UNDERSTANDING THE USE AND IMPACT OF LEARNING ANALYTICS ON STUDENT EXPERIENCE MANAGEMENT IN THE UK HIGHER EDUCATION SECTOR

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UNDERSTANDING THE USE AND IMPACT OF LEARNING ANALYTICS ON STUDENT EXPERIENCE MANAGEMENT IN THE UK HIGHER EDUCATION SECTOR

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Abstract

Information systems have always been seen as an essential enabler for the success of the modern organisations. This is also very evident for Higher Education Institutions (HEIs) worldwide. Driving by the need to improve student experience, Learning Analytics (LA) has been a rapidly growing area of interest in UK HEIs. However, there is very limited literature on the use and impact of LA in the Higher Education sector. This research aims to close this gap by developing a better understanding of the use and impact of LA on student experience management. A qualitative methodology is employed by adopting an exploratory case study and semi-structured interviews with key stakeholders across UK HEIs. This research-in-progress paper will provide background information, identify research gaps, explain the research methodology and process, discuss the preliminary findings and framework so far, and present the future work and expected contributions.

Key words: Learning Analytics, Absorptive Capacity, Higher Education Institutions (HEIs), Student experience management.
1 INTRODUCTION

Providing students with the best learning experience and ensuring their academic success throughout their university lifecycle has been a serious challenge for Higher Education Institutions’ (HEIs). Whilst advances in Information and Communication Technologies (ICT) have enabled HEIs to intelligently collect more data from both internal and external sources (Bichsel 2012, Davenport 2013); this leads to the explosion of data and unprecedented challenges in making effective use of this formidable amount of data for effective decision making and better student experience management. Whilst there is indication that large commercial companies that use Business Analytics perform better than those that do not in making strategic decisions and creating competitive advantages (Kiron, Prentice et al. 2012), managers in HEIs are still struggling in making sense of ever growing amount of data and information (Tulasi 2013).

Although a range of UK universities are increasing their Big Data and Analytics investment and starting to see the impact of it, HEIs in general are still far behind the commercial sector. Majority of HEIs are still not actively exploring and adopting Learning Analytics (LA) despite the huge potential benefits. Extant literature review has revealed a number of research gaps. For example, there is a lack of understanding on how HEIs are dealing with student experience management and what challenges they are facing in making effective decisions in the era of Big Data. There are also no theoretical and empirical investigations regarding the use and impact of LA in Higher Education sector despite that many HEIs are starting to invest in LA and are eager to know the impact. There is also a need to have systematic and rigorous research to establish a framework underpinned by relevant theories that depicts the use and impact of LA, the key influential factors in relation to LA’s use and impact in the context of HEIs. It is believed that the lack of understanding on LA will hamper the effective use and impact of LA in HEIs.

Therefore, this paper aims to understand the challenges that HEIs are facing in student experience management in the era of Big Data and Analytics and to explore how LA can be used to provide data-driven insights and improve student experience that has been one of the top priorities in many UK HEIs. This research will also explore and apply the relevant theories to help explain and understand the use and impact of LA in the context of student experience management.

More specifically, this study has the following objectives:

1. To understand the challenges in student experience management in the era of Big Data and Analytics
2. To understand why and how LA is used in student experience management,
3. To explore how LA use and impact are affected by what factors
4. To identify how and why LA affects what aspects of student experience management
5. To develop a conceptual framework to provide a systematic overview on the use and impact of LA on student experience management in HEIs

The working definition used for this research is adopted from the 1st International Conference on Learning Analytics and Knowledge (Siemens and Long 2011: Page 34), which defines LA as “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs.”

2 LITERATURE REVIEW

As this study focuses on the use and impact of LA on student experience management, the following sections provide a brief literature review on the nature of student experience management and relevant theories that may be adopted to explain the issues identified through qualitative research and underpin the final framework.
2.1 Student Experience Management

Student experience management (SEM) can cover all aspects of student facing management activities from marketing, recruitment, engagement, retention, performance, to graduation and alumni relationship management. To improve student experience and ensure their success, SEM forms a critical part of Higher Education management. SEM is important in HEIs because institutions strive to distinguish themselves from their competitors through a number of processes such as improving teaching and learning success and the quality of services given to their students, and managing the costs of their procedures by enhancing efficiency and effectiveness.

HEIs are starting to become aware of the large amount of data and intelligence that are available in their own systems. This can then be utilised to understand the needs of the students, the market and to make sure that the business advantages that arise from the successful management of direct relationships with students are secure. However a unified approach amongst managers and students is required for the benefits to be realised through the use of LA. Previously HEIs have also leaned towards managing different stages of the student lifecycle using a diverse range of IT solutions, for instance “separate systems for admissions, student records, accommodation, or alumni” (Chambers and Paull 2008: page 6). Now managers within HEIs can look to organising different stages of the student lifecycle with LA. There is a very limited academic literature on SEM. For example, the most relevant work is the Chambers and Paull (2008) student life cycle model that focuses on administrative procedures of a student’s university life from pre-application to graduation and alumni, but their model does not include areas such as student engagement or student retention in the process which are important steps in the management.

