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E-book adoption in academic and research libraries

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E-BOOK ADOPTION IN ACADEMIC AND RESEARCH LIBRARIES

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Statement of Information

In the compilation of this thesis, the candidate gathered e-book usage logs and survey data from the participating university subject to the following research protocol:

> *No name identified data is to be published as a consequence of this project. Data gathered will be kept in secure storage for a maximum of five years then destroyed. No third party access to data is to be permitted, without the consent of participants.*

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Abstract

Electronic books (e-books) have grown in importance in Academic and Research Libraries (ARLs). Some ARLs are now spending more on e-book acquisitions than hardcopy books. Whether this investment in e-book provision is justified by adoption outcomes is often the subject of simplistic, rather than rigorous research. This research has attempted to rigorously explore the phenomenon of e-book adoption in a case study ARL, namely, Edith Cowan University (ECU) Library.

The study population consisted of ECU academics, students and non-academic staff. The research had three aims. First, by employing a theoretical framework based on technology adoption and information behaviour theory, the study sought explanations of adoption behaviours in the population. In a triangular research design, that included a survey, ECU users were invited to self-describe their own patterns of e-book behaviour. Survey data was used to determine if behaviour observed in transactions could be explained in terms of constructs derived from technology acceptance, information behaviour and other domain theories that seek to understand user interaction with information sources. Next, applying log analysis techniques to system-generated datasets of e-book usage, the researcher documented and analysed patterns of ECU e-book user behaviour in terms of the transaction record. Lastly, the study investigated whether transaction logs could be used with high reliability to profile users' information behaviour providing the basis of a method for e-book individualisation. The study attempted to profile power users and to derive a predictive method for identifying them in log data.

The study found many factors in technology acceptance theory that were significant in terms of adoption behaviour. E-book adoption in the case study ARL was found to be related to culture of use across the dimensions of habit/automaticity, preference for online resources and platforms, and information literacy. E-book collection sufficiency, purpose or task fit, convenience, functionality, and access/copy/print/download provisions were found to be significant in terms of performance expectancy. Dimensions of effort expectancy in finding/searching/reading e-books also significantly affected user behaviour. Other significant relations comprised perceived e-book hedonic attributes (pleasantness of experience, attractiveness of formats), familiarity (awareness,

prior experience, differentiability), intimacy (personal likeness, emotional attachment, preferences), facilitating conditions (such as discovery, findability, connectivity/access, courseware embedded links), moderating factors (including respondent category, student programme, age, gender, and experience/years). These factors were found to be significant as sources of gratification and continuance intention.

An original contribution to knowledge was also made by deriving a predictive equation for classifying users based on transaction log data. Further, the research developed a new model of higher level information behaviours displayed by sophisticated or so-called 'power users,' and generated a model of e-book information behaviour maturity that distinguishes nascent from mature behaviours. The model is grounded in self-reported information behaviour. As an expansive exploration of e-book usage patterns in a case study ARL using multiple methods, the work is also innovative both in terms of scope and as an exploration of e-book adoption in an Australian context. This research is significant in laying the foundations for machine-based user profiling and enhanced individualisation of e-books to make for more satisfying user experience and acceptance of e-books.

Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

1. incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution in higher education;
2. contain any material previously published or written by another person except where due reference is made in the text; and
3. contain any defamatory material.

I also grant permission for the Library at Edith Cowan University to make duplicate copies of my thesis as required.

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Related Refereed Publications

Discussion of interim findings and methods used in the study can be found in the following peer reviewed publications (vide Appendix D for abstracts):

Ahmad, P., & Brogan, M. (2012). Scholarly use of e-books in a virtual academic environment: A case study. *Australian Academic & Research Libraries, 43*(3), 189-213.

Ahmad, P., Brogan, M., & Johnstone, M. N. (2014). The e-book power user in academic and research libraries: Deep log analysis and user customisation. *Australian Academic & Research Libraries, 45*(1), 35-47.

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CHAPTER 1: INTRODUCTION

The first two parts of this chapter present the background and rationale for the study, respectively. Then the aims of the research are described along with the broader problems that have given rise to the research. Finally, the structure of this thesis is summarised followed by the research questions adopted for the thesis.

1.1 Background to the Study

E-books are digital versions of traditional print books that are readable across a variety of computing platforms including PCs, tablets, smartphones and purpose-designed agents, known as e-book readers (Reitz, 2014a). Students' demand for resources and services that are not limited by time and space is increasing (Nicholas & White, 2012). E-books represent a new wave in the 'displacement' of traditional formats by digital information sources and extend an existing trend toward online full-text in information retrieval in libraries (Stokker & Hallam, 2009). Guthrie argues that "transition to reliance on scholarly e-books will happen very quickly" (2012, p. 353). Renner predicts that e-books, like e-journals, will be the norm in academia by the year 2020, and Sang-ho reports Korea's initiative to replace all paper textbooks in its schools with digital versions by 2015 (cited in Asunka, 2013, p. 38). Zhao and Abuizam note that "the [US] market share of e-books has increased sharply from 1.5% to over 16% in the past five years" and the CEO of Amazon.com claimed "eBooks is now a multi-billion dollar category for the company and was up approximately 70 per cent [in 2012] from last year" (2013, p. 87).

D'Ambra and Wilson (2012) citing Cox claim that the sale of e-books in Australia has increased by more than 100% between 2008 and 2009 (p. 49). The peer reviewed literature also shows that e-books are growing in significance as a budget line in Academic and Research Libraries (ARLs). Schmidt (2013) citing Hales asserts that academic libraries' purchase of e-books is increasing at an astonishing rate (p. 1). For example, at the Queensland University of Technology (QUT) Library, e-book acquisitions accounted for 20% of the monograph budget in 2008 (Stokker & Hallam, 2009) and about 50% in 2010 (Huthwaite, McClintock, Sinnamon, & Sondergeld, 2011). A recent analysis of the Australian universities' aggregated data collected by the

Council of Australian University Librarians (CAUL, 2012) showed a 512.3% increase from 2008 to 2010 in e-book acquisitions, with an increase of 61.9% between 2009 and 2010.

Noh (2012) reveals that e-resources accounted for more than 50% of the overall budget of the 12 Korean academic libraries on average. Lannon and McKinnon (2013, p. 92) argue that "although the library saves money on storage and processing, the purchase cost [of an e-book] is generally higher than for a print book" against existing licensing and pricing models; Howard (2013) confirms this trend. This study explores e-book adoption in an Australian case study Academic and Research Library (ARL), Edith Cowan University (ECU) Library. The case study is tracking to broader industry trends with e-books. For example, the percentage of the monograph budget spent on e-books was estimated 9%, 20%, 30%, and 38% respectively for four years from 2010 to 2013 (K. Saunders, personal communication, February 21, 2014).

Current e-book licensing and pricing models require substantial investments by adopting ARLs. It is important to demonstrate the benefits of adoption when funding is scarce. The adoption picture is complex and in addition to cost, e-books present other challenges to libraries. Crosetto (2011) argues that some libraries entered the digital world with the hope that e-books would not have the perceived negative experiences associated with the print world. However, she observes that challenges once associated with print monographs are equally as applicable to e-books: rising costs and funding dilemmas, discipline-wise fair distribution of titles, challenge of interpreting varied-quality use statistics, and preservation.

Successful e-book adoption in libraries is often conceptualised in terms of 'acceptance' and 'use', and consequently measured in terms of factors such as *sessions, session duration and downloads.* Whether such measures are sufficient to indicate user acceptance or rejection or whether the discourse on measurement requires further development, are important questions for this research.

1.2 Rationale and Significance of the Study

This study analyses and interprets outcomes of e-book adoption in a case study academic and research library located in Western Australia. The analysis involves an investigation of (a) information behaviour by scholarly users of e-books, as revealed through a data mining technique, statistical Deep Log Analysis (DLA), applied to e-book platform transaction logs, and (b) perceptions and attitudes of e-book users and non-users through their self-reported behaviour. As e-book budgets grow, justification for e-book adoption becomes important for many ARLs, which face funding pressures. This justification can only proceed from a full understanding of how users act in the e-book virtual environment and why they do, and do not, use e-books (Abdullah & Gibb, 2008a). Moreover, understanding of what expectations and values users bring to the virtual space (Shin, 2011), can lead to the expansion of opportunities for engagement on user terms. The characteristics of e-book users and non-users and predictability of their behaviour by different factors (e.g. information need, culture of use, and acceptance) can assist librarians with evidence-based support for developing functional, successful collection management policies (Abdullah & Gibb) and publishers with valued e-book market intelligence (CIBER, 2009a).

Becker (2011) states that "over the past few years, e-books have shifted from being an extravagant means of leisure reading to becoming a serious contender for the consumer's Dollar" (p. 181). Bennett and Landoni (2005) assert that "academic libraries have tight budgets so it is important that the resources they buy are justifiable and well-used by students and academics" (p. 15). While acquisition and collection management have shaped the discussion, there has been a recent shift to utilisation. Crosetto (2011) argues that patron use is still an important determinant in justifying the allocation of library resources and to this end, the e-book collection together with the associated usage data and analysis is crucial for librarians worldwide. She further adds that if a high proportion of funds is being re-directed to e-books, then this investment needs to be justified, which is a pressing task for libraries in circumstances of contracting budgets and resources.

Boness (2009) wonders if "academic libraries spend many millions on electronic resources each year, are such resources utilised as well as they might be? Do they

provide the ‘bang’ for the ‘buck’?” (p. 1). Moore, MacCreery, and Marlow (n.d.) emphasise that libraries should validate their acquisition choices in terms of user expectations and needs. Al, Soydal, & Tonta (2010) argue that user requirement analyses and studies to determine what and how existing library resources are being used may be the only ways to effectively manage library collections. They also emphasise the need of more studies on e-book use as e-books are forming a substantial part of library collection building. All types of libraries have to be concerned with being able to justify any expenditure earmarked for e-books. Consequently, the importance of the e-book usage patterns, contrasted with the printed counterpart usage data, then becomes preponderant in this regard (Crosetto, 2011).

Wells and Dumbell (2010) citing Cox, and Ebrary argue that e-book use statistics assist librarians with collection development decisions, for example, “whether to purchase titles in print or online, and in which specific subject areas ... and to plan promotional activities and user training ... if statistics show that they are rarely used” (p. 1). Armstrong and Lonsdale (2009) on the basis of a study conducted with library professionals in eight UK universities using focus groups claim that the “overall impression was that [e-book use] statistics ... were not always highly valued, partly because libraries either did not see a need or could not afford the time required for meaningful analysis, and partly because of the varied quality...” (p. 7).

Although it is a difficult challenge to find and evaluate methods to judge the worth of library resources in situations of volatility, such methods are required to maintain the utility of libraries into the future (Moore, MacCreery, & Marlow, n.d.). Patron use continues to be one of the most important and tangible factors that prove the usefulness of library resources; producing usage data for e-books that establishes the level and extent of use is of utmost importance (Crosetto, 2011). Wells and Dumbell (2010) citing King assert that “owing to the financial crisis and subsequent financial restraints that were imposed on academic institutions and libraries, analysis of usage statistics for electronic resources has become more important than ever in recent times” (p. 1).

This research is also significant as an investigation of how self-reported and raw transaction log data can be used to provide insight on e-book usage patterns that assists with adoption outcomes and e-book collection management. Wells and Dumbell (2010)

assert that "a number of authors agree that the exercise of analysing and interpreting usage statistics for electronic monographs can prove to be difficult, especially if multiple platforms or databases are to be compared" (p. 2). They further cite Cox that DLA of "user statistics asks for a large and time consuming effort, and will most likely be conducted by research teams rather than librarians" (p. 3). Asunka (2013) argues that students are one of the major stakeholders in e-book uptake and usage and exploring their levels of awareness, perceptions, and experiences would help understand the situation. ChanLin (2013) asserts the need for more research on different reading audiences and specific domains to inform guidelines for the successful implementation and application of e-book technology in ARLs. This study will fill a gap in the existing research-oriented literature on e-books by (a) demonstrating the feasibility of whole population transaction dataset analysis and also its usefulness as a technique, and (b) understanding perceptions and attitudes of e-book users and non-users through their self-reported information behaviour.

1.3 Purpose of the Study

Academic and Research Libraries (ARLs) in Australia are adopting e-books without rigorous assessment of adoption outcomes. For example, D'Ambra and Wilson (2012) acknowledge that the University of New South Wales, Sydney is "... a large Australian university that has no strategy for the adoption of e-books by staff or students but had subscriptions to about 200,000 e-books in 2011" (p. 62). Borchert, Hunter, Macdonald, and Tittel (2009) also emphasise the need for a theoretical framework with reference to e-book adoption in ARLs particularly in an Australian context.

The purpose of this study is to explore these outcomes through examining scholarly usage patterns of e-books by academics, students, and general staff. The study aims to explore underlying explanations of patterns observed in e-book use and user behaviours, users' reaction to e-books and their purpose (e.g. academic, research, recreation) and needs, the desired features of e-books, book consumers' actual interest in and preferences for digital content, factors influencing reading habits, features that facilitate engagement, user perceptions of e-book usability, how user intentions are formed, and what cognitive perceptions are fulfilled (Shin, 2011). Data analysis and interpretation of

user behaviour and attitude to e-books are expected to provide insight into frameworks and models that are predictive in terms of adoption outcomes.

1.4 Statement of the Problem

Nelson and Hains (2010) opine that e-books in general and e-textbooks in particular are still in their infancy, while Polanka (2011) argues that e-books have become academic mainstream. Higher education institutions worldwide are transitioning to e-books generally, and e-textbooks particularly (Asunka, 2013). Kim (2006) argues that vendors report the growing popularity of e-books among university libraries, but universities perceive problems in e-book wide acceptance. Safley (2006) claims "while electronic journals are widely accepted by most academic library customers, the delivery of online books has had a very different acceptance rate" (p. 445). Walton (2014) observes that many academic libraries report use rates of e-books either equal to or greater than that of the print books. According to Letchumanan and Tarmizi (2011a), acceptance of e-books among target users is still not at the satisfaction level. Brown (2013) argues that e-books are continuously gaining popularity but successful e-book adoption and user acceptance is not universal as his review of prior research studies shows mixed results.

Link, Tosaka, and Weng (2012) argue that "e-books may meet only a fraction of the demand for monographic scholarly output and that libraries cannot yet rely on e-book content to entirely supplant print, although e-book coverage is growing dramatically" (p. 254). Levine-Clark (2006) states that the University of Denver's "Penrose Library has invested heavily in e-books without a real sense of how or why they are used" (p. 288). He further argues that "since available statistics and research tell a very different story than those heard at the reference desk, a [user] survey ... was conducted to ... get a better sense of e-books usage" (p. 288). According to Pymm, Steed, and Burless (2012), 2.9 million items were borrowed in 2011 by 1.9 million users of the Libraries ACT (Australian Capital Territory). Of these borrowings, e-books or e-audio shared only a small percentage, despite an increase (127.76%) in e-collection from 2,453 titles in 2006 to 5,587 titles in early 2012.

What constitutes successful e-book adoption and what libraries can do to maximise user acceptance, use, and engagement are core issues for this research. As discussed in an

academic library context, successful adoption is often measured simplistically in terms of downloads and other log file statistics (Abdullah & Gibb, 2008a; Nicholas, Rowlands, & Jamali, 2010). Are simple metrics of this kind sufficient as indicators of user acceptance?

The relevance and worth of any electronic text needs to be judged, not only by the extent of access or the duration of its use, but also by considering perceived utility, information behaviour, expectation confirmation and other factors that are suggestive of the wider literature on technology adoption (Moore, MacCreery, & Marlow, n.d.; Shin, 2011). Borchert et al. (2009) visualise the need for a theoretical framework to inform or summarise analysis of e-book adoption in ARLs. What does the research literature on technology adoption and information behaviour have to offer that informs understanding of adoption behaviour? This question is explored in the thesis.

If, as the literature suggests, e-books are coming to dominate acquisitions budgets in academic and research libraries, then libraries must be clear about what kinds of information behaviour are most important in measuring adoption outcomes. Lin, Tzeng, Chin, and Chang (2010) claim that "... the investigation of the behavioural intentions to use e-books is relatively new to library researchers" (p. 854). Zhang and Kudva (2014) argue that many of the existing studies have failed to examine users' preferences of book format more closely. They assert that "these are the users who could offer comparative insight into reader preference" (p. 1698). As various current studies (e.g. Asunka, 2013; Brown, 2013; Walton, 2014) observe that situation of e-book adoption outcomes in ARLs is still volatile, research undertaken in the previous years (e.g. Christianson & Aucoin, 2005; Kim, 2006; Safley, 2006) might hold little of relevance to the current situation, and that this is one of the challenges of conducting research in a rapidly evolving area. Validation of adoption outcomes requires more in-depth analysis of log data and survey of user attitudes, information seeking behaviours, culture, values and emotions (Park, 2007; Shin, 2011). They must be clear about metrics and patterns of use that describe successful adoption, or alternatively, metrics and patterns of use that suggest the need for action to address deficiencies.

1.5 Research Questions

The research questions addressed in this study are based on the technology adoption and information behaviour frameworks discussed in Section 2.5. The study addresses the following research questions:

RQ1. What patterns of e-book use exist in the case study academic and research library?[1]

This question addresses e-book information behaviour and will be explored, first, using data mining methods and techniques referred to as Deep Log Analysis (DLA). Second, it will be explored via a survey where users self-report their information behaviour with e-books, attitudes towards them, agents used and other factors impinging upon user's experiences. Data for the DLA are to be sourced from raw transaction logs created as a record of user download and interaction on the Ebook Library (EBL) and Ebrary platforms. Data are to be analysed in terms of: downloads (page views/copied/printed), unique titles, searches, sessions conducted and time spent online (session length or duration) and other parameters found in the data. The role of the survey, on the other hand, is to provide an explanation of behaviour observed in log files that cannot be derived by analysis of the log data alone. The research works with a wide range of constructs that relate to adoption outcome measurement, and not just to simple metrics such as downloads and sessions. The study aims to be innovative in these terms and to discard assumptions about behaviour in favour of evidence-based analysis and interpretation.

RQ2. How can these patterns of e-book use be understood?

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[1] Whilst planning had initially favoured multiple independent case study involving more participating libraries, ECU Library was the only library to respond favourably to the researcher's invitation to participate in the study (vide Sections 4.2 and 4.4).

To answer this question exploration of explanations of the patterns observed is required. Factors to be investigated include methods of access, searching/browsing, type of content viewed, individual titles and subjects used, users' reaction to e-books and their purpose and needs, the desired features of e-books, book consumers' actual interest in and preferences for format, factors and features influencing reading habits and facilitating engagement, how user intentions are formed, and what cognitive perceptions are fulfilled (Shin, 2011). Results from analysis and interpretation of log and survey data are expected to provide the basis of the explanations.

RQ3. Are use and behaviour consistent with the major models of technology adoption?

Results from RQ1 and RQ2 will be checked for consistency with major models of technology adoption and innovation. An exploratory model, inclusive of these explanations appears as Figure 2.7 (p. 68) and Figure 4.3 (p. 102).

RQ4. What intervening or control variables significantly affect use and behaviour?

Results from RQ1, RQ2, and RQ3 are also used to shed light on the intervening or control variables that exist in e-book adoption. These, for example, include demographic factors, culture of use (e.g. preference for particular agents or platforms), embedded courseware links and peer effects.

1.6 Thesis Structure

This section summarises the contents of this thesis. Chapter organisation of the remainder of this thesis is described here.

Chapter Two, the *Literature Review*, reviews the research-oriented literature on technology acceptance and adoption after introducing the e-book and its beginning and rise in libraries. It contextualises this literature in terms of the problem of e-book adoption in academic and research libraries. The chapter also addresses the literature on information behaviour research that informs understanding of the e-book user, particularly power user behaviour. Outcomes from the review shape the research questions by identifying gaps in knowledge.

Chapter Three, the *Research Methodology,* describes research methods and techniques used in the study and explains why they are appropriate. It identifies variables impacting on the research questions and their inter-relationships and the theoretical and philosophical assumptions underpinning the study.

Chapter Four, the *Research Design,* describes the research design, including an explanation of the variables that shape the study, data collection instruments and procedures, data analysis techniques, limitations of the study, and also ethics clearance. The figure below from Chapter Four presents a conceptual overview of the design.

