green/partly paper based

C. Where does University want to be?
   - Technologically advanced and modernized institution

D. What needs to be done?
   - Implement digital attendance monitoring
   - Implement digital book borrowing system
   - Implement digital access control

E. How will it get there?
   - Develop, Test, Train and Deploy

F. Did they get there?
   - Get data, analyses and evaluate

G. How do we keep momentum going?
   - Review effectiveness of the product
   - Realize new potentials and benefits
   - Deliver improvements

VII. CONCLUSION

RFID is a rapidly being adapted in various palaces, from shops, book stores, grocery stores, etc. to hospitals and airports. Its benefits including ability to reduce human interaction to minimum helps users to focus more on their life rather than stress about their technological surroundings. With ever increasing adaption rates, Internet of Things can truly deliver benefits to our life by connecting us throughout while doing so in secure, time efficient and reliable manners.
VIII. REFERENCES


Towards A Contactless Academic Environment
NFC - An Innovative Identification System For Universities

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Abstract— the aim of this paper is to critically evaluate the sustainable information and corporate governance impact of the NFC technology on University of Derby. The paper will firstly justify why there is a need of this technology to be implemented and how stakeholders such as students, staff and administration will benefit from it. Ultimately, this paper will provide a detailed Information Governance strategy that will need to be adopted in order to guide the development and incorporation of NFC technology into the university.

Index Terms— Near-Field Communication; Contact-less Data Transfer; Corporate Governance; Governance Strategies; Zachman Framework.

I. INTRODUCTION

The ever increasing number of students in higher education in UK over the last decade (HESA, 2012) has increased significant workload on universities’ students, staff and administrators. As a compensation of this increased load, a desire for process automation at the universities has raised. This has led universities to look for new technologies that enable universities’ stakeholders to perform their tasks autonomously and efficiently (Benyo et al., 2012).

The paper suggests the implementation of NFC (Near-Field Communication) technology to University of Derby. NFC is classified as a proximity contact-less technology that is build upon the RFID (Radio Frequency Identification). This short range device wireless technology enables users to initiate connection with different wireless networks while acting as a protected smart key in order to transfer data (Gomes, 2007).

Implementation of NFC technology in university environment will open a wide window for development of systems that enhance user’s experience and accelerate daily tasks performed by its stakeholders. For instance, it could be used to perform tasks such as make payments, log-in to university computers, borrow books from library or as student identification. To make use of this technology, users can either use their mobile devices or they can be provided with NFC enabled card which is also a cost-effective solution.

It is of significant importance, at this point, to highlight that NFC in this scenario will operate as an identification system. Correctly identifying students is of fundamental importance, particularly when it comes to monitoring students’ attendance. This is because, government provides funds to universities based on accurate and auditable records. In addition, academic institutes need to provide a secure environment to everyone, thus accurate identification becomes of fundamental importance while performing almost any task at the site (Identimetrics.net, 2009).

The paper will comprehensively look at the governance issues related to the implementation of NFC technology in the university environment. A governance framework will be chosen after carefully understanding the needs and demands of the stakeholders using the services.

II. EVALUATION OF GOVERNANCE ISSUES

Corporate governance indicates how a company is governed through set of systems, ideologies and procedures. They supply a set of guidelines with regard to how the corporation can be controlled or directed in order to achieve its goals and objectives in such a way that the value of the company is increased and the stakeholders benefit from it in a long run (Thomson, 2009).

IT governance effectively allows comprehending of an IT business value and the risks evading it. Examiners on IT governance nowadays are more concerned about the structure and pattern of IT functions alongside the sets of responsibilities for key decisions (Chunyang, 2010).

As stated by United Nations (2003) good understanding and well awareness of the issues is the first step towards excellent corporate governance. There are several governance frameworks available in order to identify key governance issues regarding a technology such as COBIT, ITIL and ISO 17799. COBIT is known to be a framework that offers controlled mechanisms over the Information Technology domain while ITIL framework is more process oriented and pays more attention in identifying the best practices regarding the management of IT service levels. Last but not the least, the ISO 27000 framework has been developed by the international Organization for Standardization with the intent of focusing on security and aid during the creation of efficient IT security plans (Symons, 2005).

All these frameworks are very useful and provide a structure to identify governance issue; however, it has been considered appropriate and more helpful to use the Zachman framework in this particular case. Although, Zachman is mainly an EA (Enterpris Architecture) framework, Perko (2008) believes there is a strong relation between IT governance and EA as its benefits will expectedly have effects
on the governance of IT. He further adds that EA is a significant tool for IT governance and Enterprise Governance as it explains what the enterprise currently is, how it should be in the future and the strategy needed to achieve this step.

Zachman framework is formed by six interrogative rows that are both primitive and comprehensive. These rows are all different from each other and after answering all the question present at different levels in this framework, any kind of question related to the technology can be answered (Zachman, 2013). In this particular scenario, only the Planner perspective will be considered. This process will give a comprehensive understanding of this technology from the planners’ point of view.

After carefully considering all six questions from the first row of Zachman Framework, it is found that some questions are particularly interesting to focus upon. Thus, this paper will mainly focus on those questions to highlight some rather important governance issues surrounding the implementation of NFC technology at University of Derby.