There are also various challenges that HEI managers face in the utilisation of data and analytical tools when improving areas within SEM. One of the main challenges is having vast amounts of data but the data is actually held in several individual systems such as Moodle, BREO or the HEI’s specific student records system (SRS). With so many silos of analytics tools it makes it difficult to bring the different tools/systems together to gain a better visualisation of what is happening within key areas such as student engagement and student retention and also makes it harder to see the relationship between bits of data. So far from the data analysis there seems to be a need for silo systems to be integrated to provide better SEM, therefore this study proposes a comprehensive SEM cycle which is shown in Figure 1.

![Diagram of Student Experience Management in HEIs](image)

**Figure 1. Student experience management in HEIs**

2.2 Learning Analytics

As a result of the current explosion of Big Data, which refers to the variety, velocity and volume of the data produced using ICTs, LA is commonly used in the education sector to improve SEM. Sclater (2014) states that “Learning Analytics is seen by some institutions as a way of enhancing teaching and helping to build better relationships between students and staff”. In the horizon report, Johnson,
Adams Becker et al. (2013) acknowledge LA as a key component in technology enhanced learning and teaching for the future. There are many different interpretations of analytics. For example, when examining LA in practice, there is slight confusion between Learner and Learning analytics. With Learner analytics it’s about focusing only on characteristics of the learner, Learning Analytics is much wider in the sense it’s the way in which students learn is influenced by the people around them, their network, and their opportunities. In the context of this research, Learning Analytics is the preferred term because not only does it focus on the individual but it focuses on learning as a process.

Similar to Business Analytics, LA can also be classified into descriptive, predictive or prescriptive based on its key functionality. For example, Descriptive analytics in HEIs can examine data in learning management systems by observing factors such as course completion. Daniel (2015) states that the main aim of descriptive analytics is to find patterns from samples that address current trends, i.e. graduation rates, student enrolment and advancing into higher degrees. Prescriptive analytics uses models to identify optimal behaviours and actions (Davenport 2013) and is used to analyse the current problems faced by HEIs such as “student retention, enrollment management, prospect analysis, improving learning outcomes and curricular planning”(Schaffhauser 2014). Predictive analytics are very significant in HEIs as it is used to support students who are at risk of dropping out Eckerson (2007) defines predictive analytics as “an area of statistical analysis that deals with extracting information using various technologies to uncover relationships and patterns within large volumes of data that can be used to predict behaviour and events”(Page 5). By engaging in the use of predictive analytics from various data sources, problems can be predicted early as well as intervention plans formed. This gives a full view of each student (student profiling) and provides a better learning experience catered to the student.

In reference to the research gaps, HEI managers don’t seem to have a thorough understanding of the concept and evolution of LA which could prove useful so that they are aware of the different terminologies concerning LA and also the current status of LA. Most HEI managers view LA as complex technology that will culturally change the future of HEIs and also as an expense. It is hoped that HEI managers may feel more at ease when a framework is put in place, as the classification of LA is well presented and they can observe where within their role, LA can be used. It is important for HEI managers to know about the use and impact of LA within organisations to make informed decisions regarding SEM. The discussion of the relevant theories in the next section provides a variety of conceptual components that could be included in a framework.

2.3 Relevant theories

In order to understand the use and impact of LA on SEM and lay the foundation for further discussion and conceptual development, this section provides a short review of the relevant theories that can be used to help unveil what key factors might affect the use and impact of LA, how LA use might help develop organisational SEM capabilities, and finally how SEM might be improved as a result of LA use.

Technology, Organisation and Environment model (TOE)

Technology-Organisation-Environment (TOE) framework is one of the widely recognised and well-used frameworks in technology adoption and diffusion research. Tornatzky, Fleischer et al. (1990) proposes the TOE framework to study the adoption of technological innovation. They suggested that the decision to adopt a technological innovation is based on factors in the organisational and environmental contexts, and also on the characteristics of the technology itself. Technology, organization, and environment are three common contexts that have been considered when IS researchers in organizational studies seek factors (Oliveira and Martins 2011). TOE has been widely adopted in investigating factors affecting technology adoption and used at the organizational level.