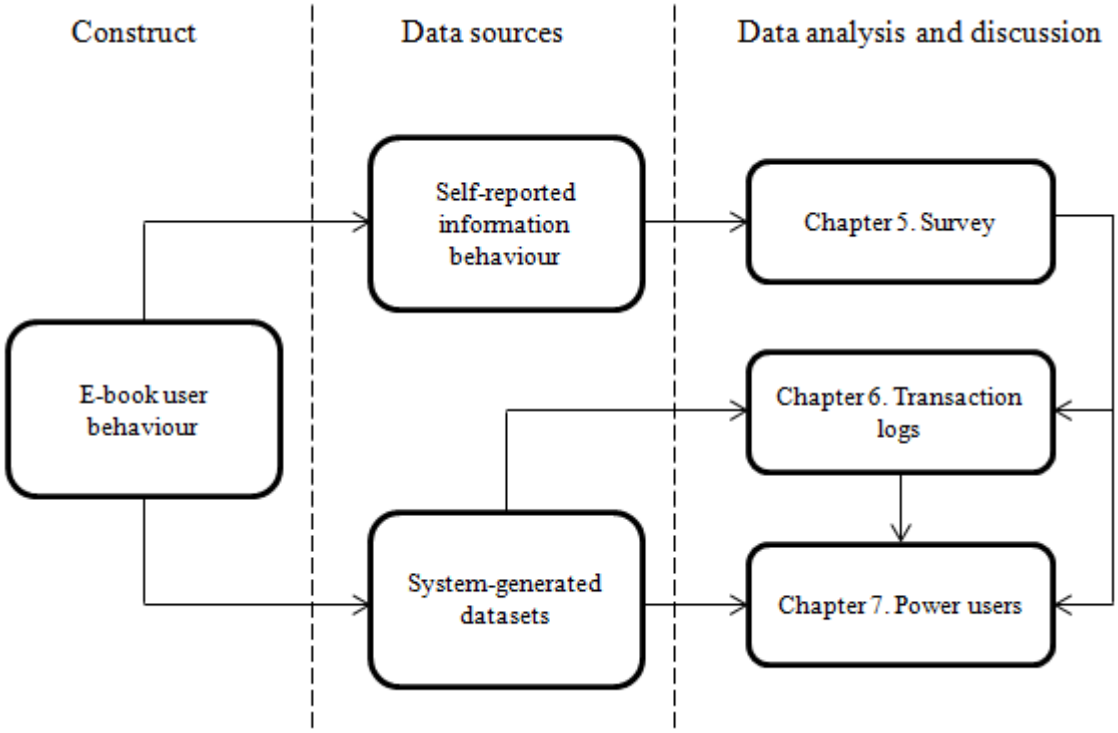

Figure 1.1. Map of research

The data analysis and discussion comprises three chapters in all. Chapter Five, *Data Analysis and Discussion: Self-Reported Information Behaviour,* analyses and interprets evidence of self-reported information behaviour collected in a survey. The data for this study was sourced from a survey based on a convenience sample of ECU participants.

Chapter Six, *Data Analysis and Discussion: System-Generated Datasets,* provides an analysis and interpretation of EBL and Ebrary raw transaction log data using deep log analysis (DLA). The analysis is comprehensive of three years of EBL (2010-2012

inclusive) and two years of Ebrary (2011-2012) data comprising transaction and aggregated descriptions of user e-book interactions. This chapter also compares findings of its own with the previous chapter on survey.

Four types of users were identified as a result of survey and log data analysis: *skim readers, fact finders, average, and power users.* Chapter Seven, *Data Analysis and Discussion: Power Users- Addressing the Gap between User Expectation and Experience,* reports results from an analysis of sophisticated users referred to here as 'power' users.

Chapter Eight, *Discussion and Conclusions:*

- describes the contribution to knowledge made by this investigation;
- discusses key findings in the context of previous research on e-book adoption in ARLs;
- acknowledges limitations of the study; and
- proposes directions for further research.

This thesis consists of 20 appendices in the end followed by references. The first, Appendix A, contains definitions of terms the researcher used in this thesis. Appendices B and C comprise the ethics-approved survey (covering letter and questionnaire, respectively) administered online in mid-2013. Appendix D consists of abstracts of peer reviewed papers published during the researcher's PhD candidature. Appendices E to R supplement survey data analysis of Chapter Five. Appendix E supplements respondent demographics and sample attributes with details of discussion on survey. Appendixes F to R comprise crosstabulation and other data, and a thematic analysis of open-ended comments as supplements of Chapter Five's survey data analysis. The last two appendixes (S and T) comprise data relating to Chapter Six's system-generated datasets and supplement transaction log analysis of the EBook Library (EBL) and Ebrary usage at the case study institution, respectively.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the research-oriented literature on technology acceptance, information behaviour and e-book adoption. It contextualises this literature in terms of the problem of e-book adoption in academic and research libraries. Outcomes from the review shaped the research questions.

The review begins with an introduction to the nature and history of e-books and a discussion of their use in ARLs. Next the main theories that help explain e-book adoption and use are explained, including theories of technology acceptance and information behaviour. This discussion is followed by review of the literature on e-book adoption that is not so tightly or explicitly linked to theoretical frameworks. The discussion here is concerned with critical success factors and barriers to adoption. Since the research evaluates adoption outcomes using case study, the literature on measuring e-book adoption outcomes is also considered. Lastly, the review explores the topic of the e-book 'power' or 'intensive' user.

Figure 2.1 describes a conceptual model of e-book acceptance and use in terms of domain and non-domain theories found in the research-oriented literature.

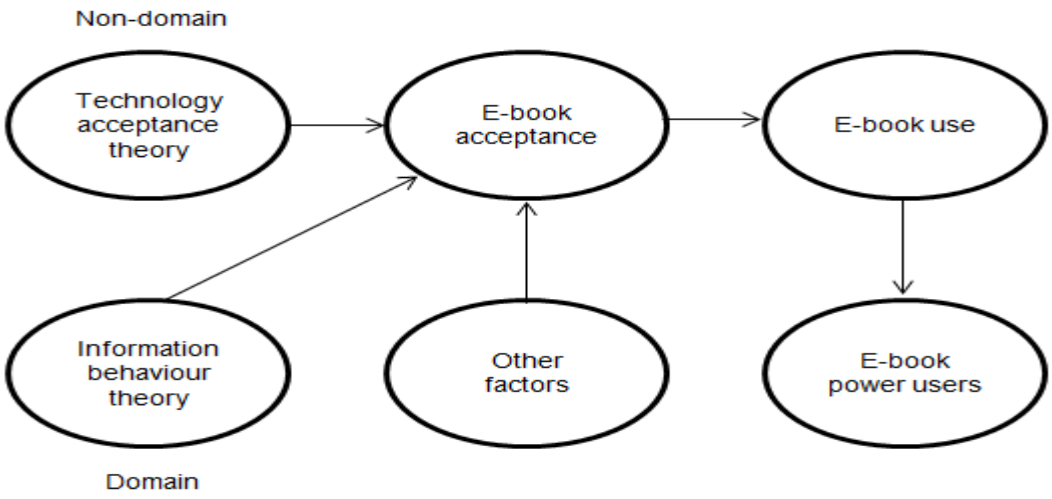

Figure 2.1. Conceptual model of e-book acceptance and use

The literature review begins with a discussion of the nature and origin of e-books, followed by a discussion of trends in e-book adoption in ARLs.

2.1 What is an E-book?

Vassiliou and Rowley (2008) note that there is no agreed-upon definition of an e-book, as various authors have defined the term 'electronic book' (abbreviated as e-book or ebook) differently. The term e-book has been used to describe:

I. "A digital version of a traditional print book designed to be read on a personal computer or an e-book reader (a software application for use on a standard-sized computer or a book-sized computer used solely as a reading device); synonymous with digital book, e-book, ebook, and online book" (Reitz, 2014a, electronic book, para. 1).

II. According to Bennett and Landoni (2005), an e-book is a medium where information is organised and structured for the reader to facilitate consultation that at least includes browsing, searching, extracting, comparing and assessing relevance and quality of information presented.

III. "Text in digital form, or digital reading material, or a book in a computer file format, or an electronic file of words and images" (Rao, cited in P. Lam, S. L. Lam, J. Lam, & McNaught, 2009, p. 30).

IV. "Book-length publications in digital form, either "born-digital" or derived from a printed version" (Browne & Coe, 2012, p. 289).

V. "A digital object with textual and/or other content, which arises as a result of integrating the familiar concept of a book with features that can be provided in an electronic environment" (Vassiliou & Rowley, 2008, p. 363).

Although these definitions are slightly different, they share a common understanding of e-books as electronic versions of traditional print books designed to be accessed and read on a computing device. Initially available on desktop PCs, devices now include mobile agents such as smartphones, tablets, laptops and purpose-designed readers.

2.2 Origin and Rise of E-books

Libraries have been persistent and committed adopters of new technology. This journey began with the first attempts at library automation. Reitz (2014b) argues that libraries first started digitising catalogues, progressed to periodical indexes and abstracts, then to

serials and large reference works, and finally to book publishing. E-books took decades to evolve. The concept of a portable, desktop prototype named 'Dynabook' was articulated in 1968 by Alan Kay (MacWilliam, 2013) as a harbinger of Project Gutenberg. The first e-book 'United States Declaration of Independence' was created by Michael S. Hart in 1971 (Galbraith, 2011, p. 3). E-books captured public attention in a real sense when an online novella *Riding the Bullet* hit almost 400,000 downloads within 24 hours in 2000 (Reitz, 2014a).

Tenopir (2010) observes that "for the last several years speakers have predicted that e-books would be the next big thing, which is most likely true, as the penetration of e-journals is almost complete" (p. 21). According to Polanka, with the introduction of aggregator services that provide access to a wide range of e-books of hundreds of publishers on a variety of disciplines, "the e-book has become mainstream, with recent triple-digit annual increases in sales" (2011, Preamble, para. 1). She further claims that e-books have been around for more than 10 years, but are still a relatively new phenomenon to many publishers and librarians.

E-books involve a new business model for scholarly publishing that promises to deliver strategic business benefits to publishers and transform the world of scholarly publishing. For example, e-books reduce costs and risk associated with academic publishing, providing a supply side stimulus to the growth of academic publishing. Shin (2011) argues that a greater number of publications with shorter time to print is now possible with the use of e-book technology. He further cites Ching et al. (p. 262) that the rising costs of paper books and the potential to link multimedia resources to e-books have major impacts on university libraries and users. Asunka (2013) asserts that integration of multimedia resources and animation is possible with e-book technology with relatively lower costs, ease of publication, and higher frequency in content revision. According to Armstrong and Lonsdale (2009), drivers in e-book adoption are distance education, short-loan or no-loan collections, need for multiple concurrent access, and additional features.

2.3 E-books in Academic and Research Libraries

As discussed in the Introduction, ARLs are now spending substantial amounts of their acquisitions budgets on e-books. For example, the QUT Library spent about 50% of its total allocation for monographs on e-books in 2010, and users have access to more than 100,000 e-books covering most subject areas (Huthwaite et al., 2011). Stokker and Hallam (2009) claim that "with fixed or declining library budgets, the advantages of e-books with their high level of acceptance by users, especially for undergraduate use, will result in a greater proportion of resources being purchased as e-books, at the expense of hardcopy books" (p. 564).

Platform features differ between suppliers and some have implications for user acceptance and behaviour. For example, Ebrary and EBL support downloadable copy subject to rights management, MyiLbrary and Netlibrary do not. There are three main acquisition sources for e-books:

a) Publishers, for example, Wiley-Blackwell, Elsevier, Taylor & Francis, SAGE, Springer, Palgrave, Oxford University Press, Cambridge University Press;
b) Suppliers or aggregators that provide e-books with a single platform and interface on a wide variety of subjects from a wide range of different publishers. The major e-book suppliers (aggregators) are MyiLibrary, EBook Library (EBL), Ebrary, Safari, Dawson (via Dawsonera), and NetLibrary; and
c) Booksellers/vendors, for example, Amazon (Content Complete & OnlyConnect Consultancy, 2009).

Current commercial e-books have multiple formats, standards, and purchasing models (Tenopir, 2010). There are currently three acquisition models for libraries, namely, purchase, subscription, and pay/cost-per-use/view. Table 2.1 shows some of the existing e-book supplier acquisition options and features.

Table 2.1. E-book Supplier Acquisition Options and Features (adapted from Schell, 2011, p. 77)

Feature*	**Ebrary**	**EBL**	**MyiLibrary**	**NetLibrary**	**Safari**
Title by title (purchase)	√	√	√	√	
Subject packages (subscription)	√		√		√
Pay-per-view/use (including Patron-Driven-Acquisition)		√		√	
Simultaneous users (fixed or unlimited)	√	√	√		√
Download files	√ (from 2012)	√			√

*Vide Sections 6.1, 6.1.12, and 6.2 for further details.

From a library management perspective, e-books display advantages when compared with books in traditional format:

- E-books provide a solution to "student complaints regarding inadequate availability of core books in short loan" (CIBER, 2008). One e-book is sufficient for all users thus minimising the cost of purchasing multiple copies of a printed book especially textbooks which are heavily used.
- E-books minimise heavy circulation pressure including no issue/no return/no fine matters. The e-book is also beneficial when the printed counterpart has no-loan or short loan restriction (Armstrong & Lonsdale, 2009).
- Unlike conventional books, e-books cannot be lost (Miller, 2008) and mis-shelved. E-books require no shelf maintenance and no manual processing (accessioning, tagging, stamping) for use (CIBER, 2008).
- E-books cannot be mutilated (Miller, 2008). No conservation or preservation activities involve in case of e-books, which are likely regarding printed books due to wear & tear, and mutilation.
- There is no chance of stealing of e-books (Miller, 2008), thus eliminating the activities of stock taking and write-off associated with physical counterparts.

- In the cases of multi-campus institutions, distance education or where students have mobility problems, e-books require no physical infrastructure except computers and the Internet. Further, e-books also provide a solution to space and storage problems and the associated costs in libraries (Lannon & McKinnon, 2013).
- E-books do not require printing and thus newer editions are readily available as per "users' demand for up-to-date textbooks" (CIBER, 2008). Whereas the information in a printed book especially in most specialised and frequently advancing disciplines (e.g. science and technology) may become out-of-date due to printing press process and delivery time.
- Building a critical mass of e-book content quickly is possible for libraries with e-book collections. E-book collections also save library staff time in selecting and acquiring individual print titles. A wide range of valued e-books for a wide range of users with 24/7 easier discovery and access is available on a single platform in different acquisition models (University of Liverpool, 2010).

In the UK university context, Content Complete and OnlyConnect Consultancy (2009), report that most major publishers have been supplying academic e-books to libraries for the past few years. With the growth of e-book publication, aggregation has also increased. According to the Joint Information Systems Committee (JISC), university librarians in the UK, however, consider course e-textbooks as a valuable back-up, supplement and safety valve rather than a substitute for print textbooks (JISC, 2009).

2.4 E-book Adoption in ARLs

Discussion so far has focussed on the basic concept of an e-book, its origin and rise in ARLs, and collection development and management perspectives on e-book adoption. This part reviews various studies that report e-book adoption outcomes including e-book user behaviour and different approaches to measurement of adoption outcomes including e-book user behaviour outcomes.

2.4.1 Scope of Prior Research

Most research on e-book adoption in ARLs conducted by the library community has focused on collection management, acquisitions, and like matters. Most previous studies on e-book user behaviour in ARLs have addressed population subsets (cohorts) or particular disciplines of university users, for example:

- Students (e.g. Croft & Davis, 2010; Cumaoglu, Sacici, & Torun, 2013; Ebrary, 2008; Letchumanan & Tarmizi, 2011a, 2011b; McGowan, Stephens, & West, 2009).
- Graduate students (e.g. Abdullah & Gibb, 2009; Chong, Lim, & Ling 2008; Brahme & Gabriele, 2012; Lim & Hew, 2014; Wu & Chen, 2011; Zhao & Abuizam, 2013).
- Undergraduate students (e.g. Asunka, 2013; Chanlin, 2013; Gregory, 2008; Huang, 2013; Kang, Wang, & Lin, 2009; Letchumanan & Muniandy, 2013; Letchumanan & Tarmizi, 2011b; McFall, 2005; Perry, 2005; Roesnita & Zainab, 2005; Rojeski, 2012; Smyth & Carlin, 2012; Walton, 2014).
- On-campus students (e.g. Walton, 2012, 2014),
- Off-campus: students (e.g. Brahme & Gabriele, 2012), faculty and students (Shen, 2010).
- Faculty (e.g. Bierman, Ortega, & Rupp-Serrano, 2010; Brown, 2013; Camacho & Spackmane, 2010; Carlock & Perry, 2008; Ebrary, 2007a; Horava, 2008; Posigha, 2012).
- Faculty and graduate students (e.g. Foote & Rupp-Serranoe, 2010; Hoseth & McLure, 2012; Rajan, Jasimudeen, & Mathew, 2012; Shen, 2010).
- Faculty and librarians (e.g. Mullarkey, 2008), librarians (e.g. Ebrary, 2007b).
- Discipline specific, for example, business and management (Camacho & Spackmane, 2010; Nicholas, Rowlands, & Jamali, 2010; Zhao & Abuizam, 2013), computer science and IT (Roesnita & Zainab, 2005), mathematics and engineering (Letchumanan & Tarmizi, 2011a, 2011b), English as a foreign language (Huang, 2013), geosciences (Foote & Rupp-Serranoe, 2010), health and medicine (Folb, Wessel, & Czechowski, 2011; Hartel & Cheek, 2011),

humanities (Horava, 2008), pure and applied sciences (Bierman, Ortega, & Rupp-Serrano, 2010), and social sciences (Hoseth & McLure, 2012).

E-book studies in ARLs have also been highly specific rather than holistic, for example, specifically concerned with e-book readers, collection management, reference service, e-reserves, interlibrary loan, in-class reading, e-textbooks, leisure reading, comparison with print circulation, e-book formats and interface.

Further, very few studies have been based on *whole university user populations*. Particular studies include (for example, Li, Poe, Potter, Quigley, & Wilson, 2011; McLure & Hoseth, 2012; Nicholas, Rowlands, Clark, Huntington, Jamali, & Olle, 2008; Shelburne, 2009; Walton, 2008). Another limitation concerns the elementary use of transaction log data based, for example, on descriptive statistics describing downloads and titles viewed. There has been little attempt to apply sophisticated methods such as inferential analysis as tools to achieve richness. Holism and more sophisticated analysis of transaction log data comprise opportunities for this study to add to the research-oriented literature on e-book adoption.

2.4.2 E-book Adoption in ARLs: Australian Context

The datasets on which this study is based derive from an Australian ARL, namely, Edith Cowan University Library.[2] Australia comprises seven states and the Australian Capital Territory. It is an island country with an area of 7,692,024 square kilometres – the 6th largest in the world (Geoscience Australia, 2014) – with a projected population of around 23,715,950 on 15 December, 2014 (Australian Bureau of Statistics, 2014). Australia hosts 39 universities more in public and less in private sector with over one million enrolled students and 100,000 staff (Universities Australia, 2014).

[2] Conceived as multiple independent case study involving more participating libraries, ECU Library was the only library to respond favourably to the researcher's invitation to participate in the study (vide Sections 4.2 and 4.4).

The researcher visited websites of most of the Australian universities and found that all universities offer e-resources including e-books of a variety of suppliers/publishers to their communities. Review of the research-oriented literature shows an under-representation of research on e-book adoption and user behaviour in an Australian ARL context. The following paragraphs review findings from the studies on e-book adoption including e-book user behaviour in the Australian ARL context, including two conducted jointly by this researcher.

Anderson and Pham (2013) selected a random sample of 264 of 331,515 unique physical books from the RMIT University Library and searched for their electronic counterparts available elsewhere (e.g. GOBI, Google, Amazon). The study found that only 33% of the sample print titles were available as e-books including 6.4% already held by their library. They also found that most of such e-books were published after 2005.