**A. Why**
- Why is there a need for this technology to be implemented?
- Why NFC and not other technologies?

**B. What**
- What needs to be done in order to implement this technology?
- What benefits does it bring to the University?
- What will university be required to do?
- What limitations does this technology have?

**C. Who**
- Who are the main stakeholders that will benefit from this technology?
- Who is responsible for the maintenance of this technology?

**D. How**
- How secure is this technology?
- How can you measure the success of NFC technology?
- How important it is to involve all the stakeholders while planning the implementation of this technology?

**E. When**
- When should this technology be implemented?
- When will the new system made available to the students?

### III. GOVERNANCE STRATEGY PROPOSAL

**A. Why**
Implementation of NFC technology in a university environment accelerates daily routine tasks performed by both students and staff. In fact, the technology can be utilised to perform tasks such as personal identification, electronic payments, access to university resources or register to examination date (Benyo et al. 2012).

Below, Figure 1 illustrates some of the most common actions that users perform on daily basis at university. To increase autonomy of these processes, implementation of NFC technology is being recommended.

![Fig. 1. Stakeholders and their routine tasks at University](image)

People today could argue that NFC technology is expensive to implement and there are other alternative technologies that are cost effective and easier for the end user to use. Then why should university spend in a technology which is expensive to implement and not many companies and businesses have adapted to it? The answer is very simple: NFC or contactless technology is the future and the manufacturers are always keener to develop and improve this technology. The more this technology will be used and adopted the more research will be done upon it and consequently the prices will drop and it will become necessary for all the brands to adopt it (Romero, 2012).

It is also important at this point to mention that an NFC attendance monitoring system has already been introduced at the Budapest University of Technology and Economics (Benyo et al., 2012). Hence, it is evident that the proposed technology has already been implemented in a university environment and it brings along multiple benefits such as automation, accuracy and reliability (Bueno-Delgado et al., 2012).

**B. What**

1) **Providing new technology to the users**

The planner of this technology will firstly be required to estimate the total amount of NFC terminals required in the main campus of University of Derby. Secondly, it will be necessary to make sure that the app necessary to communicate between the users’ phones and NFC terminals is installed on all the mobile devises of the enrolled students. Nevertheless, this app should be available to install on University’s website. It is also planners’ job to investigate where these devices can be bought from and fix a number of technicians required to install these devices in the required areas. In addition to this, it is important to realise that not everybody at the university posses a smartphone and therefore there is a need to have a backup method for them to make use of the new system. Use of NFC enabled cards is being recommended to deal with this particular issue. These cards can be issued to those who do not possess a smartphone device. A great advantage of NFC capable cards is that they will not be as expensive as phones and in the event of
loss; it is not very expensive to get another card issued (Ozdenizci et al., 2010).

2) Cost and Acceptance

A fundamental issue in implementing this technology could be the economical aspect. NFC technology will be expensive to put into practice at the start but in a long term this technology is expected to be cost effective and time efficient. An important aspect to highlight at this particular stage is that one of the biggest mobile brand “Apple Inc” is not in favour of the NFC technology and doesn’t look to adopt it unless it get secure enough. One of the reasons for this choice is believed to be the fact that many merchant/organisations still hesitate towards adopting this technology on security related concerns. However the NFC technology is believed to be the future and it is expected Apple will finally acknowledge this technology when it becomes more secure and it is accepted by a larger number of organisations (Wehner, 2013).

3) Limitations

Although smartphones are very powerful devices, they do have some limitations. NFC technology needs a little extra power to work and this will reduce the battery life (Romero, 2012). Ultimately, the technology itself needs to be bought. According to Analysys Mason Limited (2008) adding NFC to a smartphone was between three to five dollars in 2008.

C. Who

This service has been designed keeping in mind students, staff and administrators of University of Derby and how their experience could be improved. The new system will not require them to carry cards at all times or remember passwords, rather it will be sufficient to carry their mobile devices on them which are a fundamental part of anyone’s everyday life nowadays (NFC Forum, 2008).

The university will be required to train staff on how the technology works and subsequently maintenance of the technology. The staff should be ready to deal promptly with any sort of issue that might arise. For instance, if a student is unable to connect to the app necessary to use the NFC technology, a backup plan should be ready and this must be executed as quickly as possible without creating long delays.

The functionality of NFC terminals should be checked on regular basis in order to make sure that all the devices are working properly and therefore guarantee the maximum accuracy and reliability.

D. How

One of the key governance Issue related to the NFC technology that have been identified is whether NFC technology can be implemented in a University environment. NFC has been internationally standardized through ECMA-340 and ISO/IEC 18092 standards; both describe the communication modes for Near-Field Communication (British Standard Institute, 2004). The fact that this technology has been standardized by ISO is a clear indication of the fact that this technology has been regulated to be implemented by any corporation.

Another important concern regarding the Near-Field Communication technology is how secure this technology actually is. In an environment such as Universities, the data treated is extremely sensitive and administration is very rigorous about secure ways to utilise this data (Paranjape, 2009). Some of the most common security attacks related to this technology are Eavesdropping, Data Corruption, Data Manipulation, Data Insertion and Man-In-The-Middle (Haselsteiner and Breitfuß, 2011).

To overcome security issues listed above, NFC technology has been standardised through ISO/IEC 21481 and ECMA-352: they identify the communication mode designed to not disturb any ongoing communication (British Standard Institute, 2004).

