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EXPLORING THE BALANCE BETWEEN AUTOMATION AND HUMAN INTERVENTION IN IMPROVING FINAL YEAR UNIVERSITY STUDENT NON-COMPLETION

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Abstract

This paper examines the research methods used in the 'Pedestal for Progression' project, a project that set out to determine why students at Loughborough University fail to complete their final year. It demonstrates how methods adopted can be used to enhance student experience and improve retention. Initial research with students found that the difference between student experience in initial and final years can be characterised by concern over the independent study required for the dissertation project and associated worries of managing workloads with competing deadlines. Interviews and workshops with students also identified a wider concern about the quality of relationships with technical, administrative and academic staff. In addition, research found that the final year can be flooded by concerns over employability. Fundamental to these issues are student relationships. Using the methods of Service Design and Data Mining the project designed, implemented and assessed a number of initiatives aimed at alleviating these student concerns. Key to the theory of Service Design is the management of points of contact with service providers and vital to Data Mining is the identification of patterns of behaviour that could predict non-completion. Service Design aims to provide customer focused highly desirable services. Whilst, on the other hand, data mining aims to identify signals that determine those at risk of not completing courses. This paper examines the use of Service Design and Data Mining in Higher Education from the results of the project and determined that whilst the methods can be used in a complementary manner, each derives from different paradigms of knowledge.

Keywords: Service Design, Teaching and Learning, Higher Education, Undergraduates, Data Mining.

1 BACKGROUND

The Joint Information Systems Committee (JISC) is driving innovation in UK education and research by providing knowledge, expertise and resources to support change and champion digital technology within Higher Education Institutions. A recent focus for funding has been to support activities around student relationship management, covering the student lifecycle from pre-registration through to alumni.

The Centre for Engineering and Design Education at Loughborough University has been funded by the JISC (Feb'11 – Aug'12) to carry out research activities and subsequently trial interventions or processes that better support students' progression, retention and non-completion. The project is entitled 'Pedestal for Progression' and includes an investigation of both human interventions and Information Communication Technologies (ICT) within the process of supporting students whilst on their course. It set out to discover the optimum balance of human versus automated intervention to ensure an enhanced student experience.

Whilst more traditional user-centred development techniques, for example requirements engineering, are used specifically for the design of ICT systems this project set out to employ the Service Design method in conjunction with data mining techniques to ascertain user perception and behaviour. These techniques when used in combination will help to specify the human processes that are intertwined within IT processes and information handling required within a successful system or service.

2 THE BENEFITS OF TWO COMPLIMENTARY METHODS

Service Design has emerged from the commercial sector and entered Higher Education. Service Design allows designers to model and improve complex interactions and identify multiple, often

intangible variables, contributing to the success of interactions. It is typically used in the Customer Relationship Management (CRM) field.

Key to the theory of Service Design is the management of relationships and vital to Data Mining is the identification of patterns of behaviour amongst service users. Service Design is concerned with providing authentic customer focused, highly desirable, and pleasurable, services. It aims to foster a sense of ownership, and to include often intangible customer feelings about a service, representing them in a visual manner. Snook, a Service Design consultancy based in Glasgow, defines a service in the term Service Design as "…a co-created event that delivers value to the parties engaged in the interaction" [1].

In recent years these methods have emerged from the confines of the commercial sector and, for example, even within the urban design context these techniques are being adopted to work with the multiple complex interactions necessary to build sustainable cities. Within the context of HEI's however, the use of Service Design has presented widely criticised and problematic model of students-as-customers, which has very different connotations to students as learners, including entitlement to satisfaction, a duty to complain and a University management team keen to exceed customers' expectations. As Schwartzman (1995) has argued, where students are envisaged in this way, educators, by default, '…assume the role of panderers, devoted more to immediate satisfaction than to offering the challenge of intellectual independence' [2] (Schwartzman, 1995).

Data Mining, on the other hand, uses large amounts of data to identify signals to determine those at risk of not completing courses or where there may be a lack of engagement or progression with their studies. A tremendous amount of data is collected by ICT systems during a student's time at University, for example; time and location when logging into a network; attendance at lectures; access to and time spent within online systems such as a Virtual Learning Environments (VLE); access to library resources such as books borrowed or online journals accessed. In most cases this data tends to be confined to the system that collected it and accessible only by system administrators. However, this engagement data has great potential to predict patterns of behaviour for certain types or profiles of learner in order to help tutors identify struggling or un-engaged students. In the 2011 Horizon report Johnson et al. predicts that in the next two to five years, "Learning analytics promises to harness the power of advances in data mining, interpretation, and modelling to improve understandings of teaching and learning, and to tailor education to individual students more effectively" [8].