Ahmad and Brogan (2012) analysed one year, i.e. 2010, e-book transaction logs of the Ebook Library (EBL) platform at the Edith Cowan University (ECU). The study found that the majority of the ECU population (approximately 62%) did not engage with e-books. The EBL titles browsed and read respectively accounted for less than 10% and 5% of the EBL collection. Few of the users and titles (15% to 20%) were responsible for most usage, conforming to "Trueswell's 20/80 rule" or "Juran's 'Vital Few' Principle, sometimes incorrectly referred to as the 'Pareto Principle'" (Eldredge, 1998, p. 496). The study concluded that reasons of use, low use, heavy use, and non-use should be explored through other methods, for example, survey, employing varied theoretical frameworks. A further extension of this study resulted in profiling a sophisticated user behaviour so called 'power user' (Ahmad, Brogan, & Johnstone, 2014).

In a University of New South Wales study, D'Ambra and Wilson (2012) measured and evaluated the perceived fitness of e-books to the tasks of academics using a Task Technology Fit (TTF) model. They recruited 361 academics that had experience of using e-books in the past 12 months from three faculties (medicine, science, and engineering) through a questionnaire/survey. The study found a significant positive impact of e-book-based academic tasks, e-book technology features and functionality,

and academics' individual characteristics on the perceived fitness of e-books in academic settings which in turn influenced academics' use of e-books and their overall job performance. The study indicated the need of further research in identifying additional dimensions of TTF in e-book adoption.

In another study of e-book adoption at QUT Library, Huthwaite et al. (2011) conducted two trials of e-book readers against the criteria of usability, functionality, accessibility and compatibility with QUT Library's e-book collection and DRM issues. The first trial of seven e-book readers (iPad, iPhone, Kindle, Kobo, CyBook, Cool-er, and ECO Reader) was conducted by the library staff followed by joint discussion. The second trial of five e-book readers (iPad, Kindle, Kobo, CyBook, and ECO Reader) was conducted by two groups of four students followed by focus group discussion. Both trials found that none of the e-book readers could offer everything an ARL may require against the predetermined criteria.

In a Curtin University study, Wells and Dumbell (2010) analysed usage statistics of three e-book suppliers, CRCnetBase (2006-2009), Knovel (2004-2009), and EBL (2005-2009), against different acquisition models. Data analysis showed that usage per title of the selected CRCnetBase modules increased after the addition of new titles. Usage of Knovel e-books gradually decreased. Use per EBL title increased in the beginning over the first few semesters and then decreased slowly. The study recommended the purchasing of e-books individually to meet short-term demand as well as the acquisition of larger packages to meet long-term demand.

At the University of Western Sydney, Boness (2009), after usage analysis, found a modest use of e-resources in research and teaching by faculty. To test the assumptions (faculty's unawareness of the availability of e-resources and their appropriateness for academic tasks, and minimal representation of library offerings in the university's learning management system (LMS)), a sample of 100 academics was surveyed, and their LMS sites examined. Analysis of the results confirmed the assumptions. Consequently, an extensive awareness and promotion programme involving vendors, library staff and the academics, increased awareness and understanding of e-collections. The programme ultimately evidenced a substantial increase of such resources in unit outlines, the LMS, and in teaching preparation.

Borchert et al. (2009) as a result of survey and DLA at the Griffith University and the University of Southern Queensland showed a high level of awareness of e-books among both staff and students, and involved a high percentage of students enrolled off-campus. The library catalogue was the major tool to access e-books. If compared to response rate, the usage of e-books was relatively low especially within the context of specific resources for particular courses, but there was generally a preference for e-books as many of them had used e-books in their subject domain. E-books were mostly preferred due to 24/7 access and automated searching facility, however, the availability of books both in print and electronic forms was the most preferred option. Only a few users read the entire e-book online. Difficulty in prolonged screen reading was the major reason for disliking e-books and the reading of e-books through print-outs was common. A subsequent DLA of usage statistics verified the survey findings. Based on the findings, the study concluded that collection development strategies need to ensure that e-books are appropriately considered, well received and used by patrons.

Some recent unpublished work also offers valuable insight. The ECU Library's David Howard (Howard, 2013) in an unpublished presentation, highlighted issues with e-books, for example, problems with platforms and interfaces, limitations of dedicated e-book reader devices, complex pricing models, embargos on latest editions, inappropriate e-book quality and design around print models, scarcity of e-textbooks, and non-ownership vs. perpetual rights. He argued that e-books were 10 years behind e-journals. He further noted a cost increase of five to 10% per e-book title per year and the ECU Library spent approximately $200,000 for EBL pay-per-view titles in 2010. He indicated the growing user acceptance of e-book format and usage suggested better return on investment, hence ECU Library's expenditure on print ($696,602) and electronic books ($639,228) in 2012 was similar. Howard also claimed that e-titles can be very expensive compared to print equivalent for some disciplines, for example, a title "imaging for students" cost US $55.00 for print and $825 for electronic version; a quote for four pharmacology e-textbooks was US $34,800 per annum.

2.4.3 E-book Adoption in ARLs: Measuring Adoption Outcomes

This section is arranged according to methods used in the measurement of e-book adoption outcomes in a global context. It describes the literature on approaches to

measurement of adoption outcomes. Findings from studies based on particular methods and techniques are also discussed.

2.4.3.1 Transaction Log Metrics

Each e-book platform (e.g. EBL, Ebrary) has its own method of recording usage statistics. Usage reports also vary according to the acquisition model, for example, pay-per-view or subscription. Lamothe (2013) points to the confusion over the reporting of e-book usage statistics and asserts that "accesses reported for each page of a book viewed can artificially inflate usage. Conversely, reporting an access per book regardless of how many pages have been viewed can have the opposite effect and suppress real usage" (p. 41). Hence, studies that rely upon usage statistics must be treated with caution. This section summarises below the findings from previous studies based on e-book transaction log analyses, subject to this limitation.

Lannon and McKinnon (2013) at the McGill University, Canada, found that a small number of titles accounted for a large percentage of usage annually with Springer, NetLibrary, and Ebrary databases. However, over the collection's lifetime, a higher percentage of Springer and NetLibrary titles were used but 97% of the Ebrary titles were never accessed. In another Canadian study, Lamothe (2013) compared the number of searches conducted by users at the supplier sites and number of e-book viewings/transactions over a nine-year period at the Laurentian University. These e-books were acquired over the years from a single e-book in 2002 to 79,821 titles in 2010 as individual titles or in packages directly/consortially from 19 different aggregator and publisher platforms (e.g. NetLibrary, MyiLibrary, Britannica, Gale, Wiley, APA, Emerald, IEEE, Proquest, OECD, Ovid, Oxford University Press, Sage, and Springer). The study found a positive correlation between the number of searches and number of viewings aligned with yearly increases in collection size. Doctoral students demonstrated most usage, followed closely by master's students. The faculty and undergraduate student usage remained low. The author concluded that collection size and title selection were the main drivers of user acceptance and utilisation. The author produced similar findings in an earlier paper (see Lamothe, 2010).

Sotak, Davis, and Bennett (2013) showed growth in e-book use of all major suppliers (EBL, Ebrary, EBSCO/NetLibrary, Safari, Springer, and Wiley) except ABC-CLIO and EEBO between 2008/2009 and 2012 at the NC (North Carolina) State University. EBL title requests increased 25% from 2008 to 2012. However, they emphasised standardisation in the unit of usage "section requests" particularly with regard to Ebrary platform, for Ebrary treats pages as a section and Springer treats chapters as a section and both tend to have high usage. At the University of Nevada, Tucker (2012) analysed three years of usage data (2008-2010) from two e-book packages, NetLibrary (one-time purchase) and Ebrary (yearly subscription). Based on number of unique titles used yearly the research found that Ebrary showed increased usage over time, but NetLibrary demonstrated decreased usage. Only nearly 15% (2,438 of 16,285) of NetLibrary titles were used on average. Subject analysis showed that e-books in health sciences and hotel management accounted for most usage. Publisher analysis showed that four publishers (McGraw-Hill, J. Wiley & Sons, Oxford University Press, and Routledge) were most frequent in both e-book platforms' usage reports.

Bucknell's (2010) analysis of Springer e-book usage reports between July 2008 and March 2010 showed increasing use at the University of Liverpool, UK. The study focused the influence of subject area, year of publication, and the length of time since the collection was acquired, on e-book usage. Professional and applied computing/computer science ranked high in e-book usage, followed closely by business and economics, chemistry and material science, behavioural science, and medicine. Mathematics and statistics demonstrated lowest usage. E-books published/acquired not older than five years accounted for more usage. Analysis of the number of months for which each title was used showed that only one title had been used every month in 2009 and less than five percent (5%) of the titles had been used in five or more months of the year. More than 50% of titles were used between one and four times a year, and more than 45% of titles were not used at all. The author showed his concerns about the term 'section request' in usage reports, for it might even be a single page. He states "neither does the report state how a 'section' is defined for that platform; that is left to the librarian to know, or find out" (p. 133). At the California State University, Herlihy and Yi (2010) focused on the effect of currency on e-book usage. Based on analysis of five-year usage data of two e-book packages they found that subscription-based Safari

e-books with updates received more usage than NetLibrary's one-time purchased e-books without updates.

In a Hacettepe University (Turkey) study, Al, Soydal, & Tonta (2010) analysed transaction logs of the Ebrary platform to assess the usage of e-books. The data described e-book usage for around a half a million users over the period of four years (2006-2009). Using Library of Congress Subject Headings (LCSH), the most frequently used subjects found ranked medicine, education, and language and literature. Only a small number of titles accounted for heavy use, satisfying half the demand in each subject. Whereas, a major proportion of e-books was never used. The study emphasised the need to develop viable collection management policies in line with real needs of library users and consortium level licensing packages of e-book collections.

JISC launched the National E-books Observatory (NeBO) project in the UK in 2007. The life of the project was from 2007 to 2009. The aim of the project was to carry out market research to find out viable and sustainable e-book business models acceptable to all the stakeholders including publishers, suppliers (aggregators), libraries, and donor agencies. In context of the JISC NeBO project, CIBER (2009b) undertook a deep log analysis of MyLibrary log data for 10,026 e-books (including 26 JISC e-textbooks on media, engineering, business and management) available online to 127 UK universities from 2007 to 2009. This study assessed the usage of e-books with regard to page views, sessions conducted and time spent online (session length or duration), trends/patterns over time; the information seeking behaviour was analysed in terms of method of access (referrer link), location of access, searching/browsing, session busyness, type of content viewed, individual titles and subjects used. Additionally, the individual university performance was analysed. The pages viewed were nearly 7 million, and the number of user sessions/visits was over a half a million in the first 14 months of the JISC study. The study found that eighty-five (85) percent of all page views of JISC e-textbooks were below one minute, and around a third were below five seconds probably due to printing or flicking preference. Fifteen percent of users (17% for non-JISC e-books) spent over one minute in viewing one page. The highest usage of JISC e-books was in February 2008 making 21% of all e-book usage. The low time in use was at about 5am, then went up to a peak during 1pm, then fell sharply between 1pm to 5pm and then less

sharply between 5pm to 10pm. Just over a quarter of use was after 6pm and before 8am. There were differences in the subject-wise usage and each subject had its own peak months of use. There were also differences in institutional uptake both for JISC and other e-books. Mostly the contents pages were viewed in sessions. Mostly one title was viewed in one session. Overall the use of search facility at the supplier site was low. Most users arrived at the MyLibrary platform through embedded library links. The titles used by the vast majority were small in number and the top five titles each captured more than 10% of overall use.

At the University College London, Nicholas, Huntington, Rowlands, Dobrowolski, and Jamali (2007) conducted a log analysis of three-months of data from January to March 2007 describing use of 1,200 e-books known as Oxford Scholarship Online (Oxford University Press e-monograph database on philosophy, political science, economics, and religion). Five use metrics employed comprised the number of sessions conducted, number of views in a session, number of pages viewed, time spent online, and the number of pages printed. Data analysis showed that 1,277 sessions were conducted, 10,678 HTML pages viewed (1 HTML page = 5 conventional book pages), nearly three-quarters of sessions viewed contents, 17% recorded a page printed, two of the total titles explained 12% of views and top 20 titles captured 43% of usage, 36% of titles used with short viewing times. The average page view time was about 14 seconds and 51% of sessions lasted three minutes or longer. Mondays and March captured the busiest usage. E-book information seeking behaviour differed from that of e-journals.

Taylor (2013) compared one-year circulation statistics of 22 selected titles in three e-book resources, McGraw-Hill, MD Consult, and Stat!Ref, with their print counterparts at the University of Tennessee Health Science Center. Results showed that e-books were used more than print titles. The Center maintains only about 200 titles in their e-book collection built around heavy user demand. In another study, Jackson and Holley (2011) examined five-year circulation statistics of print materials and electronic resources including e-books in science and engineering at the University of Alabama. The study found a rise in the circulation of electronic resources and a fall in print materials. Statistics showed that only one-third of the print materials had circulated, many only one time.

Slater (2009) compared 23-months (between 2005 and 2007) of usage statistics for four separate but related collections of books at the Oakland University, USA. Locally selected Safari e-books, their print counterparts, and consortium-level selected NetLibrary e-books and their physical equivalents, were used to investigate the difference and statistical correlation of usage between them. There was a small to moderate correlation between subject areas and their use in either print or electronic forms. Sciences, technology and computing tended towards e-books and the humanities toward print books. The print versions circulated more than the e-books were accessed, but the usage of e-books was more concentrated than that of print books. Locally selected e-books had much greater usage than consortium-level purchased e-books. .

To find out differences in patterns of use between print and electronic books at the Louisiana State University, Christianson and Aucoin (2005) compared one-year usage statistics of 2,852 print books which were also available as e-book equivalents in the NetLibrary collection. There was a significant statistical (pair-samples t-test) difference between these formats. A smaller number of titles in both formats had high use. Print books captured more use than e-books. The electronic version meant something different for users than print. The study concluded with the need for more research with different approaches and variables, specifically: Are there differences in adoption rate? Age of user? Will they be stable over time? What role do ease of access and ease of discovery play?

2.4.3.2 Self-reported Information behaviour

Surveys have also been used to measure adoption outcomes and to explain patterns of adoption. Cumaoglu, Sacici, and Torun (2013) surveyed 222 students from 36 different universities in Turkey. They found approximately 62% of students had used at least one e-book. Other findings included convenience/accessibility (an advantage of e-books), research (purpose of e-book use), PDF (preferred e-book format), desktop/laptop computer (preferred medium of e-book use), and engineering (frequent discipline of e-book use). The study emphasised the importance of greater availability of more books in electronic format.

Asunka (2013) explored undergraduate students' awareness, experiences and perceptions of e-books, particularly e-textbooks, at a private sector Ghanaian university, Regent University College of Science and technology, using a paper-based questionnaire survey. The study received 253 responses against a sample of 300 drawn randomly from the 2,855 undergraduate student population. Using simple descriptive statistics and content analysis of open-ended comments, the study found that the majority of students (89%) knew about e-books and their potential benefits. However, a significant number (34%) did not use e-books in which the majority were junior (first and second year) students. For those who used e-books, most (68%) indicated that they did so once in a while. Regarding preference for format 93% of the students preferred physical book for academic work; no student (zero percent) preferred e-books, and the remaining 7% indicated no preference. However, one percent opted for e-book format for leisure reading only. Factors influencing these perceptions were issues of price, usability and accessibility of e-books (affected in developing countries by unreliable power supply as well as network infrastructure), and speed and cost of Internet. The study urged for (a) motivating students to use e-books, (b) adopting patron-driven acquisition rather than subscription models that result in collections hardly used by both faculty and students. The study represented a developing country perspective as Asunka also observed that stocking libraries with some donated (used) books and a few copies of some critical material was the common practice in Ghanaian and African higher education institutions.

Zhao and Abuizam's (2013) survey of 25 graduate students investigated the viability of adopting e-textbooks in an executive MBA programme at the Purdue University (USA). They found that 13 out of 18 business core texts were available as e-books and even cheaper than their physical counterparts for six-month access with an iPad. The majority of sample showed satisfaction overall with e-books and expressed their continuance intention. However, there were behavioural and technical barriers to e-book adoption as well (e.g. difficult to read/download/print, separate costs of e-book and e-reader, and eye fatigue). In another study, Brahme and Gabriel (2012) sought feedback of 37 graduate distance students in education (24), business (10), and psychology (3) of the Pepperdine University (USA) regarding their perceptions of e-books. Many of them were not aware of the transformations taking place with the e-book medium. Most

students preferred to use e-books on an iPad or similar tablet. Researchers also observed that e-books were partially meeting student needs. Some features (e.g. functionality) made users happy, while others did not (e.g. different platforms/technologies/software, and constant changes).

Walton (2012) conducted a self-administered questionnaire survey among on-campus, undergraduate students of the Southwest Baptist University, USA. The study was carried out for a doctoral degree dissertation in education, Union University, USA. Out of 1,405 on-campus, undergraduate student population, 263 (18.7%) participated in the survey based on convenience sampling. The study focussed on two factors, the purpose of using e-books, and the preference for e-book or printed book, based on four research questions, (1) How often is students' use of e-books related to (a) reading for leisure, (b) using as a textbook, (c) using to conduct research for a class assignment, (d) reading an assigned reading for a class, or (e) reading an assigned reading in class?, (2) How often is students' use of the printed book and e-book related to which format is accessible?, (3) How often is forced adoption related to students' choice to use an e-book?, (4) How often is convenience related to students' choice to use an e-book? The data were analysed quantitatively using crosstabulation with Pearson two-way chi-square. The study found that leisure reading, conducting research, forced adoption, and convenience were factors positively related to students' choice to use an e-book. In-class reading was negatively related with students' use of e-books. When both the printed book and e-book were available, students' choice was positively related with the printed book and negatively related with the e-book. When the e-book was the only format available, students' choice was positively related with the use of the e-book. Finally, students' use of e-books was positively related with convenience. Walton concluded and recommended that academic libraries should maintain a hybrid collection to support students' preference for print books while enabling them to adopt e-books when convenient or necessary.

To assess the global situation of e-book adoption, Ebrary, an e-book supplier/aggregator, conducted four surveys, one each with faculty and librarians, and two with students. In their both global student e-book surveys, Ebrary (2008, 2012a) found that print books ranked top in terms of resource trustworthiness. In terms of

frequency of use from highest to lowest e-book access methods in rank order comprised the library website, library catalogue, Google and other engines, Google scholar, courseware links, and vendor/publisher websites. Sources of e-book awareness in rank order comprised the librarians, instructors, and peers. The major reasons of non-use of e-books in rank order were unawareness (where to find), preference for print books, no offering by their library, reading difficulties, insufficient titles in particular subject areas, remote access and usability issues. In their 2011 global survey, student preference for e-books ranked third after Google and other search engines' resources, and print books for research and assignment purposes (Ebrary, 2012a).

Croft and Davis (2010) reported results of a survey of student usage of e-books at the Royal Roads University (RRU) library, Canada. Only just above 50% of students were using RRU e-books, but this proportion was greater than that of a similar survey conducted in 2003. Almost the same percentage (nearly 54%) of students preferred e-books over print book in both of the surveys. The majority of students did not consider the downloading of e-books to hand-held devices as important, even though the majority of them owned those devices - a finding at odds with the suggestion that 'culture of use' works as a moderating variable. The use of course e-textbooks considerably increased from 2003 to 2009. The top reported reason for not using e-books was lack of awareness. The study concluded that this kind of feedback could be used for collection and service development.

Shelburne (2009), in an e-book survey conducted at the University of Illinois (USA) investigated library users' (students, faculty, and staff) perceptions and patterns of usage. With 1,547 responses from 47,000 listserv population, the study revealed that 55% of respondents were aware of library e-books offerings; faculty and undergraduate students were among the top regarding awareness. Overall, 57% (mostly faculty and graduate students) used e-books. Mostly e-books were used for need-based and occasional consultation, not routinely. Uses included research, study, teaching, and leisure. The reported advantages of e-books ranked instant and anywhere access, searchability, portability, environmental friendliness, convenience and time saving. The reasons for non-use were lack of awareness, no identified need, dislike of screen reading, findability (discovery) problems, preference for paper books, insufficiency of

relevant content, and preference for e-journals. The open-ended responses revealed that several users either did not distinguish e-books from e-journals or did not differentiate reference, research, and textbook e-books. The study concluded that e-book provision proved to be an important library service, but there was a need to improve awareness, search and discovery tools, and usability and functionality features.