One could have identity fraud concerns relating to the NFC attendance technology as students could carry their fellow colleagues’ phone in order to falsify their attendance. But then the same could be said about the student card scanning system which is currently being operated by the university. However, it is less likely that the student will be passing their phones to their colleagues in order to falsify their attendance as the device contains extremely personal information and the cost of the device is also an important aspect to take into the consideration. To increase security, there are various other technologies that can be combined alongside NFC by the university. For example, this technology could be combined with the face detection technology in future to maximize the accuracy of the service.

The progress and reliability of the new system should be closely monitored for the autumn semester. The success of a project can be measured by using the several standards, for example: TAM which is one of the most famous standards and widely used worldwide (Holden and Karsh, 2008). Once the service has reached satisfactory and desired results, it can be introduced to other campuses of University of Derby.

According to the Standish Group (The Standish Group, 2012) it is essential to involve the main stake holders of the service by conducting questionnaires and voluntary interviews while planning the implementation of a new service. It will allow the planners to have a better understanding of the needs and expectations of the stakeholders and actual users of the technology. But before this can be done, a detailed research should be conducted to identify all the possible stakeholders of the service. Once identified, a detailed questionnaire should be prepared containing all the relevant questions about the expectations of the stakeholders and how according to them, the service could be improved.

E. When

It is advisable to introduce this technology to University of Derby in summer 2015. The reason behind this choice is that during the summer, university is not very busy and therefore this technology can be installed and tested before the students get back in Sep. It will also be necessary to make available on University’s website the app needed to students in order to utilise the NFC technology at the university.

During the enrolment period, when all the students come back to university, it will be necessary to make sure all the students are equipped with the NFC app on their mobile devices and therefore they are ready to make use of the new
system. Once this step has been successfully performed, the progress and reliability of the new system should be closely monitored for the autumn semester. The success of a project can be measured by using the several standards, for example: TAM which is one of the most famous standards and widely used worldwide (Holden and Karsh, 2008). Once the service has reached satisfactory and desired results, it can be introduced to other campuses of University of Derby.

IV. CONCLUSION

NFC is a rapidly emerging technology and businesses are increasingly going towards adopting it. The contact-less technology is a quick way to transfer data and its utilisation will help perform its users their daily tasks more quickly and this will be a big step towards the future (Miraz, Ruiz and Gomez-Nieto, 2009). Once adopted, the NFC technology will reduce the administration load and simplify tasks while making sure that the procedure is secure, reliable and time efficient.

In the end, it is fundamental to measure the success of a project and therefore it is recommended that the results of this service are closely monitored during the testing phase and any unexpected or unpleasant episodes are carefully monitored and dealt with promptly (The Standish Group, 2012).
V. REFERENCES


Critically Evaluate The Impact Of 3D Printing In A University Environment

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Abstract—There are many emerging technologies evolving and 3D printing is one of them. As 3D printing revolutionising over many industries, implementing into British universities can have many benefits to student and their experience. Universities that implement this new technology will gain massive advantages to a variety of courses (such as fashion, medicine, etc). With these emerging technologies there are many risks and governance issues that need to be indentified and evaluated. However, to prevent these risks a governance proposal strategy must be developed in order to produce a solid framework for 3D printing.

Index Terms—3D printing, Governance issues, Governance strategy, Universities.

I. INTRODUCTION AND BENEFITS

3D printing (also known as additive manufacturing), was introduced in the 1980s and is the physical process of creating a three-dimensional object via a computer software (Hsu, 2013). Today, it is revolutionising industries and has grown in many companies over the last few years, with healthcare being a major example (Wile, 2013). In Minnesota, 100 machines are being used in the world's largest 3D printing factory to produce a variety of items for medical, military and aerospace (BBC, 2013). From producing jewellery, clothes, electronics, toys even dental crowns and bridges 3D printing is the new printer in 21st century. 'Student Experience' can be defined in a variety of ways. Harvey (2012) defines student experience as to all aspects of the students' engagement with higher education. However, Astin (1999) argues that students need to be involved with their course and student life in order to have a good student experience.

A. Learning Style

One key aspect of 3D printing will affect the student's learning style experience. Students as individuals use a variety of learning techniques; there are over 70 different learning styles schemes (Coffield et al., 2004). The VARK (Visual, Aural, Read/Write, Kinesthetic) Model developed by Neil Fleming provides people with a questionnaire which results a outline of their learning preferences (VARK A Guide to Learning Styles, 2011). Fleming and Mills (1992) suggest four modalities that reflect on students' and teachers' experiences. This helps students and teachers to use information for effective learning and communicating more efficiently. According to Fleming's article (Date Unknown) around 60% of the population fits into the Multimodal style, meaning people having more than one learning style. However, this can cause a conflict for teachers on how they might assist the students learn.

Pedagogy, (general theory of education) focuses on the art and science of teaching, there is no single, universal approach that suits the learning of students so lectures use an array of teaching strategies (Smith, 2012). Pease and Pease (2001) helps Pedagogy theory describing the border of how our individuality visualise the data. Lecturers using 3D printed physical models in lectures can give an opportunity to students, expanding the student's insight to practical experience on their learning and knowledge especially aid tactile learners. For example, if scientists were to give a lecture to students about archaeology, they can use 3D printer to print an exact copy of a fossil. Students can physically touch the copy of the fossil without doing any damage to the actual fossil. Thus, spark the students' interest and have a clearer understanding of different types of fossils (Mail Online, 2013).