Some enterprise level applications already exist to pull together learner analytics into dashboards of information for tutors. These systems contain sophisticated algorithms that calculate and model certain types of student behaviour within joined up ICT systems as well as personal information about a student such as grades on entry and whether a student is self-funding or not. Such a system has been developed and in use at Purdue University, USA. The Signals Project (http://www.itap.purdue.edu/studio/signals/) provides a traffic light system for tutors as an early intervention system [3].

Whilst Service Design depends on the physical and voluntary participation of students in change, Data Mining is a virtual observational tool used to analyse and model learner behaviour. Students could perhaps perceive this big brother approach in a sinister way (see Perdue University, Signals project http://www.purdue.edu/uns/x/2009b/090827/ArnooldSignals.html) and, as such, it raises ethical issues about the collection of data and the surveillance of students by Higher Education Institutions (HEIs). Is it ethical, for example, to check if a student is accessing email or attending the library? Should students be the custodians of their own data?

On the other hand, Service Design is very different to this approach but also to other marketing tools as it implies collaboration and co-design. Nevertheless, the context of Higher Education is also very different to that of commercial services and its principle activity is teaching (with research being a closely associated subsequent activity). Questions about pedagogy must take precedence [4]. Service Design implies collaboration and co-development; students-as-customers can be agents for change. Moreover, Service Design aims to uncover specific, unnoticed, interactional needs. The deconstruction of traditional power relations between researcher and research participant and the visualisation of moods and emotions correlates with contemporary participative methods, community development focused tools, and even innovative pedagogy in the classroom.

Service Design attempts to articulate the story of a student's time during particular points in their studies, based on their direct experience, perceptions and emotions - using their own voice to convey their interactions. At the other end of the emotional spectrum, data mining and the use of IT to collect and convey information relating to students' behaviour gives us the opportunity to have an

unambiguous insight on real-life and real-time student activity. Siemens and Long (2011) warns over using data mining or learner analytics for deterministic modelling however, ".. we risk a return to behaviourism as a learning theory if we confine analytics to behavioural data, how can we account for more than behavioural data?" [5]. It is hoped that using data mining in conjunction with service design a broader picture can be gathered.

Students in Higher Education must be allowed the freedom of critical thinking (which some of these tools suggest), and the opportunity for independent working and self-organisation [6]. Service Design tools have a foundation in social change. Service Design has been used to benefit marginalised communities to significant social effect. Nevertheless, within the HEI context, the desire for student participation in managing the student experience and, in particular, in course design can still be notoriously insincere: as Kay et al (2010) suggest 'the concept of the student voice can be passive and disempowered, governed and operated' [7].

Service Design has limitations, and yet so does Data Mining. Methods of signalling to staff students who are in danger of withdrawal from course are, on their own, notoriously unsuccessful ways of managing student behaviour. 'Pedestal for Progression', adopted a critical and selective approach that combined these two different perspectives and chose particular techniques from each. The use of Service Design techniques provided an opportunity to design significantly better interactions and identify 'touch points' where students' interaction with the University was particularly important in retention in the third year.

3   REVEALING COMMON EXPERIENCES AND ISSUES

The Pedestal for Progression project consisted of a number of staged work packages and associated milestones, including discovery, development, assessment and dissemination associated with a research project. During the discovery phase students were asked to map out interactions with staff during the final year project in a form of a 'Blueprint' – a particular Service Design Tool - to identify the points for improvement. In initial workshops this was not however, received with enthusiasm, but the 'flower of focus' (another alternative Service Design Tool adopted) did indeed engage participants, allowing researchers to map and determine relative importance to expectations associated with final year learning experience.

Discovery phases of the project gathered user experiences and stories from a variety of different sources and stakeholders (known in service design as a diagonal slice of the organisation) using both interviews, focus groups with finalists, interviews with academic and administrative staff and extracted data from the National Student Survey results as well as minutes from Staff/Student committee meetings.

These results were compared with research work, already being carried out in the University (see 'Outduction', 'Creating Future Proof Graduate', 'Rethinking Final year Projects and Dissertations: Creative Honours and Capstone Projects'), and comparisons also including the re-design of a final year project module to improve student experience being implemented in the History Department which demonstrated significant scope for improvement in the delivery of the final year project. A select number of students were also asked to prepare a narrative of their experience in the final year. Furthermore, one engineering department had an interest in improving employment opportunities of final year students by Service Design methods thereby ensuring access to and take up of an industrial placement year during their degree courses.