In a survey inviting voluntary participation at the University of Strathclyde (Scotland), Abdullah and Gibb (2008a) found that 57% of students were unaware of the availability of e-books and 60% of them had not used an e-book, however, the 72% of students had familiarity with the term 'e-book' prior to survey. The non-users manifested a desire to know more about e-books. Major sources that created awareness of e-books in rank order comprised the library website (54%), lecturer (24%), and librarian (8%). Among those who used e-books, 57% used three or fewer books, and 67% liked on-screen reading. The main purpose of using e-books was for projects or essay writing. Textbooks captured the highest usage (42%) among reference and manual/instructional books. Abdullah and Gibb also conducted a follow-up study to gain more insights about students' perceptions of e-books. A group of 18 students from survey respondents participated. The students were asked to perform searching and browsing tasks on pre-selected popular e-book titles relevant to their disciplines on the NetLibrary platform. Subsequently, the students were asked to fill in a questionnaire regarding their experience. The students rated their opinion for browsing (very easy) and searching (easy), zooming in and out (difficult), need for browsable and searchable index and table of contents (strongly agree), and need for images of book cover (agree). The study concluded that library's collection and service policies should be based on user perception, attitude, and behaviour. They emphasised the need to increase client awareness for and the functionality and usage of e-books.

As a part of the JISC-funded NeBO project, Nicholas et al. (2008) (later published as Jamali, Nicholas, & Rowlands, 2009) received 22,437 full or partial responses for an online survey of 120 UK universities. The study investigated awareness and use of e-books subscribed by the library and JISC-sponsored e-textbooks in terms of methods of access, reasons for using, viewing/reading behaviour, and the usage of library and print resources generally. The main focus of this survey was to create awareness and to

assess and compare usage of 36 e-textbooks sponsored by the JISC. The results of this survey are shown in the next section in context of JISC consolidated report (see JISC, 2009).

Rowlands et al. (2007) conducted an online survey amongst the academic community of UCL to assess their awareness, perceptions, purposes, and levels of use of e-books. The study also aimed to assess the effectiveness of library marketing and communication channels, achieving a response rate of 6.7% (i.e. 1,818 responses out of 27,000). The principal findings with highest values comprised: (a) experience of using e-books (no, 53%), (b) age level of the majority e-book users (17-21 years, 29%), (c) more users in engineering and social sciences and history were male, whereas more female users were in arts, humanities and medicine; overall male dominated, (d) overall male users in law, and the part-time and occasional male students were satisfied with the existing provision of e-books, (e) UCL website (43%), and library catalogue (22%) were at the top respectively for awareness and marketing purposes. Availability and ease of use were the favourite features of e-books. This case study increased awareness and use of e-books amongst UCL academic community.

In their global *faculty* e-book survey Ebrary (2007a) recruited 906 individuals from about 300 higher education institutions in 38 countries (mainly Canada, USA, New Zealand, and UK). Nearly half of the faculty reported their preference for use of online resources (e-journals, e-books, and other resources) for research, class preparation, and instruction. More than 79% of the respondents, mostly from social sciences, preferred print books for extensive reading. Main sources of awareness of the availability of e-books in rank order comprised the library website, librarians, and library instructional sessions. On integrating e-books into courses, 41% of academics said they encouraged students to use e-books, 35% did not and 28% used e-book chapters/sections for student reading, 16% used embedded links to e-books in their course management software, and 9% assigned their students reading of entire text. The main pre-requisites reported by faculty for the suitability of e-books in courseware in rank order were comprehensiveness of the collection in depth and breadth, downloadability, fewer limitations on copy-paste and printing, more current titles, and better training and instruction. When asked “would you prefer your library to own or subscribe to

e-books?" (p. 33), most academics (33.28%) reported that it doesn't matter for their needs.

Levine-Clark' (2006) survey of faculty, students, and staff at the University of Denver (USA) found that e-books were used, mostly occasionally, by about 50% of the on-campus users. The convenience of remote access to materials from elsewhere including home and the facility of full-text search were the main reasons for liking e-books. Most respondents read only small portions of e-books, suggesting that print volumes were a better alternative for immersion in the text. Most respondents (over 60%) indicated their preference for print books over electronic, but an even larger number (over 80%) indicated their degree of flexibility between the two formats. Respondents were generally pleased with the e-book format. Levine-Clark also recognised the usefulness of transaction log analysis of e-book usage while justifying the need for a complementary survey. He stated "It is clear from vendor-supplied usage statistics that electronic books are used, but it is not clear how or why they are used" (p. 285). Levine-Clark's work points to the value of mixed method approaches to the study of adoption outcomes.

There are also studies on e-book users and non-users that used interviews (mostly face-to-face) or focus group discussions. Examples include interviews of 10 academic historians at the University of Western Ontario (Martin & Quan-Haase, 2013), interviews of 70 mathematics students at Universiti [sic] Putra Malaysia (Letchumanan & Tarmizi, 2011a), interviews of 20 humanities students at the National Taiwan University (Wu & Chen, 2011), interviews of a convenience sample of undergraduate students (six), faculty (four), and librarians (four) (n=14) at the University of Ottawa for a research master's degree (Bratanek, 2013), two focus groups with social sciences faculty (seven participants) and students (12 participants) at the Colorado State University (Hoseth & McLure, 2012), and a focus group with six academics in social sciences at the Arizona State University (Carlock & Perry, 2008). Some studies used a combination of survey and follow-up interviews/focus group(s) or vice versa. Examples include Bierman, Ortega, and Rupp-Serrano's (2010) online survey of and in-person interviews with 11 academics from pure and applied sciences at the University of Oklahoma regarding their e-book needs and preferences. In another study, ChanLin

(2013) conducted interviews with eight undergraduate students and then administered a survey among 201 students at the Fu-Jen Catholic University, Taiwan, to know their different reading strategies for academic and leisure e-books.

2.4.3.3 Mixed and other Methods

E-book user studies based on mixed and other methods are common. Citation analysis shifts the locus of measurement to demonstrated use of information sources. Groves (2014) analysed student citations to e-books in their 480 pieces of submitted coursework followed by interviews and comparison with EBL summary logs. A purposive sample of 240 global studies postgraduate students at the University of Sussex (UK) was drawn. Only 22.5% of students viewed 14% of EBL e-books and 11.6% of students cited an e-book in their work mostly from EBL database. Library e-books received 44 of 12,072 citations (0.36%). Third party e-books obtained more citations including two kindle e-books. The study suggested the need to increase students' awareness of e-books, improve their information literacy skills, and increase the availability of e-book titles. Limitations of the Groves study include subject representation (global studies only) and the exclusion of academic and other university users. Since the researcher in this study was not able to access datasets of student work such as assignments and projects, citation analysis was discarded as a viable research technique.

Lim and Hew (2014) from the Nanyang Technological University (Singapore) explored the usefulness of a purpose-designed e-book (in Adobe Flex Rich Internet application format), featuring annotative and sharing capabilities aimed at promoting student learning through reflection and sharing of ideas. Thirty-six university diploma students who participated in the study were oriented to the e-book interface and functionalities. The sample used the e-book on laptops and annotated its advantages and disadvantages in a classroom environment as part of their course assessment. They were then required to comment on at least one of their peers' annotations as well as respond to those comments on their own annotations. A follow-up focus group with 10 students was also conducted. Overall findings suggested that purpose-designed e-book promoted student learning experiences through engagement and interaction. Lim and Hew conclude that design, interface, format, and functionality of e-books are important to acceptance and

use in academic settings. ChanLin (2013) also urged better understanding of student reading strategies as critical input for the design of e-book systems.

Huang (2013) selected a purposive sample of 67 first-year undergraduate students of English as a foreign language (EFL) programme at the National Taiwan Ocean University. The sample was asked to read at least one e-book weekly from a reading list of 77 non-audio storybooks in any of the four given formats (Kindle for PC, PDF, HTML, and plain text). In follow-up questionnaires and interviews students provided feedback on their reading experiences. Pluses included e-books' potential to cultivate better reading habits. E-book advantages (availability/convenience, portability, and eco-friendliness) also increased students' motivation to reading. Minuses comprised difficulties with e-book reading in terms of eyestrain while dealing with lengthy texts. The study suggested that e-book reading on iPads, Amazon Kindle, or cell phone devices could enrich user experiences in EFL programmes. This study therefore functions to focus attention on the role of agents as intervening variables in e-book adoption and use.

McLure and Hoseth (2012) analysed 753 survey responses from academics, students, and general staff and usage data for the EBL titles made available via patron-driven acquisition (PDA) at the Colorado State University. The survey was linked to a library database of 7,942 EBL unique title records. About half of the respondents had not ever used an e-book before. Only 29.22% of respondents preferred the e-book format. The major reason of using an e-book was convenience. Open-ended comments provided more insights, for example, desire for e-textbooks with longer checkout or download options, e-book functionality features, and better usability. Respondents also registered their e-book concerns, for example, DRM restrictions, unsatisfactory quality of read-aloud function, poor interface design, single-user access, and varied reading experiences on different devices including on-screen reading issues, e.g. eyestrain. Eight-month usage data of the EBL e-book titles during the survey timeframe showed a low use overall. Only 997 unique users browsed 923 unique titles and from them 683 users read 610 titles. The percentage of browsed and read titles was respectively 11.62% and 7.68% of 7,942 EBL titles against the PDA model.

Noh (2012) measured the performance of electronic resources in academic libraries in Korea with a different approach, i.e. an input-output analysis of electronic resources using evaluation indicators. To measure the efficiency (i.e. performance/outcome) of the input-output ratio, evaluation indicators were divided into inputs (e.g. expenditure on acquiring e-resources such as web databases, e-books, e-journals, and preparing their use environment including user training) and outputs (quantification of the use of each resource). The measurement showed that inputs (expenditure) exhibited higher efficiency than outputs (use). The efficiency of e-resources of Korean academic libraries in terms of an input-output ratio was found to be 88.20%, i.e. more input and comparatively less output.

Rojeski (2012) reported on a pilot programme at Dickinson College (USA) where select reserve e-books for an undergraduate class were purchased and linked through the College's course management system. The study found a much higher use of e-books over print reserves. The survey and focus group responses also found a relatively high student satisfaction with the use of e-books. Main issues reported were related to online reading, DRM, and personal incompatibility. Appealing features of e-book use concerned availability/convenience, and in-text searching.

Smyth and Carlin (2012) compared one and half year's circulation statistics of 143 books mainly on computer science available both in print and electronic formats in the University of Ulster, UK. In an online survey 109 undergraduate students from two faculties (computing and engineering, and art, design and the built environment) self-reported their e-book perceptions and attitudes. Circulation comparison showed that e-books were accessed 30 times more than their physical counterparts. However, users expressed a definite preference for print books in the survey. The study concluded that e-book "usage has not yet reached self-sustaining take-off. E-books cannot be considered interchangeable with books; promotion should take account of how e-books are considered 'different' from print" (p. 176).

To find out when and why medical students, faculty, and clinical staff use e-books, as opposed to print books, Hartel and Cheek (2011) conveniently sampled 16 e-book users from the Ohio State University. Using mixed methods (baseline survey, interviews, an exercise with five titles in both formats, and exit survey), the study found that e-books

were used in both hospital/clinical and academic settings including course readings. The respondents rated print format as more intuitive and easy to navigate and read longer, and more satisfying. However, they preferred e-books for quick searching and brief reading and when they felt inconvenient to carry large physical books.

Foote and Rupp-Serrano (2010) surveyed nine academics and nine graduate students (n=18) in the geosciences at the University of Oklahoma to assess their familiarity with and usage of electronic resources. The participants were later observed using e-books on different provider platforms via a computer. E-books from Ebrary, Elsevier, Knovel, and Springer platforms were discussed (focus group) and evaluated by the participants in the study. Only four of the participants (two each) were e-book users. The frequent e-book access pathways used ranked library catalogue, online databases, and websites of professional societies. Reading chapters or sections of e-books online for research and instruction was frequent. Print books were preferred for extended reading. Elsevier and Knovel platforms were the most preferred, compared to Ebrary and Springer, the least preferred. Participants also registered their dislikes for e-book copyright/DRM restrictions, and on-screen advertisements. Suggested improvements in e-books concerned high quality graphics and colour, high resolution for maps, more functionality (e.g. video, animation, and data files), entire e-book downloadability, and library promotion of e-books.

Using mixed measures (e-book transactions, and self-reported behaviour based on focus groups and interviews of business and management faculty and students at the UK universities) Nicholas, Rowlands, & Jamali (2010) found convenience and ease of access as the main drivers of e-book use. Based on the findings of previous research they selected business and management discipline for having a relatively higher percentage of e-book users. The study concluded that e-books were gaining in popularity and mass acceptance especially for fact finding information or reference use.

In a University of Strathclyde (Scotland) study, Abdullah and Gibb (2009) observed interactions of 45 computer and information science graduate students with e-books against scripted tasks involving searching, browsing and fact-finding. The study found that a back-of the-book index was a more efficient, usable tool for quick retrieval of information than a table of contents and full-text search function. In another study,

Kang, Wang, and Lin (2009) designed an experiment to compare the differences between reading an e-book and a physical book (p-book) with objective measures. They recruited a sample of 20 junior students from a college in Taiwan for the experiment. Response measures included reading performance and critical flicker fusion. The results indicated that reading an e-book caused significantly higher eye fatigue than reading a p-book. Reading a p-book generated a higher level of reading performance than reading an e-book. In addition, females demonstrated better reading performance than males in reading either book.

In 2009, JISC produced a final consolidated report (JISC, 2009) based on various studies (deep log analysis, surveys, focus groups, interviews) conducted as part of their NeBO project in the UK universities. The report (later published as a journal paper with some modification, see Lonsdale & Armstrong, 2010) included some new findings. For example, it was found that nearly 65% of students and teachers used an e-book for academic or leisure purposes. Course e-textbooks use was seasonal linked with academic calendar. Use of e-textbooks was based on convenience, flexibility and advantages. Almost one third of pages were viewed off-campus at all hours of the day. In contrast to the assumptions of publishers and authors, course e-textbooks were being used for reference purposes (fact finding and brief viewing) instead of continuous reading due to limitations of downloading, printing, screen reading, and slow speed. There were differences in usage of e-textbooks by subject, age, and gender. Users were confused with a variety of platforms and routes to e-books. Library catalogues and hyperlinks from library websites were the most used paths to e-books.

2.4.3.4 Summary of Approaches to Outcome Measurement

Studies in this section have shown in approaches to measuring behaviour and no single dominant view about what constitutes successful e-book adoption in behavioural terms. In summary, the literature shows approaches to measuring behaviour based on log analysis (e.g. DLA), user surveys, mixed methods (e.g. combinations of survey, DLA, and other methods) and user citation analysis. Measures encompass metrics such as downloads and views, engagement, attitudes and demonstrated use. Tenopir (2010) and Noh (2012) suggest that satisfaction and user outcomes are the ultimate parameters to measure the success of library collections and services. Tenopir argues that any

measurements must answer three questions: “did users find what they needed in the library databases? Did the material help them accomplish their tasks more effectively or efficiently? Did it improve their results?” (p. 21). She further argues that simple metrics of downloads and time spent in viewing an e-book title are unreliable measures of adoption outcomes.

If as Tenopir (2010) argues, attention is switched from downloads, to information behaviour, expectations and gratification, the picture of acceptance is nuanced, with some studies pointing towards user disaffection. Issues identified in the literature include:

- screen reading for longer duration (Borchert et al., 2009; CIBER, 2008; JISC, 2009; Shelburne, 2009);
- lack of awareness (Abdullah & Gibb, 2008a, 2008b; Armstrong & Lonsdale, 2009; Ashcroft, 2011; Croft & Davis, 2010; Milliot, 2007; Shelburne, 2009);
- restrictions or limits on copying, printing, and downloading known as Digital Rights Management (DRM) (Armstrong & Lonsdale, 2009; CIBER, 2008; JISC, 2009);
- platform problems (interface, usability, functionality) (Abdullah & Gibb, 2008a, 2008b; Armstrong & Lonsdale, 2009; CIBER, 2008; Huthwaite et al., 2011; JISC, 2009; Shelburne, 2009);
- findability (discovery) problems (Shelburne, 2009);
- accessibility issues (CIBER, 2008; Huthwaite et al., 2011);
- Internet connectivity and speed (Ahmad & Brogan, 2012; JISC, 2009; Konappa, 2014);
- user preference for physical books (Bratanek, 2013; CIBER, 2008; McLure & Hoseth, 2012; Smyth & Carlin, 2012; Woody, Daniel, & Baker, 2010);
- lack of sufficient number of titles with some platforms (Shelburne, 2009; Shin, 2011);
- e-textbook availability owing to publishers’ fear of loss in print sales (Content Complete and OnlyConnect Consultancy, 2009); and
- user information retrieval skills, and the inefficiency of discovery tools (Ahmad & Brogan, 2012; Shelburne, 2009).

2.5 Models and Frameworks

The discussion to follow focuses on the underlying causality of e-book user behaviour and acceptance. This section discusses technology acceptance and information behaviour models and allied frameworks and how features or validation of them may be manifest in patterns of e-book use. Beginning with the Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989), investigation of the research-oriented literature reveals a handful of models that may play a role in the study of e-book user behaviour and acceptance.

2.5.1 Technology Acceptance Model

Adapted from Fishbein and Ajzen's theory of reasoned action proposed in 1975, Fred D. Davis introduced the Technology Acceptance Model (TAM) in 1986 (Davis, Bagozzi, & Warshaw, 1989). TAM holds that perceived usefulness, i.e. "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease-of-use "the degree to which a person believes that using a particular system would be free from effort" are two major determinants to explain computer usage behaviour and an individual's attitude and intention to use information technology (Davis, 1989, p. 320). Figure 2.2 presents TAM in its original form.

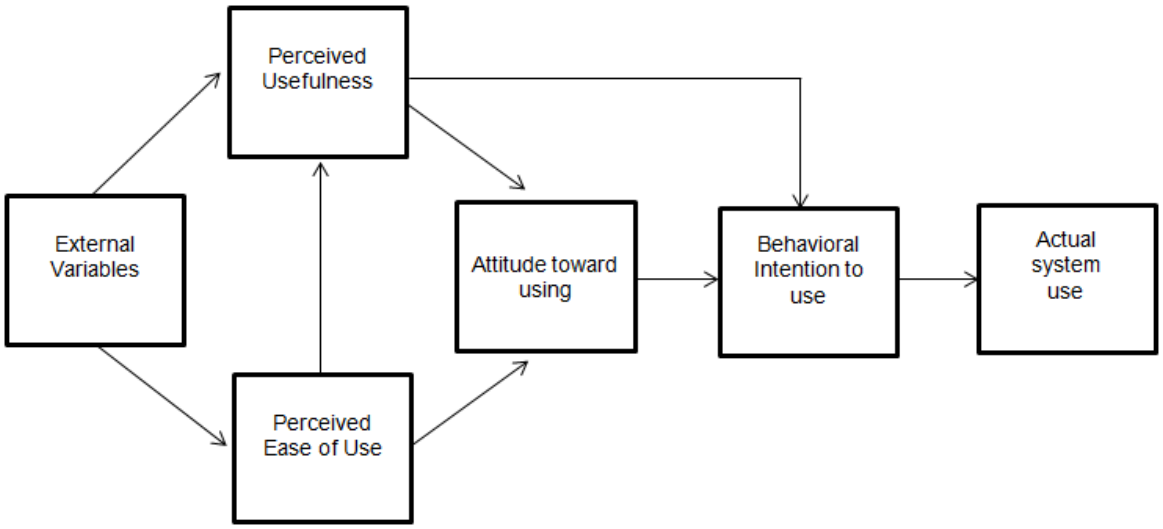

Figure 2.2. Technology Acceptance Model (adopted from Davis, Bagozzi, & Warshaw, 1989, p. 985)

TAM has been used and adapted in a variety of contexts, for example, educational hypermedia (Gao, 2005), virtual learning (Van Raaij & Schepers, 2008), knowledge management (Aman, 2010), and use of a website recommendation system (Martinez-Lopez, Rodriguez-Ardura, Gazquez-Abad, Sanchez-Franco, & Cabal, 2010). Other significant adaptations of TAM include different settings by using various additional constructs such as computer background, demographics, perceived invasiveness, perceived objections, perceived playfulness, perceived security, self-efficacy, knowledge of search domains, system characteristics, cultural affinity, and personal values (Park, 2007; Smith, 2008). Letchumanan and Tarmizi (2011b) argue that "very few studies have investigated TAM as a model to explain the acceptance of the e-books" (p. 517).