B. Skills

Another key aspect of 3D printing is rapidly becoming integrated with mainstream manufacturing, helping the biggest manufacturers such as GE, Ford and Siemens. (The Economist, 2013). 3D printing is an economical manufacturing saving companies up to 70% of manufacturing costs from packaging and shipping for consistency and materials (Caliper Media, Date Unknown). Furthermore, 3D printing has purposeful manufactured goods in which many industries make use of such as aerospace and biotechnology (Heath, 2013). Rolls-Royce is planning to use 3D printer to produce components of jet engines (Vasagar, 2013). Hughes (2013) states students who have 3D printing skills are able to open new doors in different areas such as medicine, automotive technology and manufacturing. This will benefit students with the necessary 3D printing and Computer-Aided Design (CAD) software skills which is currently used in industries. Students can have the opportunity to have access and advancement to jobs after graduation.

C. Practical

3D printing offers a rapid and functional prototype which can be used for a part or a creative inexpensive 3D printed model (McComb, 2013). Scientists today can use 3D printing
to print a copy of an exact fossil using a CT scanner, this technique helps scientists analyse fossils without the risk of damage or too delicate to be passed around (Mail Online, 2013). Creating a powerful learning environment in the universities, 3D printing can empower students to embrace this emerging technology by allowing new levels of thinking. (3D Printing Systems, Date Unknown). Student population in many different courses (Architecture, Fashion, Engineering etc.) can have the benefit of 3D printing of giving the opportunity to be hands on with their ideas and models. Printing their 3D design prototype allows students to test their ideas and help their theories to be supported by actual physical results. From this, students can analyse their work, develop more of their knowledge by criticising and make recommendations of their design model for improvements to understand their creation process better.

D. Open Days

University open days encourage and support potential students onto their campus, to take a tour and be able to meet staff/lecturers, and ask current students more information about different study programs (Top Universities, 2010). OpinionPanel (2011) state that over the last four years 22% attended one open day while only 15% attended three or more before handing their UCAS applications. Implementing 3D printers into university can benefit not only students but the university (stakeholder) itself. For future students having a 3D printer can make their chosen course from medicine, fashion, automotive etc (Ehrlich and Fu, 2013) more engaging which can change the student experience being more practical with their course modules while it promotes universities being up-to-date with current technologies that other industries are currently using.

II. EVALUATION OF GOVERNANCE ISSUES

This emerging technology has many benefits; still there are governance issues that can impact the incorporation of 3D printing in a British university. As there are many governance issues, the key question is which issues needs to be evaluated? By evaluating these key issues from a variety of different frameworks, the university will be able to identify the biggest risks and potential threats. Section 0.4 (ISO 27002, British Standard Institute, 2013) and Cobit 5 (2012) will help the university to identify the most common issues in order to develop solid guidelines. This section will identify these key issues and evaluate how they can impact the implementation of 3D printing into a university. These issues include risks, security, ethical and copyright.

A. Risks and Security

The first governance issue to evaluate when incorporating 3D printing into universities is security and risks. All organisations/companies when applying new technologies are constantly dealing with risks. One risk of 3D printer is students being able to print offensive weapons, not is it only a risk, but it's also a security issue as students can use these weapons to harm people. This needs to be considered as there is no policy of what can or can't be printed. According to The Telegraph (2013) in the UK criminals could use 3D printers to develop weapons, which concerns security officials. Nevertheless, for students this is a risk to consider since UK gun laws are very strict and difficult to own, students could be able to print gun parts separately within a time frame without the university knowing, if a student is able to print all the gun parts without being detected by the university they can own a working gun.

Daw (2011) reveals there are new ways of criminals using 3D printing such as printing house, car or even handcuff keys. For example, during a conference (Hackers on Planet Earth) in New York, a German hacker and security consultant demonstrated a problem for handcuff manufacturers. He produced a key which could open handcuffs with a laser cutter and a 3D printer (Greenberg, 2012). Plastic guns are not the only threat that can be printed; military parts, drugs and even chemical weapons are threats to 3D printing (International Business Times, 2013). For instance, a student measures the diameters of a key and prints another copy of their own, their families or even their friends' keys such as a car key. Nevertheless, students having copies of their friends' car keys can be able to drive or steal their friend's car without their knowledge and permission.

Another risk to be concerned with when implementing 3D printers in universities is health. Printing a plastic 3D model in a poor ventilated room presents serious health problems to students or other users, this result in producing particles and toxic gasses (McCallion, 2013). Illinois Institute of Technology researchers' studies show individual's risk can be increased for stroke, asthma and cardio respiratory illness by inhaling too much of these toxic gasses (Fox News, 2013). With this in mind, the Health and Safety at Work Act 1974 protects this risk from happening. However, if students have health issues from breathing toxic gasses while using a 3D printer, students can sue the university for not obeying the rules and regulations of health and safety which results giving the university a bad reputation. There has been cases in which students sue their university such as misinform students about job prospects (Koumpilova, 2013).