These early studies allowed the research team to identify a series of expectations of learners in the final year (but not necessarily the respective importance of these expectations). These included: flexibility of study, sufficient contact time, additional skills support that was easy to access, opportunities for personal development, enterprise opportunities, industrial skills development, fair and balanced assessment with consistent and timely feedback, variety in the delivery of courses and in teaching approaches, access to facilities and equipment when needed (especially relevant to students with laboratory based final year projects), relevant, up-to-date and stimulating curriculum content, the opportunity to feedback to lecturers and tutors and the ability to use personal technologies, IPads and IPhone and social networks for learning.

The balance between automation and human intervention required to maximise the perception of a 'quality relationship' was thereby raised by these early discovery phases. The research focus of the latter phases of the project, as initiatives designed went beyond the improved functionality of any of these existing services and systems, became that of a deep engagement with identifying 'touch points'

(a service design phrase); times and places where interaction with the University really mattered in the final year: times and places and consequent relationships that could be improved to meet many of these expectations. Initial student interaction mapping identified a general need for a better quality of relationship but Service Design tools, like the flower of focus, and its relative weighting of needs, revealed that issues like programming, timetabling, planning of deadlines for coursework and concerns over employability were rated more highly that expected in determining quality of experience and retention.

Methods adopted in the latter stages of the project uncovered numerous peripheral, apparently minor, but often highly significant anxieties. Students raised a number of recurrent issues, including: being able to manage time properly; being able to access the library resources; being able to access to specialised software; having help with employability; being able to contact personal/individual tutors (which included a criticism in the description of 'knowledgeable personal tutors', 'tutors familiar with dissertation brief', 'tutors who can advise on module selection'); and more contact time with support staff (tutors, lab technicians etc.,) as lab based final year projects characteristically had problems with access to technicians to build equipment. The issues were rated by students in terms of greater and lesser degrees of importance, and could be rated statistically, nevertheless, what was so significant, about the method, was the opportunity, simultaneously, to devise solutions themselves. Combining Service Design and Data Mining provided a way to explore final year experience and moreover to design and implement change. This was expressed in one student's concern over employability as the need for a plan, in one of the early interviews carried out: "I think one of the most important things to consider in the third year is to develop a long term plan on what to do after graduating from Loughborough" (Sport and Exercise student entering final year October 2011).

4 IDENTIFYING LEARNER DATA

Co-Tutor (http://co-tutor.lboro.ac.uk/about.php) has been developed at Loughborough and is a staff / student relationship management system. It provides an 'intelligent tutor' dashboard for staff containing information about their students, and is place where they can enter information on conversations or meetings with students as free text, pre-defined statements and tags. Tutors can email students through the system and archive communication from their students too. As well as comments, Co-Tutor contains important metrics on student welfare, progression and attendance. It is used by departmental management to monitor the contact and interaction that staff have with the students; attendance at lectures, tutorials and meetings; as an archive for email communication and used as an invaluable resource after the students have graduated.

Other systems in use at Loughborough, which collected activity data and information about the students, and therefore potentially could be mined were; the open source 'Moodle' system (a Virtual Learning Environment); the open source 'LORS' system (Loughborough Online Reading List System), the 'Attendant' system for recording attendance and the in-house electronic coursework hand-in system to record the physical hand in of documents, reports and drawings from students.

5 RECOMMENDED INITIATIVES

From the vast collection of user experiences gathered during the discovery phase and knowledge of the existing data collected on students, potential solutions areas for improvement were identified and arranged into themes: [a] Improving the capability to time manage – easy access calendar (thought in terms of student experience as no conflicting demands of coursework/ project deadlines); [b] Easy access to knowledgeable, better briefed, personal tutors (who know students' better) and other support staff; [c] More help with employability and support for progression beyond study; [d] Possible Opportunities for students to have mentoring mentors scheme in their final year; [e] Access to library resources and [f] Active staff -, students being asked if they need more help, or to be re-assured about progress or to be contacted if seen to be struggling.

From this list, recommendations for new initiatives were made to various departments within the Institution and across the support services, such as the Library and IT Services. These initiatives necessarily included a mixture of ICT developments (known as backstage in Service Design) alongside a change or enhancement to the people processes and human interventions (known as front stage in Service Design) to effectively support the various generic personas of the student population.