Many researchers (for example, Venkatesh & Bala, 2008) suggested refinements to TAM that improve its reliability as a predictor of adoption outcomes. Extensions and modifications to TAM have emerged with perspectives from different theoretical domains or paradigms such as sociology, marketing, and psychology (Venkatesh, Morris, G. B. Davis, & F. D. Davis, 2003). Significant developments include:

- Decomposed Theory of Planned Behaviour developed in 1995 by Taylor and Todd (Venkatesh, et al., 2003).
- TAM2 proposed in 2000 by Venkatesh and Davis (Venkatesh, et al.).
- Information System Continuance Model formulated by Bhattacherjee in 2001 (Bhattacherjee, 2001).
- Unified Theory of Acceptance and Use of Technology (UTAUT) suggested in 2003 by Venkatesh, Morris, G. B. Davis, and F. D. Davis (Venkatesh et al.)
- TAM3 evolved in 2008 by Venkatesh and Bala (Venkatesh & Bala, 2008).

Owing to wide recognition, use, and adaptation in different technological contexts (Aman, 2010), the UTAUT model is explored further here and contextualised in terms of e-books.

2.5.1.1 *Unified Theory of Acceptance and Use of Technology*

In 2003, a group of leading information systems researchers formulated the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Figure 2.3) based on eight contemporary technology acceptance models including TAM (Venkatesh et al., 2003).

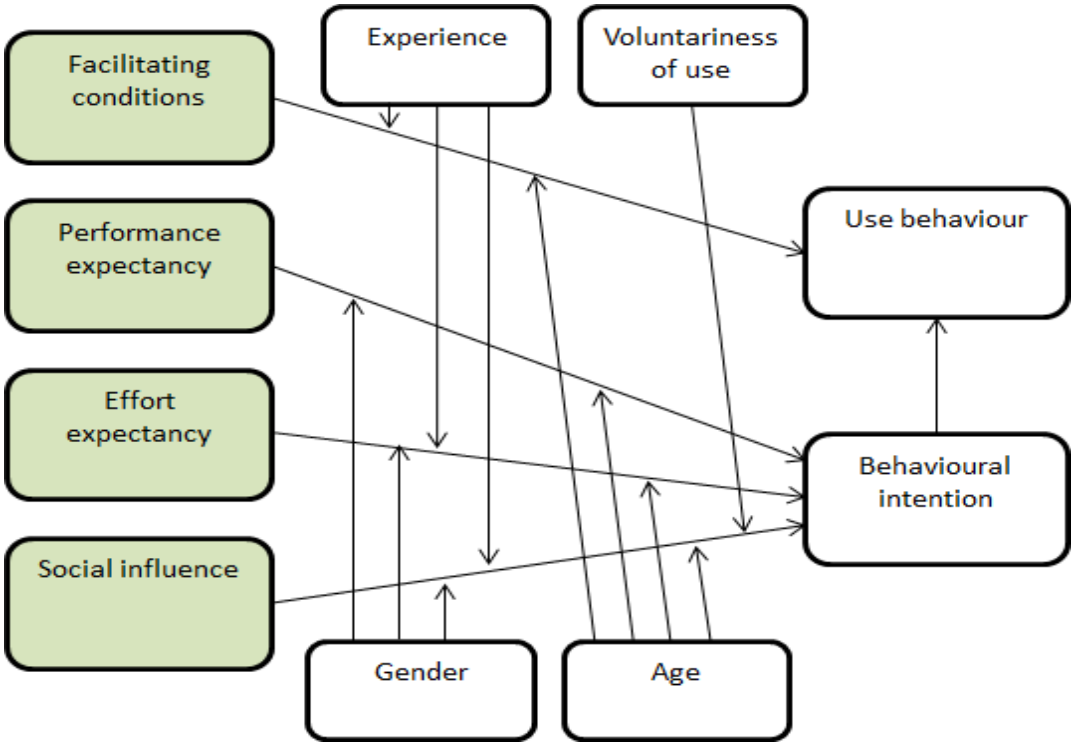

Figure 2.3. Unified Theory of Acceptance and Use of Technology (UTAUT) (adapted from Venkatesh et al., 2003, p. 447)

UTAUT consists of four determinants of behavioural intention and use, namely, performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al., 2003). Performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). Effort expectancy is defined as "the degree of ease associated with the use of the system" (p. 450). Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (p. 451). Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support

use of the system" (p. 453). Additionally, the variables of gender, age, experience and voluntariness of use moderate the key relationships in the model (p. 447).

2.5.1.1.1 Role of Performance and Effort Expectancy in E-book User Acceptance

The library literature on e-books emphasises performance expectancy or utility features that include comparative *advantages of e-books* over their print counterparts, content sufficiency and e-book effort expectancy (often operationalised in terms of usability) for the key functions of browsing and screen reading. Section 2.3 described advantages from a library management perspective. User perception of advantages and disadvantages of e-books are recounted in this section describing connections with both performance and effort expectancy from modified UTAUT and also Use and Gratifications Theory (UGT). Often untied to larger theoretical frameworks, discussion of advantages and disadvantages commonly occurs within the mainstream LIS literature:

I. Drivers to adoption: Advantages of e-books

CIBER (2008) conducted a nationwide survey of 123 UK universities in the context of JISC's National E-book Observatory (NeBO) project. The respondents (mostly students) furnished free-text comments regarding the utility and usability (advantages) of e-books. The report (also published as a journal article; see Jamali, Nicholas, & Rowlands, 2009) summarised the following advantages of e-books from a total of 11,624 responses from users' perspective.

- Online access: The e-books can be accessed online from anywhere at any time.
- Always ensured availability. E-books do not go out of print (Tenopir, 2010).
- Searchability: The biggest usefulness of e-book is the full-text searching with Ctrl+f function in addition to online metadata search.
- Cost: Users may become owner of e-books free of charge if downloadable permanently.
- Portability: The quality of being light enough to be carried to anywhere.
- Convenience in use.
- Eco-friendly owing to paperless.

- Storage: E-books occupy less space (virtual/digital) than hard copies.
- Easy to navigate, scan and browse through ToCs, hyperlinks, etc.
- Multiple uses simultaneously with no issue, no return, no reserve, no wait, no fine.
- Time saver in writing due to copy and paste facility.
- Easy to locate, read, annotate/highlight, bookmark, and share.
- Up-to-dateness as no printing press process and physical delivery involved.
- Better quality digital graphics.
- Interactivity
- Fitness for fact finding: Since e-books provide quick searching and finding, e-books are good for fact finding information, i.e. reference use, rather than general reading.

Hence, fieldwork such as the UCL NeBO study provides basic confirmation of important facets of usefulness (TAM)/performance expectation (UTAUT) and usability/ease of use (TAM)/effort expectation (UTAUT).

Utility is in part determined by content suitability. Shin (2011) argues that while e-books have been in use for many years, they still represent a very small proportion of book market. Shin citing Aedo et al adds that the insufficient number of titles is the key problem and the unsuccessful content capabilities together with lack of appropriate technology have held the e-book market back (p. 261). Lamothe (2013) claims "...it was the size of the [online e-book] collection that exhibited the strongest association to usage levels and would suggest just how important the size and content of a collection can be to patron acceptance and utilization" (p. 39). Husted and Czechowski (2012) point out that low availability of reference e-book titles affected their library's collection development. Content Complete and OnlyConnect Consultancy (2009) assert that although e-book publication and aggregation have increased, many of the core e-textbooks are not available to academic libraries owing to publishers' concerns regarding adverse impact on print transactions and confusion over pricing and licensing mechanisms. The study noted that purchasing of textbooks in traditional format is declining because unit costs are making them unaffordable for many students.

II. Barriers to adoption: Disadvantages of e-books

Despite advantages, e-books have certain issues that inhibit them from mass adoption and user acceptance and use. There is a need to remove barriers in e-book usability and functionality. The following discussion highlights some of these barriers.

Asunka (2013, pp. 37-38) reviews some of the barriers to widespread e-book adoption and acceptance including unsuitability for extended reading compared with physical books, lack of a common standard format, issues of sharing due to intellectual property rights, piracy, unfair pricing, and regulations. For users with disabilities or impairment, e-books can pose accessibility issues. Huthwaite et al. (2011) argue that e-book platforms, due to lack of standards, have inadequate accessibility features for students who suffer visual impairment.

Other issues concern user interface design. Armstrong and Lonsdale (2009) commenting on the MyiLibrary platform, suggest that e-book interfaces are not intuitive. They highlight issues that include poor-look or old-fashioned interfaces, poor navigation around and within textbooks, lack of consistency within a single collection, unsmooth browsing, accessing page-by-page, copy/print/download limitations, error messages and lock-out in rapid paging. Use of e-books on other platforms can also involve limitations on printing, downloading and latency. According to JISC (2009) e-book platforms and interfaces are not ideal or not user-centred. Asunka (2013) citing Motiwala notes issues with most mobile devices such as small screen sizes, limited processing power and battery time, and graphical limitations (p. 38).

Huthwaite et al. (2011) review the most desired functionality and features of e-books and agents/media (e-book readers) in academic settings. Their review include enhanced interactivity with the text, making notes, highlighting, underlining, adding comments, multiple bookmarking, quick and easy navigation and searching, printing, copying and pasting, downloading, multimedia support, and wireless connectivity enabling multitasking and references to related, linked resources. They observe that it is hard to see all these features in one e-book or agent.

CIBER (2008), on the basis of users' feedback from 123 UK universities, also highlight issues with e-book platforms and interfaces concern:

- Being inclined to Microsoft tools, Ebrary is unsuited to Mac, Linux, Apple, Palm handheld and Firefox technology. The Ebrary reader has no resizing flexibility and the screen moves quickly leaving behind the very next page.
- E-book interface menus (browser bars, status bars, and controls) occupy too much space, such as MyiLibrary, thus leaving an insufficient room for the book.
- The e-book system either disconnects or alarms to disconnect the user either after every fifteen minutes or pages.
- The Oxford Scholarship's copyright notices over the text causes difficulties in study and concentration.
- Lack of one standardised platform/interface/format brings about user confusion and disaffection.
- Because standards are not fully open, integration with different discovery tools cannot be assumed.
- For some users, e-books may be difficult to read from the screen. Eyes and posture soon become tired making harder to concentrate and absorb. Screen-reading for longer texts tends also to cause migraines. On-screen reading causes problems for dyslexic users owing to present setting of visuals, graphics and background colour. Prolonged screen reading is difficult for users having glaucoma. It is difficult to browse or speed read. While analysing e-book log statistics of the Books24x7 platform Borchert et al. (2009) found that most users read online for up to 30 minutes only.
- On-screen editing is not always possible to get the desired printout in terms of font size, layout.
- It can be difficult to access e-books online from home, off-campus. Some systems have limits on simultaneous use of e-books by multiple users.
- Printing is seldom consistent across e-books. Either the printing is not allowed or there is a restriction that restricts printing to a limited number of pages. For example, ECU Library has found that EBL allows one user to print only up to 20% of an e-book (D. Howard, personal communication, April 13, 2011).

- Some e-book systems or libraries either do not allow downloading or "downloaded material automatically deletes after some certain time" (D. Howard, personal communication, April 13, 2011). Some platforms have not the facility of on-screen writing notes, annotation, or highlighting.
- The pagination of an e-book according to its ToC often does not match with the pagination provided by the reader software (browser or e-book reader).
- E-books in HTML format are less user-friendly than PDF format. Williams (2011) argues that EPUB e-book format is open, standardised, and reflowable; reflow ability allows reformat and repagination as per screen size and user's settings, as opposed to pdf format which preserves a document's original appearance.
- The physical book is more than an e-book in terms of ease of use and reading with more concentration and comfort at favourite places; they are compact, restful and cheap.
- The e-book use may be more popular in certain subject areas than other disciplines. In certain disciplines where an extensive textual screen reading is involved such as social sciences and humanities, e-book may prove less befitting.

Since more than six years have passed when CIBER (2008) conducted users surveys with respect to utility and usability aspects of e-books and this technology keeps on progressing with additional features and facilitation. It is, therefore, pertinent to re-check these aspects with some additional constructs especially with different platforms (e.g. EBL) as well as in a different national/ethnic context.

2.5.1.1.2 Role of Facilitating Conditions

In UTAUT, the idea of facilitating conditions (called 'compatibility' in Innovation Diffusion Theory) encompasses environment factors such as organisational and technical infrastructure to support use of the system (Venkatesh et al., 2003). Such factors may include promotional and marketing activities (Vasileiou & Rowley, 2011), training and information literacy instruction (ACRL, 2013; Mahmood, 2013; Milliot, 2007), findability, discovery, and connectivity (Konappa, 2014; Shelburne, 2009),

access/referrer links/routes to e-books (Armstrong & Lonsdale, 2009; Borchert et al., 2009; CIBER, 2009b) such as catalogue, meta-search, and course lists.

Promotion, marketing, and information literacy (IL) instruction can also play a pivotal role in e-book adoption by users. Association of College and Research Libraries defines IL as "the set of skills needed to find, retrieve, analyse, and use information" (ACRL, 2013, para. 1). Milliot (2007) feels that there is a "need to increase the profile of e-books by improving training and tools" (p. 16). Jamali, Nicholas, & Rowlands (2009) while analysing an online user survey of UK universities comment "there was also a lack of knowledge about how to access and use e-books and e-resources and this highlights the need for instructions and the improvement of information literacy programmes at universities" (p. 42). Mokhtar and Majid (2008) argue that the current age of digitised information and networks demands new proficiencies and capabilities in information and communication technologies (ICT) - one of the components of information literacy.

Armstrong and Lonsdale (2009) argue that librarians regard the collection promotion as secondary only to access provision. They emphasise promotion of e-books in order to increase their use. They further argue that there are many stakeholders such as publishers, suppliers (aggregators), vendors, but the key role players are the library professionals and faculty members. Keeping in view academics' complementary and critical role in e-textbook promotion, Vasileiou and Rowley (2011) suggest a variety of methods and platforms that can be used for e-book marketing and promotion.

Findability/discovery, connectivity, and access routes to e-books such as catalogues, meta-search and course lists may serve as intervening variables to understand e-book user experience and behaviour.

2.5.1.1.3 Role of Social Influence

According to Venkatesh et al. (2003), intention or propensity to use can be affected by social influence, i.e. the influence of peers or domain specific actors. Social influence is a construct from previous research such as the idea of subjective norm (drawn from social psychology's theory of reasoned action, TAM2, theory of planned behaviour, decomposed theory of planned behaviour, and innovation diffusion theory) and the role

of social factors (as found in the model of PC utilisation), and image/identity (innovation diffusion theory). Influence of peers in a classroom or on an online discussion forum, and recommendation of lecturer/tutor (Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010) closely match with two of the UTAUT's items of social influence, i.e. use of system by co-workers, and people who are important or who influence one's behaviour think that he or she should use the system, respectively.

Recommending sources might also play an important role in e-book use. For example, students might modify behaviour to encompass e-books, if a teacher recommends doing so through reading lists, VLE modules, and oral communications (JISC, 2009). Content Complete and OnlyConnect Consultancy (2009) assert that "...the lecturer is a key determinant in terms of student demand. If the lecturer is enthusiastic and recommends e-access, demand from students is very likely to follow" (p. 5).

To examine how users perceive the influence of recommendations on the intention to use e-books for academic purposes when they receive e-book recommendations from peers, advertisers, and experts, Lin et al. (2010) report the results of a survey of 382 academic digital library users (undergraduate and graduate students) of a university in Northern Taiwan. The findings comprising comparison of three recommendation sources (word-of-mouth, advertising, and expert recommendations) reveal that word-of-mouth played a more important role than other recommendations in determining the intention to use e-books in an academic digital library.

Therefore, social influence may be considered an important factor in e-book adoption.

2.5.1.1.4 Role of Hedonic Attributes

Venkatesh (2000) points out two types of motivations, extrinsic and intrinsic. Extrinsic motivation captured in TAM as perceived usefulness is the drive to achieve some goals or benefits, while intrinsic motivations relate to perceived pleasure and satisfaction. Since TAM does not explicitly include intrinsic motivations Venkatesh proposes some extension to TAM. Among various constructs computer playfulness and perceived enjoyment have been shown as important in shaping user's perceived ease of use.

Computer playfulness may be viewed in terms of culture of use, for example, e-book use platforms and users' satisfaction with them (see Section 2.5.1.2).

Venkatesh (2000) defined perceived enjoyment as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (p. 351). He further argues that perceptions of effort/time will be lower in the case of a more playful user when compared to a less playful one. Later researchers also highlight the importance and role of hedonic motivations. For example, Lee (2010) asserts that users will be intrinsically motivated to adopt the technology if it brings them fun and pleasure. Lin, Wu, and Tsai (2005) emphasise the role of perceived playfulness in forming a user's intent to reuse a website. Zhou (2011) argues that users may have different expectations, for example, students may be more concerned with the hedonic attributes than businessmen's utilitarian preference with regard to mobile services. Hedonic and aesthetic motivations are adventurous, entertaining, and gratifying and lead towards focused attention and engagement in e-commerce context (O'Brien, 2010).

Hence, hedonic attributes may be applicable to perceived attractiveness of the e-book formats and overall pleasantness of e-book use experience.

2.5.1.2 User Values Perspective

Despite the wide recognition and use of TAM, research has also pointed to the role of personal values. A user's value system or personal values (e.g. social values, legalistic values, status values, economic values, and altruistic values) also motivate behaviour (Park, 2007). Park further cites Kohli and Ketinger that "personal values are individual beliefs that [regulate or] form the ultimate [behaviour or] action such as adoption of a new [technology, system or] practice" (p. 20). Since the personal values and individual's value system (i.e. priorities) serve as the criterion or standard of conduct, hence they potentially explain an individual's behaviour. Values are extensively used in predicting individuals' different behaviours such as aptitude tests, choice of career/occupation, workplace and teamwork behaviour, power users of e-books and mass media, consumers, decision making and managerial capability, and production workers.

A ‘culture of use’ may evolve around values and sociological factors such as the perceived social standing of a platform or technology. User preferences for mobile technologies may supersede judgements about perceived value or even override judgements of cost burden. In summary, users’ personal values and ‘culture of use’ have given new determinants to TAM in addition to the more familiar utilitarian cost burden determinants. Since TAM predicts only a utilitarian view (i.e. an individual’s personal benefits), these non-utilitarian outlooks need also to be encompassed in future research (Park, 2007).

Role of Culture of Use

In terms of the models presented as part of the theoretical discussion, ‘Culture of use’ seems close to Park’s (2007) perspective of personal values. In this sense it refers to the prevailing common trend in devices and technologies that is in part socially defined. For example, use of smart phones as e-readers (Wood & Philips, 2011), culture of using computing technologies, social media, Internet & online resources (M. Brogan, personal communication, May 13, 2011), and habit/automaticity (Park). Culture of use is also referred to as e-culture, which means “the nature of intellectual life in a world of high-speed, global networks, intelligent services, and massive data – eCulture subsumes eScience, eResearch and other terms that describe formal academic work and includes phenomena such as wikis, blogs, video games” (Crane, 2007, para. 1), and “all processes of expression, reflection and sharing in the digital domain” (Schwarz, 2006, p. 2).

Prominent in discussion of culture of use today is the idea of ‘Web 2.0’. ‘Web 2.0’ technologies enable users to social network and to personalise websites with user contributed content. Web 2.0 services include blogging, podcasting, RSS feeds, wikis, instant messaging, social networking, mashups and social tagging through a variety of services, for example, Facebook, Flickr, Twitter, Youtube, Second Life, MySpace, Linkedin, Del.icio.us, Wikipedia, Skype, and Digg (Holmberg, Huvila, Kronqvist-Berg, & Widen-Wulff, 2009). Services have also been adapted to business application in libraries via the umbrella term *Library 2.0*. Holmberg et al. (2009) citing Maness refer ‘Library 2.0’ to the “application of interactive, collaborative, and multi-media web-based technologies to web-based library services and collections” (p. 671).