B. Ethical

With students being able to print offensive weapons, there is always going to be a higher risk of violence by students, however, is it the 3D printer manufacturer at fault? If for example a student uses the printer to manufacture the gun and uses it to harm a person. There aren't any court cases that can set as a guide; nevertheless, 3D printer manufacturers can selectively sell their products (Krasny, 2013). Nonetheless, in this case the university should take the responsibility in ensuring they are obeying the law (Computer Misuse Act, 1990) and make sure the 3D printers are being used correctly by the students.

Another big ethical issue with this emerging technology is piracy. As piracy is a never ending problem over the internet, files can be easily copied, which they can obtain from torrents called 'Physibles' (digital files). This can be reproduced as long as students have access to a 3D printer (Aamoth, 2012). Nowadays, copyrighted files such as music, software, movies etc. can be downloaded from torrent websites (Helton, 2007).
Students can download and steal files from torrent websites and can claim it as their own. However, this can be a difficult issue as students can have access to these files not only in the university but at their very own home and the university wouldn't be able to detect.

In medicine, 3D printing is being used to print human parts such as bones (Doyle, 2013). Boyle (2013) states stem cells being used as 'ink' in a 3D printer can produce 3D printed organs and tissues. According to the BBC (2012) the first 3D printed lower jaw has been created and transplanted for an 83 year old woman in Netherlands. However, this produces major ethical issues, as students in medicine or science courses can use 3D printing to print 'clones' of themselves or other people. This can be controversial for many religious students, for example, a Catholic student would find 'cloning' as human beings manufactured not created by God and bringing new cloned human is not commendable (Michigan Catholic Conference, 2005).

C. Copyright

Compliance especially dealing with intellectual property is another governance issue. Copyright is an unregistered right that are designed, drawn or written (Bradshaw, Bowyer and Haufe, 2010). There are copyright infringement issues to 3D printing, for example, if a student uses a part of a copyrighted object, file or software and the rest of the idea is theirs, the copyright owner would charge. Apple sued Samsung for copyright design base on Galaxy smartphones and tablets copying iPhone and iPads (Kane and Sherr, 2011). This can give the students or even the university a huge fine to pay since students are using the university resources in order to be able to print these files. Unfortunately, there is no indication of whether the CAD files on the internet are label as copyrighted (Hornick, 2013). Students can have access to these files without knowing if it’s copyrighted or not, will give a bad reputation to the university.

III. GOVERNANCE STRATEGY PROPOSAL

As the governance issues are evaluated and pointed out a Governance Strategy must be developed and apply to guide the development and implementation of 3D printing to ensure a maintaining structure to the universities. IT governance is defined as a framework which provides support to stakeholders to be able to achieve their goals (Calder and Watkins, 2008). This ensures that the technology is beneficial to the university will minimal risks of misuse and potential damage to their reputation in the UK and worldwide. This section will incorporate many frameworks as there is no specific set of guidelines for the implementation for this emerging technology.

A. Risks and Security

In order to prevent students printing offensive weapons, the university could follow the recommended sections from ISO: 27002. Section 6.1.1 and 6.1.2 of the framework should be applied to reduce chances of unauthorised or misuse of 3D printing and define security responsibilities. Since 3D printing is a privilege resource it needs privilege access rights, section 9.2.3 should implement a formal log in. This will help the issue of students misusing the 3D printer by printing drugs or even military parts, it can enable universities manage the situation from not happening and revoke access rights to students who misuses. By obtaining authorisation from IT department for the use of 3D printers, it is important that a separate approval for access rights is appropriate from the management.

Applying ITIL framework gives the best practice when implementing 3D printers. In context of 3D printers, students being able to print offensive materials or weapons the ITIL Service Transition (ITIL V3, 2007) key principles need to be considered. These key principles will guide the university by creating and implementing a solid policy framework which provides consistency from 3D printer service failures. In addition, COBIT 5 is another framework which will prevent students printing offensive materials, using principle 3 as a guide to the university. This can be done by integrating a single framework to support applicable policies, guidelines and frameworks up-to-date also aligning relevant frameworks such as ITIL and ISO standards.

Control of Substances Hazardous to Health 2002 (COSHH) is a regulation which is required by the university. This law will help control the toxic gasses from the 3D printer 'plastic ink' in order to prevent students and other users from health problems. According to COSHH a risk assessment needs to be completed from the university decide on how to prevent harm such as having a 3D printer in a well-ventilated room (Health and Safety Executive, 2002). With this act in place, this will prevent students and other users having serious health risks and suing the university.

B. Ethical

It's difficult to apply a framework when it comes to ethical issues as there is no legal framework. However, with piracy issues the Digital Economy Act (2010) will help the universities to make sure this situation can be prevented by any means. Topic 2, section 9 based on technical guidelines such as the university blocking student's access from torrent websites to steal 'physibles' files. This act needs to be implemented to set to avoid students making an identical copy of the whole design file and using it as if it's their own idea instead of the creator's.

As 3D printing can be able to 'clone' humans offending students' religious beliefs it is difficult to find a guideline for this ethical issue. The Data Protection Act 1998 (DPA) section 2 can help show a clear guide to consider a person's religious beliefs or other beliefs when it comes to 'sensitive personal data'. Despite this, students especially from science or medicine courses can have an optional option to choose whether or not if they want to use 3D printing. This changes the students' experience by demonstrating the students how the university is understanding and respects their beliefs.