For example, when specifying a new initiative to address the 'Active Staff' [f] area for improvement, processes were designed with personal tutors to look at the current use of attendance data and how a mixture of new automated notices could be sent via email to students and 'at risk flags' could be generated in Co-tutor, with emails to the relevant member of staff (both the personal tutor and class lecturer) to highlight non-attendance. The service design element of the initiative helped to inform when it might be best for staff to intervene in the process. Changes to the way the registers were set up allowed each session to be recorded as 'critical' or not and also allowed a reason for absence to be recorded so more specific emails could be sent to those students who were missing critical sessions only – rather than blanket emails sent to all students for every lecture missed. It was also felt important that students could access their own attendance data and be pro-active about seeing and addressing their own change in patterns of attendance alleviating to a degree questions about the ethics of this approach.

The use of data mining allowed the existing attendance database within the software Co-Tutor to be mined for potential changes in patterns of attendance. 'At Risk' flags were developed and the ability to interrogate the data by new members of staff, such as welfare officers, allowed for more personalised and targeted emails to students during specific weeks of a course.

6   ITERATIVE METHODS OF DESIGN AND EVALUATION

The project is now at a stage where the initiatives implemented are about to be assessed. Researchers will be returning to the many interventions, examining, for example, a student-led curriculum development for the history dissertation and examining case histories provided by the students to carry out profiling of student types most at risk and testing these (with students) against interventions designed.

7   RESEARCH AND IMPLEMENTATION ISSUES

Research needs to be carried out with a representative group of all students not just those deemed to be at risk because of poor access or incorrect selection of modules (Co-tutor provided this data for us). Nevertheless, the project concluded that these new tools can be utilized to make interactions better, improve academic engagement, raise students' sense of well-being and improve retention in final year. Designing better interactions may meet many of the concerns raised by students and also allow students to examine in detail why relationships often fail – a significant benefit for later life experiences.

The relationship between research student-participant and Service Design researcher will always exist within a context and a framework of inequality of power – whether in terms of age and experience or academic status: students will tell researcher/University employees what they want to hear, and the Institution will exhibit a large degree of insincerity in promoting ownership. This contrasts with the commercial context where customer engagement in the product defines the success of the brand and where customer satisfaction correlates with the success of the product. Nevertheless, the potential benefits of designing better interactions are significant for Universities, irrespective of whether students are deemed consumers or 'active participants', 'co-producers' or 'partners'.

One of the most significant findings to emerge from this study was however the importance of 'buy-in' from management, of time discussing and planning how ICT can be used and implemented, and in addressing political issues around organisational change with institutions, rather than simply imposing ICT solutions to what are so often problems arising from poor relationships.

8   CONCLUSION

This paper has given an account of and the reasons for the widespread use of data mining and the growth in the use of Service Design tools in the Higher Education sector. Critical success factors of the project were; that there was a broad engagement from students and staff in the Service Design process; the identification of areas for improvements where new ICT and department workflow can be easily implemented; and support from department managers to ensure the uptake of any new services or initiatives by staff and students. The project has so far, succeeded in these three factors and would recommend to others thinking of undertaking changes using Service Design and Data Mining that these factors are addressed early in the project.

REFERENCES

[1]   Snook, cited in Schneider, J and Stickdorn M (2011) This is Service Design Thinking: Basics, Tools, Cases. Business Industry Services.

[2]   Schwartzman, R (1995) Are Students Customers: The metaphoric mismatch between education and management. Education. Vol. 116

[3]   Perdue University Course Signals, Purdue University. Details available via the World Wide Web at: http://www.itap.purde.edu/learning/tools/signals

[4]   Haggis, T. (2003), Constructing Images of Ourselves? A Critical Investigation into 'Approaches to Learning' Research in Higher Education, British Educational Research Journal, 29 (1) pp.8-104

[5]   Siemens, G and Long, P (2011) "Penetrating the Fog: Analytics in Learning and Education", EDUCAUSE Review, vol. 46, no. 5,

[6]   Mann, S.(2001) Alternative Perspectives on the Student Experience: alienation and engagement, Studies in Higher Education, (26) 1, pp. 7-19

[7]   Kay, J., Dunne E., and Hutchinson J. (2010) Rethinking the values of higher education - students as change agents? QAA Report, available online: http://www.qaa.ac.uk/

[8]   Johnson, L., Smith, R., Willis, H., Levine, A., and Haywood, K., (2011). The 2011 Horizon Report. Austin, Texas: The New Media Consortium.