Absorptive Capacity

Cohen and Levinthal first coined the term “absorptive capacity” (ACAP) in 1989 and subsequently defined it in a wider view as “…an ability to recognize the value of new information, assimilate it,
and apply it to commercial ends’ (Cohen and Levinthal 1990: Page 128). ACAP has been widely used in the prior literature to broadly indicate firms’ receptivity to technology change and innovation (Joshi, Chi et al. 2010). For example, Joshi, Chi et al. (2010) invoke ACAP to conceptualize firms’ IT-enabled knowledge capabilities and link these capabilities to firm innovation.

It is hoped that by adopting TOE and ACAP theory to assist our examination in this study, the research will be able to develop a framework illustrating the use and impact of LA and the key influential factors on its impact.

3 RESEARCH METHODOLOGY

As this research primarily seeks to develop our knowledge and understanding of how and why LA affect SEM in HEIs, the methodological approach employed is thus qualitative approach, which is different from the mainstream adoption, use and impact of studies of information systems.

Firstly, while the majority of IT adoption and impact studies have focused on using confirmatory statistical techniques (Schwarz and Chin 2007, Silva 2007), Silva (2007) argues that IT adoption and success research requires more explanatory theories and methods that can help explain and understand the phenomenon. Being aware of the current criticism and limitations on the dominant use of the quantitative approach in IS adoption and success research, this study employs a qualitative approach to explore the richness, depth and complexity of the LA phenomenon.

Secondly, instead of using a pure deductive approach using a pre-selected theoretical framework to inform the data collection, a two-stage research method is adopted. A conceptual framework will be developed to enrich the theory and provide a systematic overview on LA’s use and impact on SEM and associated key influential factors affecting the use and impact.

The data collection of this research involves two stages:

The exploratory case study: In the first stage of the study, an exploratory case study is employed with semi-structured interviews as an instrument to gain knowledge and insights from a sample of key stakeholders in a UK HEI. Other secondary information is also collected and analysed in the case study. The objectives of the case study are to gain a rich understanding of the current situation regarding how and why LA is used and its impact on the SEM from the managers’ views in the context of Big Data within this UK institution. This case study follows a data driven inductive approach by collecting qualitative data based on the main objectives and generate a comprehensive list of 1st order themes using the thematic analysis method. According to Braun and Clarke (2006) “Thematic analysis involves the searching across a data set – be that a number of interviews or focus groups, or a range of texts – to find repeated patterns of meaning” (Page 16). Based on the comprehensive analysis and understanding of the themes and the relevant theoretical literature review, the most suitable theoretical lenses will be adopted to broadly map out and explain the issues identified. The exploratory study helps to explore the suitability of the theoretical framework to be used for the second stage of study.

The main study: The main study involves data collect using semi-structured interviews with 30 participants in different UK HEIs. Additional secondary information is also used to provide better background information about the organisation that each participant works. The main objective of the main study is to further enrich the preliminary findings and extend the conceptual framework (theory extension and enrichment).

4 DATA ANALYSIS AND FRAMEWORK DEVELOPMENT

4.1 The exploratory case study

The case study HEI, short named as BS is one of the newer universities in the UK that is currently utilising LA as a way to improve student experience because “managing a diverse range of over 20,000 students during their academic life in the university has always been a challenge as well as
threats because the government’s tough policy on funding and immigration control” (interview of a senior manager). The use of LA is mainly being driven by the government policy and HEI’s senior management team. The Deputy Vice Chancellor Academic is particularly interested to find out how analytics can be used to further understand the student experience. Also there is a proposal to develop an approach to deliver LA across the university that will include different types of analytics. In terms of the analytics systems being used, this university uses interactive business intelligence as well as an Oracle data warehouse. The student engagement dashboard used by the university currently is developed by a third party warehouse and also through working with the University registry and ICT department. BS is still looking to improve the current student engagement systems by integrating various the reporting tools.

Seven middle to senior managers are interviewed as part of the case study. Using thematic analysis method, a number of themes are identified. The findings suggest that many factors would affect the use and impact of LA on the SEM. These influential factors range from technology advances, such as Big Data technology availability and affordability of LA software (e.g. cost of BI platform was a barrier in this case), to external LA triggers such as government requirement, UKVI compliance, funding from the UK Joint Information Systems Committee (JISC), competitive pressure. Internal factors, such as senior management commitment, in-house expertise, system integration, etc. To systematically map these factors to understand their theoretical dimensions, it appears that Tornatzky, Fleischer et al. (1990)’s TOE model can be used to provide a useful theoretical mapping of the key influential factors. In the context of SEM, TOE framework can help understand the key factors that affect LA use and impact on SEM. The technological factors may include the existing LA technologies in HEIs such as Moodle, BREQ, SITS; and the emerging LA technologies such as Tableau and Qlikview (Wang, Wang et al. 2010). These LA technologies are seen to be able to provide descriptive, predictive and prescriptive analytics to significantly improve SEM. The organisational factors could include data driven culture in the organisation, leadership, organisational support in terms of the slack resources that an organisation has internally, quality of human resources, SEM strategies, as well as processes and culture in general. Adoption of LA is also be affected by the environmental factors that can serve as either barriers or opportunities for technological innovation, such as governmental policy, public funds, and the level of competition between HEIs.