C. Copyright

Section 18.1.2 should utilise the guidelines allowing the university making sure that students do not copy full or part of any document or files, thus protect materials that are considered intellectual property (ISO 27002, British Standard Institute 2013). Universities can have a 'plagiarism' system
such as Turnitin for 3D printing and managing students to obey copyright law. In addition to compliance, the university should follow the Intellectual Property Guidelines for Business by section 1 and 5 creating a policy for students to encourage them to comply the laws and the university’s policy. Section 4 and section 6 (International Chamber of Commerce, Date Unknown) shows this can be done by designating a staff(s) whose is responsible for enforcing the intellectual property policies and have regular relevant training to employees. These legal guidelines will help students preventing plagiarism using other people's ideas. Furthermore, all universities have covered policies on computer usage and network covering all aspects for students. Implementing this emerging technology it’s highly important for these policies to be up-to-date ensuring students responsible and being aware of the legal implications to use 3D printers.

IV. CONCLUSION

3D printing has many benefits, not only in British universities but universities around the world. This can give an insight for students’ experience, this will assist students to learn CAD software and expand these skills in the working world within a variety of industries. By applying these frameworks this can help avoid governance issues when using 3D printers as long as it’s strictly regulated by the universities can bring a real benefit to the students also the universities.
V. REFERENCES


Implementing A Digital Library System Through The Use Of BYOD/Tablet Devices In A University Setting

A Governance Strategy Proposal

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Abstract—In order to implement a tablet device infrastructure into the University of Derby that ties in with a digital library through the use of databases and cloud server technology, many things need to be taken into consideration in terms of governance risks. Whilst the list of risks would be rather long, a number of risks are detailed in this document. Some issues to consider is the risks with BYOD, the issue with power consumption and power sources, Technostress (where stakeholders may feel overwhelmed by technology) and student preference (which is whether students would even welcome the proposed plan). In order to take care of these risks, Governance Strategy proposals need to be created, using elements of ISO/IEC and ITIL as guidance. Through the use of security certification and recommendations towards security care and virus care, some of the issues with BYOD can be avoided. The university will have to make sure that power consumption is as low as possible, with the potential increase of power usage, therefore it should look towards renewable energy. Conversely, the university is not currently equipped with enough power sources for the increase in BYOD, meaning more power sources will have to be wired into the infrastructure. In order to make sure students would welcome the plan, student surveys will have to take place. From there, a roll out plan will have to be implemented, in order to test the system in some numbers before rolling it out to the mass market. Technostress will have to be solved by putting services in place that can help deal with the causes of Technostress. One of the main causes being the users struggle with new technologies, so teaching courses and a help desk should be installed in order to guide the users of the infrastructure through the process, in order to avoid any stress.

Index Terms—ITIL, Tablet device, Digital books, BYOD, Technostress, Power sources

I. INTRODUCTION

In order to introduce a new technology into a university, using the University of Derby as the example university, a detailed plan needs to be constructed before implementing the infrastructure. In order to do this, the technology needs to be identified, as well as the benefits it will give to the stakeholders at the university, being the students, staff and visitors. From there, the governance issues need to be identified: what problems will rise from the implementation of the infrastructure, what needs to be taken into consideration? In order to plan ahead to cover for these issues or solve this issue, plans need to be put in place. These plans come in the form of governance strategy plans, which use security frameworks such as ITIL and ISO/IEC 27002 as guidance. There will need to be a judgement call at the end of the process as to whether the benefits outweigh the potential risks. There will always be risks and we need to make sure they are taken care of in the best possible way.

A. Chosen technology and proposed benefits

Using a combination of tablet devices, databases and cloud based servers, the proposed idea is to create a system for tablet devices which can be used to supplement a student’s learning experience. This could be an application that can be downloaded onto student’s own devices, but it could also be a system in which the tablets are supplied to the students. The idea is to have a system in place that gives students electronic access to every single book in the library. This solves the issue of the limitation of the number of books in the university. The device will also allow students to make notes on the electronic book itself, which will help aid their learning. It is much easier for a student to carry around a lightweight tablet device as opposed to several large books, which in turn can lead to students doing more reading and research which can lead into grade and results improvements. It will also save students money from reduced library fines, for late book returns. If the system progresses enough and is successful, it could be possible that the library space can remove all the books, as they will be available digitally, and then transform the space into a different useful area for the university.

Furthermore, the system would also allow lecturers to upload work documents, giving students access to them from anywhere in the university. This benefits the lecturer as they can guarantee that every student has access to the document and they will have the added benefit of knowing that a student will be able to view work straight away, solving an issues of students not reading emails or seeing announcements. This in turn will give students more time to think about and complete work which will help see an improvement in results.
The tablet device would connect to a cloud server infrastructure which allows students access to it from anywhere in and around the university. The idea is to give students a ‘multi-screen’ experience; this means giving students an additional screen, allowing the device to supplement their studies. This will help improve student’s productivity (switching between screens, tabs or windows on a computer is time consuming, for example).

The digital books will be stored in a database, which students will have access to and will be able to search through with ease. It is important to make sure this database is secure and only those with permission to access it will be able to access it.