Culture of use also manifests itself in the agents used to connect with services. Cassidy et al. (2011) examined students' trends, usage and preferences of popular Internet and communication technologies at the Sam Houston State University, USA, to inform decisions regarding library service development. Survey results indicated that most students wished to have basic library services easily accessible through a few of the most popular social networking and Internet technologies. Ownership of mobile phones was among the highest (98.8%). Majority of phones models were almost new including Apple iPhone and Blackberry brands. Text messaging ranked second (94.4%) only behind phone calls (97.3%) in student usage of mobile phone features, and 84% of respondents indicated that they used text messages on a daily basis. Other heavily used mobile phone features included photo/video, web browsing, e-mail, playing audio files, using a touch screen, downloading and using apps, and chat/instant messaging (IM). Students also used their mobile phones in asking the library questions through text messages and IM, renewal of books, searching for and reading journal articles and library text message alerts. The use or interest in other services included chat/IM through online messenger services (64%), Facebook and MySpace (48%), YouTube (37.6%), podcasts (36%), library blogs (34%), Twitter (21%), VOIP/Skype (18%), RSS Feeds (16.4%), Foursquare/Gowalla (6%), and Second Life (3%). Although only a small percentage of students owned an e-reader due to their high prices, they showed high interest in borrowing e-readers from library with preloaded content.

Therefore, culture of use may be helpful in understanding e-book acceptance and usage.

2.5.2 Uses and Gratifications Theory (UGT)

UGT is a model used in media research spanning user motivation studies ranging from different media to cell phones and the Internet. Shin (2011) citing Leung and Wei argues that UGT assumes that users are actively involved in media usage and highly interact with the communication media (pp. 263-264). Gratifications are referred to as some aspect of satisfaction regarding the use of a particular medium based on users' feedback. Shin defines gratification as "some aspect of satisfaction reported by users, related to the active use of the medium in question" (p. 263).

UGT provides the framework for understanding the specific reasons that motivate users to use that product. This approach focuses on what people do with media and why people use particular media, rather than on content as the main explanation of acceptance or rejection. Mondi, Woods, and Rafi (2008) argue the importance to understand 'how and why' students use computer technology in educational context in order to: "(i) detect students' preferences, expectations and learning difficulties, (ii) design and develop suitable e-learning resources that are in congruence with students' communication behaviour, and (iii) help teachers to support, guide and scaffold students' learning processes" (p. 242).

The theory suggests that students make conscious and reasoned decision in selecting the media to satisfy their needs (Shin, 2011). T. Stafford, M. Stafford, and Schkade (2004) found process, content and social gratifications with regard to a study focused on Internet-specific gratifications. Paragas, Clara, Main, and Rahman (2010), in a research study of mobile telephony, operationalised '*use*' into three concepts: patterns of use, perceived ease-of-use, and use of functions. They also cite Leung and Wei who used '*sociability*, *immediacy*, *mobility*, and *security*' as dimensions of gratifications for use of mobile phones (p. 216).

Role of Gratification

Tenopir (2010) is of the view that satisfaction and outcomes are the ultimate scale of the success of library collections and services. The perceived performance equalling or exceeding expectation leads to positive confirmation, i.e. satisfaction. The formation of subsequent behaviours, such as gratification and acceptance and engagement, is according to levels of confirmation (Mondi et al., 2008; Paragas et al., 2010; Shin, 2011; Stafford et al., 2004). Satisfied users reuse or form an intention to reuse the product in future, whereas dissatisfied patrons do not (Bhattacherjee, 2001).

Shin (2011) asserts since the e-book interface has interactive features with high user involvement, the application of UGT to understand e-book user behaviour seems justified with some adjustment in scales. Expectation confirmation may serve as an intervening variable in this study that connects the independent variables to the dependent variable - gratification. Engagement, also known as continuance intention or

reuse (Zhou, 2011), is another factor based on gratification in addition to other independent variables, for the satisfied users accept and reuse the product.

2.5.3 Expectation Confirmation Theory (ECT)

ECT has its foundation in consumer behaviour research with a main focus on consumer satisfaction and post-adoption behaviour or continuance intention. Shin (2011) citing Oliver argues ECT suggests that both pre- and post-behaviour have influence on confirmation, which successively affects satisfaction and continuance intention (p. 263). Consumers compare their expectation and perceived performance to form satisfaction. Confirmation is based on the actual performance judged by a user against expectation or pre-purchase standard. Perceived performance equalling or exceeding expectation leads to positive confirmation. The formation of subsequent behaviours, satisfaction or dissatisfaction, is according to levels of confirmation; satisfied users reuse or form an intention to reuse the product in future, whereas dissatisfied users do not (Bhattacherjee, 2001; Zhou, 2011).

Role of Continuance Intention

Various studies with regard to different technologies, for example, mobile telephony uses and services (Paragas et al., 2010; Zhou, 2011), information systems (Bhattacherjee, 2001), e-learning (Mondi, Woods, & Rafi, 2008), use of Internet (T. Stafford, M. Stafford & Schkade, 2004), and e-book users (Shin, 2011), assert that expectations (utility/performance and usability/effort: Venkatesh et al., 2003) have influence on confirmation, which successively affect gratification/satisfaction and acceptance and continuance intention. Consumers compare their expectations with outcomes to form acceptance or rejection. Confirmation is based on the actual performance judged by a user against expectation or pre-purchase standard (Bhattacherjee).

Hence, and according to Shin (2011), the application of ECT is appropriate to know how e-book users' individual differences affect their confirmation and continuance intention. Shin also suggests some theoretical extensions as ECT emphasises on

cognitive evaluation and does not consider emotional factors or beliefs and culture of use that may predict repeated use of e-books.

2.5.4 Innovation Diffusion Theory (IDT)

Having its roots in sociology, IDT has been applied and adapted to study various innovations especially in communications research (Venkatesh et al., 2003). Shin (2011) argues that IDT "provides a demand-side explanation of when and how newly-introduced technologies [or technological products] are communicated, evaluated, adopted, rejected, and re-evaluated by consumers," conceiving the diffusion process as "a process of information exchange facilitated by mass media and interpersonal channels within the social system" (p. 264).

Shin (2011) citing Leung and Wei list four factors that impact upon user's decision to accept or reject an innovation, namely (1) adopter's personality attributes, (2) socioeconomic effects, (3) use of mass media and interpersonal channels, and (4) perceived features of an innovation (p. 264).

Moore and Benbasat adapted and refined the core constructs of IDT to study user acceptance of technology that include relative advantage, ease of use/complexity, image/observability, visibility/trialability, compatibility, result-demonstrability, and voluntariness of use (cited in Venkatesh et al., 2003, p. 431).

IDT has many commonalities with other theories, for example, UTAUT's facilitating conditions, and social influence with IDT's compatibility, and image, and TAM's perceived usefulness and ease of use with IDT's relative advantage, and complexity, and ECT with IDT's trialability and result-demonstrability, respectively. Social effects and interpersonal channels may be related to UTAUT's social influence. Adopter's personality traits may form moderating variables in understanding e-book user behaviour.

Role of Forced Adoption

According to Walton (2012), forced adoption is an idea linked to IDT, i.e. adoption of an innovation may be owing to some external forces rather than personal desire of the

adopter. Walton found positive association of forced adoption with students' choice to use an e-book. Different tasks given to students, e.g. assignments, activities, workshops, and so on may be based on e-books embedded in courseware links. This is more applicable in case of off-campus students, need for multiple copies or concurrent access, and short or no-loan collections (Armstrong & Lonsdale, 2009).

Therefore, forced adoption may be considered a factor in understanding the behaviour of e-book users. Important as these theories are, thoughtful investigation must also explore other factors found in the general literature on e-book adoption and use. Discussion of this literature follows, contextualised around the problem context of academic and research libraries.

2.5.5 Other Factors in User Acceptance

To round off the discussion of factors in user acceptance, the role of intimacy, familiarity and moderating variables is discussed here. The mechanism encompasses aspects that may result in e-book acceptance, gratification and engagement or continuance intention, that are not in the literature explicitly linked to TAM, UTAUT, UGT, ECT or IDT

2.5.5.1 Role of Intimacy and Familiarity

Paper books are full of tradition and history (MacWilliam, 2013). Shin (2011) is of the view that humans have been using physical books for centuries. They can own and feel the existence of them being an entity, they can touch them and turn their pages, and they can smell paper. Hence, they have developed a sense of intimacy with physical books, i.e. emotional feeling or attachment (MacWilliam). Chong, Lim, and Ling (2009) argue that users' experiences with paper books are the basis of their expectations from e-books. Shin finds both intimacy and familiarity as directly related to users' intention to continue using e-books in addition to gratification in his proposed *uses and gratification expectancy* (UGE) model.

Familiarity (MacWilliam, 2013; Shin, 2011), or prior experience (Rowlands, Nicholas, Jamali, & Huntington, 2007), and awareness (Ebrary, 2008) also figure in fieldwork research on e-books. Shin citing Komiak and Benbasat defines familiarity as "one's

understanding of technologies, often based on previous interactions, experience and learning of the what, who, how and when of what is happening" (p. 266). Hence, familiarity acquired with leisure reading of e-books on a Kindle or iPad, constitutes prior experience or interaction that may impact on attitude toward and use of ARL e-books and platforms.

Shin's (2011) use of the term 'familiarity' aligns with the notion of prior experience based on repeated interactions. Awareness is a kindred but different notion suggesting the multi-dimensionality of 'familiarity'. Ashcroft (2011) argues that the first and foremost task is to create awareness among users about the availability of e-books. Milliot (2007) comments that the major obstacle that restrains students from using e-books is lack of awareness. Croft and Davis (2010) found nearly 50% of students were not using e-books at the Royal Roads University (Canada) and the top reported reason of non-use was the unawareness. Various other studies (e.g. Abdullah & Gibb, 2008a; Rowlands et al., 2007; Shelburne, 2009) have also reported similar findings.

Hence, it is important to know users' intimacy and preferences for both formats, physical and electronic books. Moreover, familiarity in terms of prior experience of e-book use and awareness may also be considered important in e-book adoption.

2.5.5.2 Role of Moderating Variables/Moderators

A moderating variable may be a qualitative (e.g. gender, race) or quantitative (e.g. age, income) variable that moderates the impact of another variable in some way (direction and/or strength of relation) (Tanner, 2013a). For example, "psychotherapy may reduce depression more for men than for women," hence, we can say that gender moderates the causal effect of psychotherapy on depression (Kenny, 2013, Basic definitions, para. 1). Ender (2003) asserts that moderator variables are important, for specific factors (for example, context information) are usually assumed to reduce or enhance the effect/influence that independent variables have on dependent variable.

In UTAUT, Venkatesh et al. (2003) have shown effects of independent variables (performance expectancy, effort expectancy, social influence, and facilitating conditions) on dependent variables (behavioural intention and use behaviour) moderated

by variables (gender, age, experience, and voluntariness of use), for example, "the effect of performance expectancy was moderated by gender and age such that it was more salient to younger workers, particularly men" (p. 37). Shin (2011) used three moderating variables (gender, age, and income) in his e-book reader user study and reported, for example, "...continuance intention of the high-income group is more easily affected because it finds it more economically affordable than the other group... Perceived ease of use was a more important factor among older than younger people..." (p. 271). Asunka (2013) and JISC (2009) also assert the importance of moderating effects of demographic variables in e-book adoption. Therefore, case study demographic variables are considered in this study.

2.5.6 Human Information Behaviour

Patterns of e-book use might also be understood in terms of human information behaviour theory. Important works on human information behaviour included in this study are Wilson (1999, 2000), Spink and Heinstrom (2011a, 2011b), Marchionini (2006), and O'Brien and Toms (2008). The contribution of each of these authors to this study is discussed below.

2.5.6.1 The Wilson IB Model and E-books

Wilson (2000) defined Information Behaviour (IB) as "the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use" (p. 49). According to Wilson (1999), IB comprises three subset behaviours, information seeking, searching, and use (Figure 2.4).

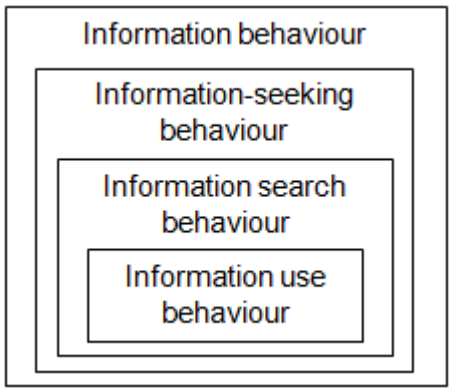

Figure 2.4. Information behaviour phenomenon (adapted from Wilson, 1999, p. 263)

Wilson (2000) defined *information seeking behaviour* as "the purposive seeking for information as a consequence of a need to satisfy some goal" (p. 49). In this course of information seeking, an individual may interact with manual systems (e.g. library pint materials), or with computer-based systems (e.g. Internet). According to Wilson's 1996 model the origins of information behaviour could be found in the context of generating the need, an activating mechanism, and the role of various intervening variables. In his 1996 model, Wilson developed aspects of an earlier 1981 model, particularly the possible barriers and various forms of information seeker behaviour (Godbold, 2006).

Information searching behaviour (Wilson, 2000, p.49) is "the 'micro-level' of behaviour employed by the searcher in interacting with information systems of all kinds". This behaviour based on both basic and advanced searching includes all the interactions with the system at two levels, human-computer interaction, and intellectual level including mental acts. Clicking on embedded links is an example of the former. Adopting a Boolean search strategy or determining which of two books on the same topic is most useful, and judging the relevance of retrieved information are examples of the latter.

Human information search behaviour is more closely related with information retrieval (IR) systems. Information behaviours or information seeking behaviours may broadly be useful in the overall design principles of an IR system (for example, specifying navigational routes, and exactly determining the kind of information or data types in the record), but not in the specification of rules for the design of interactive systems (Wilson, 1999). Wilson's ideas of information searchers' behaviour can also be viewed in context of Marchionini's (2006) concepts of basic and advanced, exploratory search behaviours contextualised in this study in terms of power and non-power use of e-books (Section 2.7.3.1, p. 73).

According to Wilson (2000), *information use behaviour* comprises "physical and mental acts involved in incorporating the information found into the person's existing knowledge-base" (p. 50). Thus, it may involve physical acts such as highlighting the text to mark significance, as well as mental acts, e.g. comparing new information with prior knowledge.

Wilson's (2000) revision of his theory of Information Behaviour (IB) may be applied to understand e-book user behaviour in a variety of ways. Wilson's theory involves active seeking of information and communication/information exchange with others. This notion may be related to peer effects and recommendation from lecturer/tutor in the context of influencing e-book user behaviour. Supportive and preventive intervening variables may represent advantages and disadvantages of e-books, respectively. Other intervening variables may represent the access methods (e.g. library catalogue, courseware links) through which users discover/access e-books. Case study 'demographics' may also moderate the impact of other variables. Self-efficacy or adapting well to new technology may also be a good predictor of e-book technology uptake. Users' preference for physical or e-books is also important to know. The 'need' and 'goal' in Wilson's model can be related to purpose or task fit with regard to using e-books.

Information system and information sources may represent respectively e-book supplier/user platforms and different sources to access e-books. The idea of information use following 'success' may be viewed in terms of satisfaction. Wilson's information use behaviour to satisfy the perceived need leads to 'satisfaction or non-satisfaction' and the same may be related to gratification and *intention to continue* using the system/resource with regard to successful e-book adoption. In the baseline model that follows, the relationship between information behaviour theory and adoption and use is captured in this way.

2.5.6.2 Other Directions in IB and their Application to E-book Adoption

Spink and Heinstrom define IB differently. According to Spink and Heinstrom (2011a), IB is a set of "complex human information-related processes that are embedded within an individual's everyday social and life processes with evolutionary and developmental foundations" (p. xvii). Spink and Heinstrom (2011a, 2011b), include in IB research ideas from the fields of information science, social psychology, evolutionary psychology, computer science, cognitive science, and related behavioural disciplines. According to Spink & Heinstrom, (2011b) humans developed an IB ability that includes processes of information sense making, foraging/searching, seeking, organising and using. They argue that instinctive and inherent mechanisms also shape IB. They include

personality differences and language, context, culture and environment in these mechanisms. *This work suggests the phenomenon of culture of use and the effect of moderating variables as factors in e-book use behaviour.*

Bawden and Robinson (2011) highlight the importance of individual differences in information-related behaviours and view them as information styles. Applied to e-books, such styles might include *non-power* use such as skim reading, reference use, snippet viewing (e.g. ToC pages), and *power use* involving fuller utilisation of functionality and higher levels of cognitive function. These typologies of use are discussed in Section 2.7. Bawden and Robinson's ideas of the nature and importance of information styles in information behaviour seeded the researcher's thinking on developing a dimension of the study based on the notions of 'power' and 'non-power' use.

Bowler (2011) introduces another dimension of IB research, i.e. meta-cognition during the information search process. She provides examples that encompass self-assessment strategies such as monitoring information-seeking processes and seeking feedback from teachers and peers to guide one's own inquiry process. Burnett and Jaeger (2011) also assert the importance of information worlds, a theory that posits that information behaviour is "shaped simultaneously by both immediate influences, such as friends, family, co-workers and trusted information sources of the small worlds in which individuals live, as well as larger social influences, including public sphere institutions, media, technology and politics" (p. 167). Ideas from this work that are salient to understanding e-book adoption in an ARL context include the role of teachers and peers (small information world), normative beliefs about e-books and agent technologies.

O'Brien (2011) emphasises the importance of human information interactions between systems and users that may be useful in modelling IB based on user experiences. She further suggests that context and tasks that motivate information needs and shape information seeking and use should be taken into account. DLA of e-book transaction logs represent users' interaction with e-books and their self-reported information behaviour assesses their experiences with e-books. Context and tasks (purposes) that motivate e-book use are also useful to know.

Sin (2011) is of the view that IB should be studied in one's environmental context. This context may include the facilitating conditions that apply to an institution or agency and individual barriers to e-book adoption. On the other hand, Elsweiler, Wilson, and Lunn (2011), consider hedonism to be a more important driver of IB than information needs, i.e. people engage in searching behaviours for pleasure rather than to find information. This idea should be observable in e-book use for recreation or leisure purpose.

2.5.6.3 User Engagement

In the literature on Human Computer Interaction (HCI) engagement is an indicator of success where technologies engage users. Shin (2011) has shown engagement (continuance) as a measure of e-book success (gratification). From an exploratory work on user engagement with four technology applications (online shopping, web searching, web casting, and video games), O'Brien and Toms (2008) define engagement as "a quality of user experience characterised by attributes of challenge, positive affect, endurability, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control" (p. 938). They argue the need to develop more engaging, and not just usable user interfaces, because if a web interface is boring and multimedia presentation does not attract and hold user attention, or an online forum fails to make a sense of community, a user dismisses them with just one mouse click. Successful technologies are not just usable rather they engage users. Failing to engage users means no or little use and users will go elsewhere to perform their tasks. They have given a useful review of four theoretical frameworks (Flow, Aesthetics, Play, and Information interaction) that may inform, predict, and facilitate engagement as follows (p. 939):

- Flow, intense involvement, comprises certain attributes, e.g. sustained and long term focused attention, system feedback, user control, interactivity, intrinsic motivation, choice).
- Aesthetics, visual appearance of the interface conforming to design principles (symmetry, balance, emphasis, harmony, proportion, rhythm) or format and display consists of attributes, e.g. intrinsic motivation, focused attention, curiosity, interest, pleasure).

- Play, learning and creative physical activity to develop and satisfy needs involving competition and collaboration, is associated with or attributed to, e.g. browsing, media presentation and video games, increased frequency of system use and satisfaction, increased motivation, enjoyment, challenge, affect.
- Interaction, communication between user and computer interface or content of the system, representing information design (data: categorisation, presentation, meaningfulness), interaction design (information as story), and sensorial design (stimulation and utilisation of the five senses), is attributed to motivations, expectations, system usability, context and environment, task, and content.

To obtain a desirable, even essential, user response to technology, the emphasis is on designing engagement based on users' experiences, i.e. perceptions, actions, and attitudes. O'Brien and Toms' (2008) work on user engagement has been applied in this study in a variety of perspectives, for example, utility, usability, hedonic attributes, culture of use, gratification, and continuance intention. Particularly, the idea of engagement in terms of intense involvement and focused attention in information behaviour seeded the researcher's thinking on developing a dimension of the study around power use of e-books (Section 2.7).