Regarding the use of LA, the case study findings suggest that although LA has great potential for improving SEM, the current level and scale of use in BS is still limited. To have a comprehensive understanding on the LA’s use and impact, an organisation’s absorptive capacity in the context of LA may offer a suitable theoretical lens. According to Joshi, Chi et al. (2010) “The application of ACAP in various studies has not been literal, and each study instantiates ACAP and its components to accommodate its unique context” (Page 474). In the context of SEM and big data and analytics, ACAP is seen to be able to help understand how HEIs could use LA to process high volume, velocity and variety of data to identify useful insights thereby to develop organisational capabilities to improve SEM. It has been indicated that the absence of absorptive capacity in an organisation prevents better organisational learning and performance improvements (Lane and Lubatkin 1998), therefore developing an absorptive capacity is important for HEIs success in utilising LA to improve SEM in the long term (Lane, Koka et al. 2006). Therefore, the LA use is considered from LA-enabled absorptive capacity by invoking ACAP to conceptualize HEI’s LA-enabled knowledge capabilities and link these capabilities to student experience management, based on the findings of the exploratory study.

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Student Experience Management
- Recruitment
- Engagement
- Retention
- Academic success

Figure 2. A preliminary framework for understanding the use and impact of LA
In the case study, BS demonstrated LA-enabled potential ACAP by developing a student engagement tracking system to acquire student engagement behaviour data and assimilate the information for better engagement management. BS is also able to transform the knowledge gained through the LA-enabled potential ACAP to enhance the success of the student experience management.

Regarding the LA impact in the case study, the empirical evidence collected demonstrate a notable positive change in student engagement behaviour in terms of class attendance level, library visit and increased campus visit.

A preliminary framework as shown in Figure 2 is proposed for developing a better understanding of the use of LA and its impact on student experience management.

4.2 The main study - semi-structured interviews with key stakeholders

In this second stage of the empirical investigation, a large round of interviews were undertaken with 30 interviewees working in 30 different UK HEIs. These interviewees were approached using purposive sampling. With purposive sampling, the researcher has an exact idea of what sample units are required and then approaches possible sample members to examine whether they meet eligibility criteria (i.e. currently working at senior management level in a UK HEI, have knowledge of LA and big data and the manager’s role being related to student experience). Those that do meet the criteria are used, while those that do not are rejected (Easterby-Smith, Thorpe et al. 2012). They have been selected from areas such as Data analysis, Information systems, IT, student management information, student services, planning, academic and research support, student experience, marketing, student recruitment and E-learning. Table 1 shows the profile of the thirty participants (See Appendix).

4.2.1. Data analysis – work in progress

Thematic content analysis is used to generate themes at different levels to enrich and improve the preliminary framework. All interviews were audio recorded, transcripted in Word and imported into the Nvivo 10 software. Twelve out of thirty set of interview data are initially analysed using thematic analysis method. Based on the codes generated so far, the preliminary framework is to be further expanded and improved with additional moderating factors, such as LA integration and context specific LA factors for each TOE category. The impact analysis will be reflected from a two dimensional measure in terms of the SEM’s four areas and the three organisational levels of SEM, i.e. operational, managerial and strategic.

6. FUTURE WORK AND EXPECTED CONTRIBUTIONS

This research has completed its data collection activity and all 30 interview recordings have been transcribed. The researchers are in the process of conducting thematic analysis using NVivo software. To ensure the research reliability, the inter-coder reliability assessment will be carried out by involving three researchers to independently conduct thematic coding and compare their results with that of our results.

Equipped with the rich empirical evidence collected from a case study and 30 interviews in 30 different UK HEIs, it is anticipated that by the end of this research, the findings will make the following important contributions to knowledge and practice in Big Data and Analytics in Higher Education sector:

1. A clarification on the concept of LA in HEIs as there is no commonly accepted definition for defining the use of analytics in the Higher Education sector.
2. An in-depth and rich insight into why and how HEIs are engaged in applying LA and what are the key influential factors on LA applications and impact.
3. A framework for a systematic understanding of the LA use and impact from an absorptive capacity perspective. The framework can be further adapted to analyse and understand the LA use in other areas of HEIs.
4. A contribution to IS research methodology by adopting and demonstrating the benefit of using a two-step research method for theory extension and enrichment.
References


## Appendix

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Table 1. Participant profile for the main study