II. GOVERNANCE ISSUES

The list of governance issues would be rather long for a scenario like this, and many policies and plans would have to be put in place to solve them. Whilst it is not possible to go into detail about all the issues that could arise from the proposed plan in this document, it is important to critically evaluate some of the larger governance issues that the university could face whilst implementing such an idea.

A. BYOD- the issues with ‘bring your own devices’

The main issues with students using their own devices within the computing infrastructure in place at the university is to do security. You may find that whilst systems are put in place to restrict access to secure areas of the infrastructure, students or staff may find ways to work around them through their devices (IseT Ltd, 2012).

One way in which people can do this is through Jailbreaking or modifying devices. What this means is that people may root the firmware of their devices, or remove the limitations that have been set by the manufacturer of the device. Jailbreaking can seriously damage the security level of a device. This issue ties in with the fact that the university will have a lack of control over the devices which can be of huge concern (Westervelt, 2013).

With the increased number of devices that would be in the university, there will be an increase in the loss or theft of devices. The law of averages would suggest that this is the case. According to the Kaspersky Consumer Security Risks survey carried out in the summer of 2013, every sixth users of a mobile device will experience some kind of loss, theft or damage to their device. This means that a lot of important data could be lost, as well as a huge loss in time, money and resources (Kaspersky, 2013).

If the users of the devices fail to update their security software, it is possible that the devices could be infected with harmful viruses and software. This is the large problem with personal use of devices, as it in turn could see the infrastructure set in place at the university being harmed by the viruses and malware brought in from the devices (Westervelt, 2013). A recent survey by InfoSec in 2012 found that this issue is an employer’s greatest concern with the BYOD trend (Bridgeway Security Solutions, 2012).

B. Power- energy costs and availability of power sources

A large issue for the university, in terms of funding, is that there will be a large increase in power usage. As the number of devices in the university increases, the cost of the power usage will rise too as hundreds of students will be constantly charging their devices. This is a definite issue, especially as energy prices continue to rise (BBC, 2013).

This is directly related to the fact that the average consumer device will only hold power for a certain amount of time; a length of time which is often not even a day long (Franklin and Blanco, 2013). It is often the case that batteries will often deteriorate after time too.

With the need for constantly charging devices, there will also be an issue with the number of power sources in the university i.e. charging stations or plug sockets for the devices to be charged. Without power, the devices will not work and the whole proposed plan will be void. Whilst this is not an exact scenario and more of a theoretical one, it still gets the point across: imagine a classroom of 50 students, all with tablet devices and only six power sockets scattered around the edge of the room, away from the seating areas. This means that the classroom is not set up in a way to accommodate such a scenario and is an issue that will need addressing. Although, a balance between the number of power stations and power usage will have to be found, as too many power stations could lead to too much of an increase in power usage which again leads onto funding problems, as well as ethical issues to do with environmental care (Choi et al., 2009).

C. Technostress- can too many electronic devices be stressful?

Technostress is a modern disease that is caused by the overuse or feeling of intrusion of computing systems. It can be caused by failing to cope with computers, or the feeling of pressure to use computers. This can lead to headaches, nightmares, resistance to learning and other stressed induced symptoms (Brod, 2008). It is possible that the inclusion of a device based system within the university could lead to Technostress, which would have the opposite effect of the desired aim: instead of increasing student productivity, it could do the complete opposite. It could also have an effect on the staff within the university, as well as the students, as it will be yet another aspect of their jobs that they will have to cope with i.e. having to deal with system failures and other potential problems (Tiemo and Ofua, 2010; Times Higher Education, 1997).

D. Student preference- would students welcome the proposed idea?

It is entirely possible that the proposed idea will not be welcomed by the students of the university, or not by the majority of students. Tying into the Technostress issue, students may feel that having a new technology aid their studies will not be beneficial to them. Whilst a study by Lim et al. (2006) showed that 79.8% of the students surveyed preferred computer based exams to pen and paper exams, it could be the case that with a different sample size or difference in the culture of the students surveyed could see a difference in results. As the study was executed in Singapore, it could be the
of security and expectations that the password is voided. This will solve issues in classrooms, as students will be expected to make sure their devices are charged before entering classrooms. However, it would be advised to set up power sockets so that power sockets are readily available, with new power stations being installed safely inside the floor if necessary.

C. Technostress

In order to solve Technostress, it makes sense to look at the causes and then look how to combat them. It is important to note that both students and staff of the university could be affected by Technostress.

A study by Pereware Aghwotu Tiemo and Justice Owajeme Ofua of Delta State University found that a lack of training, and inexperience with computers caused Technostress (Tiemo and Ofua, 2010).

Therefore, onsite training courses by experts should take place for staff should take place in order to make sure they have a good grasp of computer systems. Staff members should be made to take the European Computer Driving License which will ensure that they have the knowledge of the fundamentals of a computer (ECDL Foundation, 2013). From this, knowledge can be passed down to students through the necessary fields, either in seminar form or public documentation form. IBM highlighted the need for staff training as a way to boost company morale, which in itself solves the issue of Technostress (IDM, 2010).