2.5.6.4 Roesnita and Zainab's E-book Use Model

Roesnita and Zainab's (2005) exploratory survey in the University of Malaya yielded 206 usable responses from undergraduate students in computer science and information technology regarding their use, perceptions, and impressions of e-books. The findings indicated even though the students were skilled and frequent Internet users and had positive attitude towards the e-book service, the level of e-book use was still low (39%), and occasional. The sources of e-book awareness comprised the university library website, lecturer referral, peers or librarians. Users found e-books easy to use and their usage was mainly for writing assignment or project work. Most users preferred e-books in the form of textbooks and reference works. There were also statistically significant differences between the frequency of e-book use and gender (males tended to be more e-book users than females); between past usage of e-books and preference for print books. The study presented a model of possible factors related to e-book use,

categorised into four groups: ICT competencies, cognitive factors, access factors, and functional or use factors (Figure 2.5).

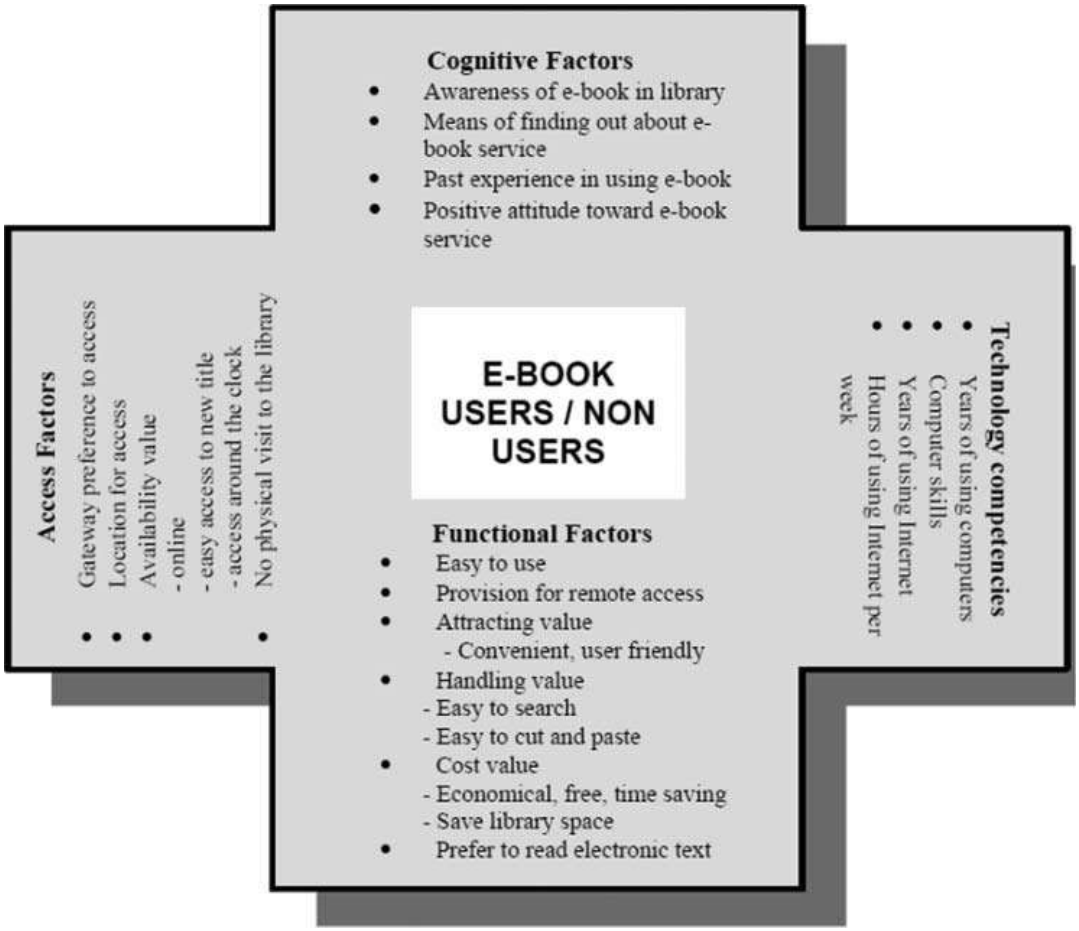

Figure 2.5. Roesnita and Zainab's e-book use model (2005, p. 17)

2.5.7 Prior E-book Research around Theoretical Models and Frameworks

Review of the research literature on e-book adoption in ARLs shows modest evidence of understanding e-book user behaviour in the light of technology adoption and information behaviour models and allied frameworks. Since e-book technology is still a relatively new phenomenon (Bansal, 2011; Polanka, 2011), understanding e-book user behaviour with relevant model(s) or framework(s) is like finding a new location with GPS. Some e-book user studies employed non-domain relevant theories but focused more on the medium/device (i.e. e-book reader or other mobile device) than the phenomenon in the fullest sense. For example, Lee's (2013) application of TAM, IDT,

and innovation resistance model; Shin's (2011) use of three theories (UGT, ECT, and IDT); Ratten's (2010) use of a social cognitive model; and Huang and Hsieh's (2012) utilisation of IDT and switching cost typology are relevant. Although, user experience of using e-books on a particular device is important (MacWilliam, 2013), resolving acceptance to e-reader devices without full exploration of the larger frameworks of acceptance and information behaviour is contestable.

Some studies utilised non-domain theories but researched e-resources broadly including e-books (e.g. Tao, 2008, 2009), while others focused only on dedicated e-textbooks (e.g. Lai & Ulhas, 2012), or a single, subject-specific, compulsory e-textbook (e.g. Bansal, 2011; Nelson & Webb, 2007), or fewer e-textbooks in a particular discipline, for example, business (e.g. Hsiao & Tang, 2014), and media (e.g. Ho, Wang, & Tsai, 2010). However, there are a few studies that used theoretical frameworks, including technology acceptance frameworks as a way of understanding academic e-book user behaviour. These will now be discussed.

Al-Suqri (2014) investigated the effects of language and personal characteristics (gender, age, and field of study) in relation to the TAM characteristics of perceived usefulness, perceived ease-of-use in an e-book academic context using a survey of 332 faculty members of Sultan Qaboos University, Oman. Findings revealed that academics who perceived e-books easier to use were likely to be more frequent e-book users. Younger male academics whose first language was Arabic, and particular disciplines (Arts and humanities, business, law, physical sciences, and engineering) tended to have higher levels of e-book usage. In another TAM-based study, Letchumanan and Muniandy (2013) identified the future intention of non-users by investigating their perception towards e-books with a survey sample of 119 undergraduate mathematics students of Universiti [sic] Putra Malaysia. The study found statistically significant positive associations between (1) perceived ease of use (PEOU) and perceived usefulness (PU), (2) PEOU and attitude towards using (ATU), (3) PU and ATU, and (4) ATU and behavioural intention to use (BIU). In a previous TAM-based survey of 169 engineering undergraduate e-book users at the same university, Letchumanan and Tarmizi (2011b) found statistically significant positive associations between (1) PEOU and PU, (2) PU and ATU, (3) PU and BIU, and (4) ATU and BIU.

To examine the integration of e-book technology in ARLs using Rogers' IDT model, Bratanek (2013) conducted 14 interviews of conveniently selected undergraduate students (six), academics (four), and librarians (four) at the University of Ottawa for a master's degree thesis. Main findings included (1) participants preferred physical books, (2) inadequate communication occurred between students, academics, and librarians, (3) information literacy training initiatives were needed to be standardised, and (4) acknowledging the advantages of a communication technology might not necessarily result in its adoption. In another Canadian study Martin and Quan-Haase (2013) interviewed 10 academic historians at the University of Western Ontario to understand their adoption of e-books for the purpose of teaching and research using Rogers' model of the innovation-diffusion/decision process. Their findings showed academic historians' concerns about the loss of serendipity in digital environments, the lack of availability of key resources, and the need for technological transparency.

Khalid (2013) investigated the relationships between the big five personality traits (known as Big-5) with TAM-based e-book adoption using a survey of 91 undergraduate students in International Islamic University College, Malaysia. Results revealed statistically significant relationships between four of the personality traits (conscientiousness, agreeableness, openness to experience, extraversion) and e-book adoption. At Yonsei University, Lee, Choi, & Kim's (2012) application of IDT, TAM, and switching cost typology to understand the process of user resistance to e-book in a Korean context, found that trialability, uncertainty, and complexity affected perceived value and switching cost. The user-based antecedents (social norm and perceived value) increased the effect of self-efficacy. Also, self-efficacy and perceived value decreased while switching cost increased user resistance to e-books.

In an Australian study utilising Task Technology Fit (TTF) model at the University of New South Wales, D'Ambra and Wilson (2012) found a significant positive impact of task, technology, and individual characteristics on the perceived fitness of e-books in academic settings which in turn influenced academics' use of e-books and their overall job performance. In a UK-based study, Smyth and Carlin (2012) summarised their analysis of a survey of 109 undergraduate students within two faculties in the University of Ulster using IDT and Roesnita and Zainab's e-book use model, and found a definite

student preference for physical books compared to e-book format. In a doctoral study (Capella University, USA) of students' preference for e-textbook formats based on TAM, Smith (2008) found strong positive correlations of students' satisfaction with HTML format for online reading and with PDF format for offline reading of e-textbooks.

2.6 Baseline Models

Outcomes from the review of the literature on technology adoption and use suggest theoretical and operational models that describe e-book adoption and use. These baseline models (Figures 2.6 and 2.7) synthesises the main technology adoption and information behaviour theories and related frameworks and operationalise these theories and frameworks in terms of factors leading to acceptance and use via gratification and continuance intention.

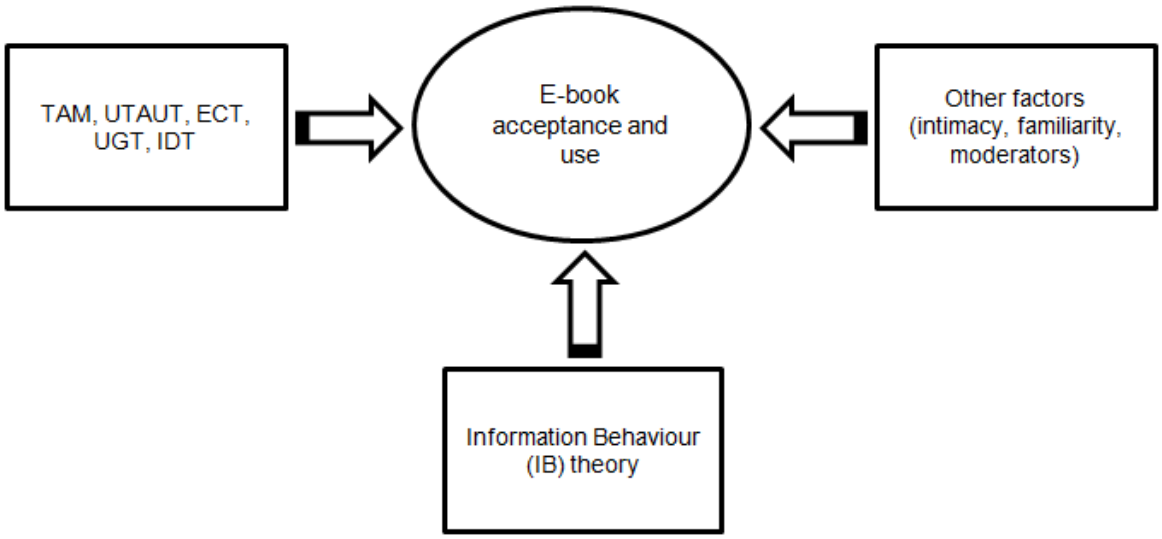

Figure 2.6. Integrated baseline theoretical model for e-book adoption in ARLs

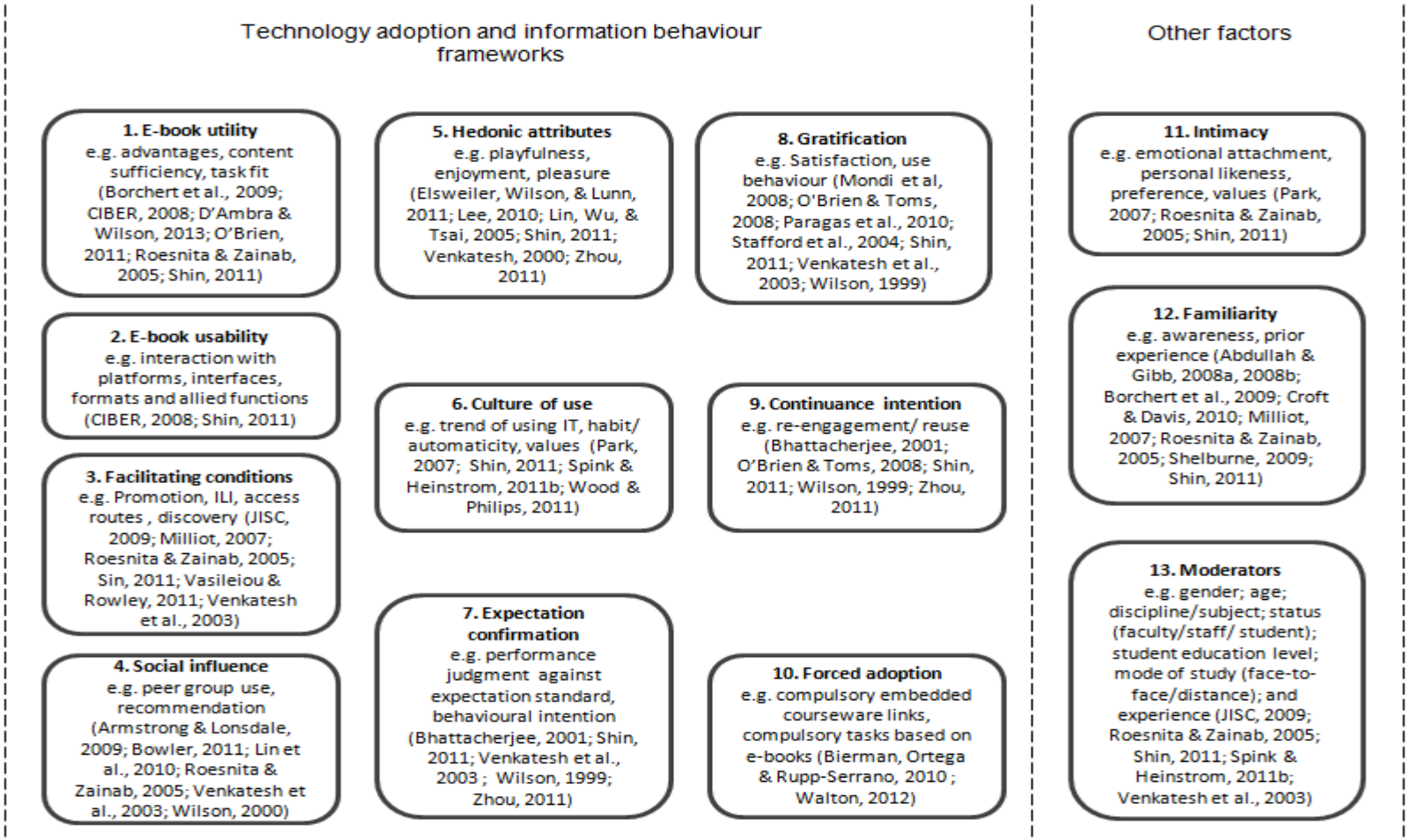

Figure 2.7. Operationalised baseline factor model of e-book adoption in ARLs

2.7 Power Users of E-books

2.7.1 Introduction

Tenopir's (2010) focus on user satisfaction and outcomes suggests the logic of investigating cohorts within the population defined not only by population parameters but also by information behaviour. Such a direction aligns with the broader literature of information systems where cohort characteristics are addressed by customisation in systems design leading to improved user outcomes in terms of satisfaction and search efficiency (Sundar & Marathe, 2010).

Power and non-power use, involving user discrimination on the basis of expertise, is an idea from end-user computing with potential applicability as an interpretive tool for analysing e-book user behaviour. Bawden and Robinson (2011) emphasise the nature and importance of varied information styles in information behaviour. Marchionini's (2006) idea of exploratory searching describes several advanced or power behaviours.[3] White and Roth (2009) affirm that exploratory searching and seeking of information exhibits sophisticated user behaviours. O'Brien and Toms (2008) consider engagement (intensively engaged users with technology) as an indicator of success.[4] Sundar and Marathe (2010) with regard to digital media and web-based services argue that there are two categories of users, power and non-power users, and their satisfaction requirements are different.[5] Within the e-book domain with simple measurement, JISC (2009) introduces another category of e-book users, power users, whose IB is different from average users.[6] This demands further research on the information behaviour of another

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[3] Vide section 2.7.3.1, for details of Marchionini's (2006) work on exploratory searching.

[4] Vide section 2.5.6.3, for details of work on user engagement by O'Brien and Toms (2008).

[5] Vide section 2.7.3.2, for details of work on power and non-power users and their requirements by Sundar and Marathe (2010).

[6] Vide section 2.7.4, for details of JISC's (2009) work on power users.

category of apparently intensive or satisfied users, i.e. power users, in e-book domain with a novel measurement technique.[7]

2.7.2 What is Power Use?

Outside the domain of e-books, the idea of 'power use' has broad currency within the ICT literature on advanced users. For example, in an end-user computing context, the term, 'power user' is used to describe early adopters and users with a propensity to use advanced features of hardware and software. Often the term is used in a context-specific manner. For example, Malyn-Smith and Guilfoy (2003, p. 4) describe power users of information and communication technologies as "individuals who break out of the confines of traditional learning, demographic, or technological barriers by constantly using, sharing, creating, producing, or changing information in creative, innovative and/or unintended ways so that they become force multipliers in their own environments". Lim, Kim, Park, and Lee (2011) see power users in the context of blog networks as "those users whose content exhibits influential power and thus induces a significant amount of activities of other users within a blog" (p. 853).

The research-oriented literature in general incorporates a useful review to distinguish between power and non-power users in regard to web-based technology use. For example, as reviewed by Sundar and Marathe (2010, p. 305), power users are more likely:

- to spend enormous time using and browsing the Internet,
- to use complex file sharing applications,
- to download large multimedia files,
- to be highly self-motivated learners,
- to commit greater effort to discovery,

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[7] Vide Chapter Seven *Data analysis and discussion: Addressing the gap between user expectation and experience*.

- to experience frustration if restricted or given little learning autonomy,
- engaged routinely in multitasking,
- to navigate through complex situations,
- tended to push any technological device to its functional limit,
- to be technophiles thinking of technology as intuitive and requiring no technical support,
- to be experts who require lesser navigational support than novices,
- to be more frustrated if the interface poses restrictions,
- to drive technological innovation,
- to have strong self-efficacy and clear outcome expectations, both good predictors of technology use, and
- to control their interaction with technology as much as possible.

Sundar and Marathe (2010, p. 305) also review non-power users which are more likely:

- lacking the expertise, efficacy, and interest in adopting newer technologies and interface features,
- lacking readiness, willingness, and ability to productively use technological interfaces,
- not to choose among given options,
- not to expend energy controlling their interface, and
- to appreciate relevant content like all users.

The next section describes sophisticated user behaviours outside the context of e-books that help understand differences between power and non-power user behaviours in more detail.

2.7.3 Sophisticated User Behaviours

2.7.3.1 Exploratory Search Behaviour

Sophisticated users display higher level information needs. Marchionini (2006) describes three kinds of search activities in the web environment: *lookup, learn, and investigate*. Searching can be basic or exploratory. Exploratory search particularly

relates to learn and investigate activities. Each layer or activity comprises a particular set of tasks (Table 2.2).

Table 2.2. Basic and Exploratory Search Activities and Tasks (Marchionini, 2006, p. 42)

Search kind	Activity	Tasks
Basic	Lookup	• Fact retrieval • Known item search • Navigation • Transaction • Verification • Question answering
Exploratory	Learn	• Knowledge acquisition • Comprehension/Interpretation • Comparison • Aggregation/integration • Socialise
Exploratory	Investigate	• Accretion • Analysis • Exclusion/negation • Synthesis • Evaluation • Discovery • Planning/forecasting • Transformation

Marchionini (2006, pp. 42-43) explains these three kinds of search activities as follows:

- *Lookup searches*, the most basic kind, are also called known item searches as opposed to topical or subject searches, fact retrieval or question-answering searches addressing who, when, and where in lieu of what, how, and why. Lookup has mainly been focused in the development of web search engines and

database management systems. Examples of basic search include proper nouns, numbers, short statements, specific files of texts or other media.