Technostress is also caused by complexity of hardware and software, as well as reliability of hardware and software. In order to improve the reliability of devices, and to make sure any issues with them can be resolved efficiently, the IT service desk already in place at the university will need to be expanded in order to deal with the larger number of devices. Using the ITIL framework to implement the service desk would be ideal. Creating a local service desk will be beneficial as it allows for fast, hands on feedback. There are several benefits of an IT service desk already in place at the university will need to be expanded in order to deal with the larger number of devices. Using the ITIL framework to implement the service desk would be ideal.

The university will need to look towards renewable energy in order to make up for the extra costs towards power consumption due to the increase in devices used. This could be done through the use of solar panels which are dedicated for storing energy that will be solely for power stations that would be spread across the university i.e. a section of the university would be equipped with power stations that will be used solely for the use of charging user’s devices. As the Keddlestone road campus of the University of Derby is a tall building, covering the face and top of the building with solar panels will see a lot of power generated. Highly efficient cell solar panels can have efficiency levels of up to 50% (raw sunlight is converted into 50% power (Taos, 2013). If the power is dedicated to the devices in the university, then a significant amount of money would be saved. Implementing power stations into the university campus will also solve some of the issues to do with power socket placement in the classrooms, as students will be expected to make sure their devices are charged before entering classrooms. However, it would be advised to set up classrooms so that power sockets are readily available, with new power sockets being installed safely inside the floor if necessary.

D. Student preference

The proposed infrastructure may not be welcomed by many students of the university, so data will need to be gathered to understand that a cultural difference in the UK means that students here could prefer pen and paper. Of the people in that survey who preferred pen and paper, several of them suggests that problems their computers led to them preferring pen and paper. This means that if there is issues with the proposed tablet idea, then it is possible that that could cause students to change their preference to pen and paper, thus rendering the idea pointless.

III. GOVERNANCE STRATEGY PROPOSAL

A. BYOD

In order to combat the issues that arise when people bring their own devices into the infrastructure at the university, security policies and recommendations need to put in place in order to maintain a high level of security and expectations (Paganini, 2012).

Using elements of ISO/IEC27002, we can draw out a policy plan that will ensure a more secure system will be put in place. Firstly, personal devices will have to use authentication that has been approved by Information Security. Authentication could be given through the use of unique digital certificates for each device. The use of digital certification will give each device its own identity, which means if there is an issue it can be tracked down to a specific device. The use of certification can help provide a high level of security in a virtual private network like the one being proposed (Government of Rajasthan, 2012; IsecT Ltd, 2012).

In order to access the library system through a user’s BYOD, appropriate forms of authentication must be used, such as user IDs, passwords or authentication code systems i.e. codes distributed through other systems such as emails that will allow access to the infrastructure (IsecT Ltd, 2012). In order to achieve compliance with ISO/IEC 27001:2005, a Privileged Password Manager (PPM) should be used, which is a system which will allow for passwords to be secure for accounts with elevated security privileges. This is usually achieved by periodically changing the password to a random value or characters. This means that there will be a small amount of time where the password is active so a user can log in to the system, and after that the password is voided. This will solve the issue of unwanted users accessing the system (Quest Software Inc., 2013).

In order to make sure all BYOD are safe, users must make sure that they are installed with virus software or have up to date firmware, which will have virus software included in the case of tablet devices (IsecT Ltd, 2012).

It will be understood that users’ BYOD may possibly be used for personal use, but it is the university’s right to control the data that goes in and out of the infrastructure so if people wish to stay private, it will be explicitly advised that the devices be kept separate from student’s personal lives. This in turn will solve some of the issues with loss of devices, where any personal information would not be lost.

B. Power

The university will need to look towards renewable energy in order to make up for the extra costs towards power consumption due to the increase in devices used. This could be done through the use of solar panels which are dedicated for storing energy that will be solely for power stations that would be spread across the university i.e. a section of the university would be equipped with power stations that will be used solely for the use of charging user’s devices. As the Keddlestone road campus of the University of Derby is a tall building, covering the face and top of the building with solar panels will see a lot of power generated. Highly efficient cell solar panels can have efficiency levels of up to 50% (raw sunlight is converted into 50% power (Taos, 2013). If the power is dedicated to the devices in the university, then a significant amount of money would be saved. Implementing power stations into the university campus will also solve some of the issues to do with power socket placement in the classrooms, as students will be expected to make sure their devices are charged before entering classrooms. However, it would be advised to set up classrooms so that power sockets are readily available, with new power sockets being installed safely inside the floor if necessary.
make a justified judgement as to whether the infrastructure should be implemented. Through the use of student and staff surveys, using the computing system already in place that already allows for the use of surveys, a questionnaire should be carried out in order to make the correct decision (Quest Software Inc, 2013; University of Surrey, 2007). If students and staff would not welcome the idea, then it should not be implemented as it would be a waste of resources. However, if students and staff do welcome the proposed infrastructure, then a system roll out system will need to be implemented. Using the Service Transition of the ITIL framework as reference, a small number of devices should be trialled by students and staff (Cartlidge et al., 2007). This will allow the users to judge whether the service works as expected and allows for improvements. From there the number of devices will be expanded throughout the university as long as the system continues to work as desired.

Any changes that must be made to the service during this period and through the lifetime of the service must be recorded, for problem solving purposes – the service can revert back if a change breaks the system. Any changes made would be tested in small numbers before being delegated through updates to all consumer devices, avoiding service failure.
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Cultural Impact of Digital


END OF BOOK