- *Learning searches* pursue multiple iterations and return results that require cognitive processing and interpretation. Examples of learning searches concern quantitative and qualitative data in various media (maps, graphs, figures, diagrams, texts, videos) that require scanning/viewing, processing, comparing, interpretation, and making qualitative judgments. This also includes social searching for making new friends or finding communities of interest. Lookup searches can also lead to embedded links to correct neighbourhood for exploratory browsing.
- *Investigative searches* engage multiple iterations over longer periods of time and may return results to be assessed critically before their personal and professional utilisation. Investigative searches aim to achieve higher level objectives such as analysis, synthesis, and evaluation through significant extant knowledge to support planning and forecasting, or to convert existing data into new knowledge. Such searches may discover gaps in knowledge in addition to finding new information. Serendipitous browsing is another kind of investigative search aimed to stimulate analogical thinking. Since investigative searching emphasise recall and is thus not well supported by contemporary web search engines that are highly tended toward precision. Since precise analytical queries require sophisticated browsing services, many specialised search services that also provide annotation and result manipulation tools are emerging to enhance general search engines.

White and Roth (2009) explain that information seeking entails the process of obtaining information in both contexts, human and technological. Information seeking processes are iterative, opportunistic, and multi-tactical. They assert that exploratory search aims to solve complex problems and demands such search systems that support beyond simple or basic lookup. They affirm Marchionini's (2006) idea and argue that exploratory search behaviours explore unknown information avenues. This notion can be seen in terms of *unique titles* viewed by power e-book users.

White, Muresan, and Marchionini (2006, pp. 58-59) suggest five metrics to evaluate the exploratory search systems as follows:

- **Engagement and enjoyment**: The extent to which users are engaged and focused on the task and seem happy with the system's response may be an indicator of system performance. The number of actionable events may also be used in this regard such as forms filled, purchases, feedback or bookmarking events, and forwarding.
- **Information novelty**: The amount of new information encountered.
- **Task success**: The sufficient amount of information encountered to satisfy goal. Since difficulty of the task also matters, the Clarity metric may also be used.
- **Task time**: The total time spent to reach the task completeness. This may also include "the time spent looking at irrelevant documents, and the proportion of time spent engaged in directed search versus the amount of time spent exploring" (p. 59).
- **Learning and cognition**: Learning, a key aspect of exploratory search, comprises "the attainment of learning outcomes, the richness/completeness of a user's post-exploration perspective, the amount of the topic space covered, and the number of insights they come up with" (p. 59).

While suggesting the methodology to assess the effectiveness of an exploratory search system White, Muresan, and Marchionini (2006) emphasise the importance of factors such as "the evolution of the information need, the dynamic nature of relevance judgments, as well as the personality, background, knowledge and preferences of the searcher" (p. 59).

Hence, the work done by Marchionini (2006), White, Muresan, and Marchionini (2006), and White and Roth (2009) provide with a background to understand sophisticated user behaviours so called 'power users' and their expectations from e-book platforms.

2.7.3.2 User Interface Individualisation

Sundar and Marathe (2010) argue that the requirements of power users and non-power users are different and two individualisation features in user interface design are

extremely important, *personalisation* and *customisation*, with regard to digital media in general and web-based services in particular. Sundar and Marathe further claim that "theoretical knowledge of the psychological appeal of customisation, however, is still in its nascent stages" and that "insufficient attention has been paid to the process of customization" (p. 299). They argue that tailoring content on websites is now even more popular and important if companies aim to satisfy all of their users and digital media have made it extremely simple. They assert that customisation is more involving and empowering as it offers more active role for the user in ensuring personal relevance and utility of mediated content. Greater customisation breeds more positive attitudes toward portals. Greater interactivity engenders more involvement, greater attention, and intimate contact of user with closer scrutiny of content. They maintain that self-as-source (agency) will motivate greater engagement with content cognitively and reflect users' identity affectively. Ultimately, this would increase users' attention to content, thus amplifying their experience with it and its effects.

Sundar and Marathe (2010) further compare personalisation and customisation and their characteristics (Table 2.3). Thus the work of Sundar and Marathe is instructive in terms of features that might enhance user satisfaction with e-books and delivery systems.

Table 2.3. User Interface Individualisation (Sundar & Marathe, 2010, pp. 298-304)

Personalisation	**Customisation**
• The degree to which the content is tailored by the system to individual needs and tastes. • Most of these services are automatic and hence require little or no direct involvement by the user. • The systems are designed to tailor content for different sets of users based on information request, and use patterns. • Users have a relatively passive role in personalisation, and the content is filtered for them. • Change in the functionality, interface, information content, or distinctiveness of a system to increase its relevance to an individual user. • Automatic personalisation systems gather user browsing behaviour data overtly by directly asking users for some pieces of information and/or covertly by observing user behaviour by placing cookies in browsers. • Adapting Web content and layout to deliver the right content to the right person in the right format at the right time. • Most non-power users use only the default features without ever exploring all the possible options.	• The degree to which the system allows users to tailor the content themselves to their needs and tastes. • Users are able to shape the nature and course of content they consume. • User deliberately tailors content by choosing options and/or creating new content. Users actively dictate the information on the site or explicitly selects between certain options. • High priority to user control and involvement, and placing users in the driver's seat. • Enhances status, utility, and functioning allowing communication receivers to serve as communication sources. • Customised offerings can be gratifying especially in the web world which is known for its concerns of information explosion and overload. • Web 2.0 and newer media offer tools that allow users to customise their information world, ranging from simple font or colour change to more advanced modifications. • Many power users use interface features such as customisation to their fullest extent.

2.7.4 Academic E-book Power User

User interface individualisation assumes that matching of system features to user groups i.e. the capability of user profiling. While profiling may be more sophisticated, the notion of power and non-power users is widely used in end user computing. Applying this concept to the e-book phenomenon, what are the attributes of power versus non-power use and how can such users be identified for the purposes of individualisation?

The topic of exactly what constitutes a power user (PU) or super user (JISC, 2009; Nicholas et al., 2010) of e-books is poorly explored in the academic e-book adoption literature. Using typology of four types of ideal users from Rainie and Jones, Borchert et al. (2009, p. 12) on the basis of simple measurement and speculation describe four categories of academic e-book users – browsers (experimenters), learners/lurkers (newcomers), satisfied users (netizens), and efficient users (utilitarians). Academic e-book researchers have also viewed sophisticated e-book users from different perspectives, for example, highest users (Levine-Clark, 2007), heaviest users (Folb, Wessel, & Czechowski, 2011; Nicholas et al.; Posigha, 2012), and most enthusiastic users (Posigha), with simple measurement.

JISC (2009) refers to an e-book 'super (power) user' as "someone who had looked at five or more e-books within the four weeks leading into CIBER's user surveys" (p. 24). Out of 8,800 university students who were surveyed, 1,540 (17.5%) were super (power) users who fulfilled the above criterion. The behavioural traits of JISC super users based on 26 e-textbooks on media, engineering, business, and management made available online by JISC to 127 UK universities from 2007 to 2009 via the MyiLibrary platform are as follows (pp. 6 & 24).

- early adopters of e-books,
- more mature than most students, typically 22-35,
- more likely to be male,
- most likely in business or engineering courses,
- much more likely to get their e-book readings from university library,
- extensive readers of wide ranging titles in longer sessions, likely to be more than 20 minutes each session, consuming whole JISC e-books or several chapters,

- navigators of e-books proactively via library web pages,
- focused, serious, and highly dependent on the valued e-content,
- highly satisfied with library provision of print books as well, and
- frequent, almost daily users of both formats.

JISC (2009) further asserts that since super users are likely to be early adopters of e-books identifying and understanding them is important for inviting their participation in beta testing new offerings and providing candid feedback.

Ahmad and Brogan (2012) conceptualise an academic e-book power user (PU) whose pattern of use describes intensity very different from the average or median user. They further characterise a PU as "...the user who prefers e-books as an information source, manifests exploratory behaviour, converts titles browsed to titles read and explores collections independently of embedded links" (p. 204). The authors claimed validation of this concept of a power user in a quantitative study of intensive EBL platform users using the criterion/formula (mean + 2 standard deviations above the mean) of the total aggregated minutes spent by all users in one year to construct a candidate sample. The study was novel in as much as the broader information systems literature on power use defaults to discussion of downloads and viewings and analysis based on self-reported behaviour rather than interpretation of transactions involving information behaviour constructs such as navigation, browsing, discovery, knowledge acquisition and engagement. In their further exploration, Ahmad, Brogan, and Johnstone (2014) profile power and non-power user behaviours using a predictive equation.

As the above discussion suggests, power user behaviour can also be viewed within domain-specific theories of Information Behaviour (IB). For example, Wilson (1999, p. 252)[8] also adopted Ellis' 1987 ideas of search behaviours to form a model of information-seeking behaviour in which the act of seeking information to answer a specific query and information searching described searcher interaction with systems

[8] Vide Section 2.5.6.1 for Wilson's (1999, 2000) work on IB.

used to satisfy searcher information needs. It is in these domains that transaction logs can be informative. For example, the clicking of an embedded courseware link to an e-book is an act of chaining within the meaning of Wilson's model adopted from Ellis. A transaction log might identify the requestor URL providing the basis of insight. Drilling down, the use of a discovery tool or library catalogue to identify e-books involves user interaction with an IR system, an example of search behaviour.

Keeping in view Wilson's (2000) work and reiterating the ECT framework a user feels satisfied if the product or outcome meets or exceeds his/her perceived expectation- the phenomenon manifested in the form of read titles for longer hours across different sessions. Dissatisfaction may either lead to leaving or reiterating the search process, for example, an average user may abandon after browsing one or fewer titles but power user behaviour may manifest browsing multiple titles and finding a considerable number of unique titles for reading. Wilson's work also elaborates the context of an information need. To understand e-book user behaviour such as view and abandonment, skimming and reading, additional evidence is required of factors that shape IB such as culture of use (Park, 2007; Wood & Philips, 2011), engagement (O'Brien & Toms, 2008; Shin, 2011; Zhou, 2011) expectation confirmation (Bhattacherjee, 2001; Shin, 2011; Zhou, 2011) usability, and accessibility (CIBER, 2008; Huthwaite et al., 2011). Wilson's (1999) earlier 1980s work on information behaviour did not attempt to rank behaviour. A researcher must look elsewhere for thinking about taxonomic ranking of behaviours providing a basis for discrimination between 'power' and 'non-power' use.

Clearly, there are problems with a notion of power use that does not account for more advanced information behaviour. Titles viewed or time spent in reading can be unreliable indicators of engagement, if all or most activity is generated from chaining via embedded links. A domain appropriate concept of power use, therefore, needs to encompass other attributes of use more closely identified with learning, knowledge acquisition and information literacy. According to Marchionini (2006), exploratory search encompasses activities involving learning and investigation, making it different from lookup, which typically entails fact finding only. Marchionini's idea of exploratory searching describes several higher order cognitive processes or power behaviours evidence of which might be found in e-book transaction logs including:

- Investigative searching involving multiple iterations and activities such as analysis, synthesis and evaluation- manifested in transaction logs by unique titles viewed, sessions, session duration, hours spent reading and viewing;
- Investigative searching involving serendipitous browsing- manifested in transaction logs by unique titles viewed and/or read; and
- Exploratory searching done with the objective of learning – evidence in transaction logs through session duration and conversions of titles browsed to titles read.

Other researchers (e.g. O'Brien & Toms, 2008; Sundar & Marathe, 2010; White, Muresan, & Marchionini, 2006; White & Roth, 2009) provide a further confirmation of power users' advanced behaviour generally that needs to be explored in e-book context.

2.8 Summary of Literature Review

2.8.1 Toward Granular Understanding of E-book Users: Identifying and Using Cohorts to Improve Satisfaction

Review of the literature on adoption revealed mixed reactions from users to ARL e-book platforms (Brown, 2013). The literature review also revealed controversy over methods and measures for measuring successful outcomes. Tenopir's (2010) focus on user satisfaction and task fulfilment suggests the logic of investigating cohorts within the e-book population defined by information behaviour. Sundar and Marathe (2010) are concerned with the role of customisation and personalisation as sources of user satisfaction with online services. Specifically, they argue that the requirements of power users and non-power users are different and two individualisation features in user interface design are extremely important, *personalisation* and *customisation*.[9] An outcome from the review is the need to investigate *cohorts* of adoption as a pattern of e-book use and how such cohorts might be reliably identified for the purposes of

[9] Vide Section 2.7.3.2.

customisation. The review identified and discussed the information behaviour styles of power and non-power users as cohort within a population of e-book users (Borchert et al., 2009; Folb, Wessel, & Czechowski, 2011; JISC, 2009; Levine-Clark, 2007; Nicholas et al., 2010; Posigha, 2012).

2.8.2 Role of Broader Discourse on Technology Adoption

This chapter also revealed other gaps in the literature on e-book adoption in ARLs. Specifically, there is a lack of theory-driven research on adoption and use that takes into account non-domain theories of technology adoption. As Section 2.5 showed TAM, UGT, ECT and IDT theories from the broader discourse on technology adoption, have potential applicability to understanding patterns of e-book adoption and use. Letchumanan and Tarmizi (2011b) argue that a gap exists in the research-oriented literature since "very few studies have investigated TAM as a model to explain the acceptance of the e-books" (p. 517).

In the spirit of positivist investigation, many e-book researchers derive conclusions about patterns of behaviour, length of sessions, downloading, the subjects/titles viewed, barriers, and drivers. However, frameworks or models that assist in understanding adoption outcomes are not strongly represented in the e-book literature. Borchert et al. (2009), with reference to e-book adoption in academic and research libraries in general and the Australian context in particular, conclude that "it is interesting that there appears to be as yet no theoretical framework in the literature to inform or summarise analysis" (p. 5). This research will aim to address this deficiency through exploration of the role of technology acceptance theory, and also explore how the domain theory of Information Behaviour can be used to understand e-book adoption and use (Marchionini, 2006; Spink & Heinstrom, 2011a; Wilson, 2000)

2.8.3 Measuring Outcomes and Role of DLA

Other conclusions from the Literature Review concern measurement and more user centric approaches to measuring adoption outcomes. In regards to measurement, the review has highlighted simple approaches in the literature to measuring adoption outcomes based on number of downloads and duration of views.[10] The literature is not in agreement about such an approach to the measurement of outcomes. Nicholas et al. (2008) argue that transaction logs and DLA are capable of delivering richer insight into acceptance and use than such simple metrics.[11] Various authors (e.g. Bhattacherjee, 2001; Shin, 2011; Tenopir, 2010; Zhou, 2011) take the view that user satisfaction, not metrics should drive discussion of measuring impact and success. This kind of view is consistent with elements of the technology acceptance theory such as UGT.[12] Taking Tenopir's (2010) points about user satisfaction and task fulfilment as loci of adoption outcome measurement, the review noted efforts to explore new datasets and user application of information and knowledge obtained from e-books. The emergence of citation analysis, a measurement technique, is an example of research based on richer exploration of information behaviour.

2.8.4 Significance of the Proposed E-book Research

The significance of the proposed e-book research is also clear from the literature review. E-books can be underutilised (Abdullah & Gibb, 2008a, 2008b; Borchert et al., 2009; Christianson & Aucoin, 2005; Nicholas et al., 2008; Rowlands et al., 2007; Slater, 2009). They also tend to be used for scanning (such as fact finding or reference use.) rather than deep learning (Nicholas, Rowlands, & Jamali, 2010). Typically such use involves a small proportion of e-books in sessions of very short duration (CIBER,

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[10] Vide Section 2.4.3.

[11] Vide Chapter Seven on power users.

[12] Vide Section 2.5.2.

2009b; JISC, 2009; Nicholas et al., 2007). The literature review has also shown many factors at work in the delivery of adoption outcomes, however, the value or weight to be placed on factor clusters or groups is unclear. The proposed research is expected to shed valuable light on the weight to be accorded to factors such as usability, utility and functionality. The review has also shown that measures of adoption outcomes are mostly electronic equivalents of traditional usage statistics and other measures are required, for sophisticated understanding of adoption outcomes.

2.8.5 Research Design

The literature also revealed various approaches to research design. Abdullah and Gibb (2008a) and Nicholas et al. (2010) emphasise the need for multiple methods, if superficial and shallow perspectives are to be avoided. As Nicholas et al. assert DLA has also been used to frame questions to be asked in follow-up questionnaire with aim of exploring the underlying meaning of observations derived from the analysis of log data in this research. The literature is supportive of a more expansive view of data gathering. According to Moore, MacCreery, and Marlow (n.d.), the relevance of a particular text in an electronic delivery platform must be considered in context on the behaviours that it drives, not merely measured on how often it is accessed or how much time a patron spends reading it.

2.8.6 Conclusion

Rigorous e-book research aims to explore underlying explanations of patterns of observed behaviour. The technology adoption literature also suggests the logical place to begin is with the focal relationship between users and engagement (see Figure 4.2) since what matters most in successful adoption is continuance or repeat behaviour following acceptance. As the baseline models show (Figures 2.6 and 2.7), this relationship is formed and strengthened by independent, antecedent, dependent, control, intervening, and consequent variables. Figure 4.3 explains these variables and relationships. The baseline models, based as they are on the main technology adoption and IB models and frameworks, provides a holistic explanation of the role of utility, usability, expectation confirmation, facilitating conditions, culture of use, gratification, intimacy, familiarity and hedonic attributes on user acceptance and engagement within a

holistic model. Anchored in the research-oriented literature, the model provides a foundation based on current theories and thinking about technology adoption and IB.

Case study from the review shows mixed success in e-book adoption based on commodity ARL platform solutions such as EBL and Ebrary. The potential for the information systems idea of customisation and personalisation to be applied to cohorts of users with gains in terms of satisfaction and task fulfilment is worth of investigation forming a gap in the current literature.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explores research paradigms, approaches, methods, and techniques and explains why they are appropriate for this study. It identifies variables impacting on the research questions and their inter-relationships and the theoretical and philosophical assumptions underpinning the study.

In order to make a clear distinction between paradigm, method, approach, and technique, these terms are defined here for the purposes of the study.

- Research paradigm: "An overall logic of inquiry – including a set of assumptions or a paradigm as a foundation for (the selection of) research methods and techniques and the way they are used to make knowledge claims," for example, positivism, interpretivism (Cecez-Kecmanovic & Kennan, 2013, pp. 115 & 133).
- Research approach: Often divided as quantitative and qualitative (Sutharshan, 2013) is mainly concerned with the nature and treatment of data, for example, statistical data (numeric) vs. non-statistical data (words/text, images).
- Research Method: "A much narrower concept that defines processes, procedures and techniques to conduct empirical studies and collect and analyse data," for example, experiment, case study, survey (Cecez-Kecmanovic & Kennan, 2013, pp. 115 & 133).
- Research Technique: "A procedure or tool for undertaking research processes" (Williamson & Johanson, 2013, p. 509), for example, questionnaire, interviews (Cecez-Kecmanovic & Kennan, 2013, p. 133).

Further development of this chapter is sequentially based on the selection of research paradigm, approach, methods, and techniques with regard to the domain and research context of the study.

3.2 Study Domain

The purpose of this study is to explore e-book adoption outcomes in Academic and Research Libraries (ARLs) through examining scholarly usage patterns of e-books by academics and students. The study aims to explore underlying explanations of patterns observed in e-book use, user attitudes, and perceptions, providing insight into frameworks and models that are predictive in terms of adoption outcomes.

Cognitive foundations of the study draw upon *technology adoption*[13] and *information behaviour*[14] research. Technology adoption frameworks encompass factors (e.g. utility, usability, satisfaction, engagement) involved in adopting new technology by the users.[15] Information Behaviour is "the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use" (Wilson, 2000, p. 49).

3.3 The Research Context of the Study

Selecting a research methodology comes after the researcher has identified the research problem, identified or built a theory, and formulated a hypothesis, where appropriate, and/or research question(s) (Connaway & Powell, 2010). The purpose of the research,[16] research questions,[17] and theoretical framework[18] are discussed in Chapters One and Two. Within the context of e-book adoption in ARLs, the research questions addressed in this study are:

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[13] Vide Sections 2.5.1 to 2.5.4 for the explanation of technology adoption frameworks.

[14] Vide Section 2.5.6 for the explanation of information behaviour frameworks.

[15] Vide an exploratory model, inclusive of technology adoption explanations as Figure 2.7.

[16] Vide Section 1.3 for the explanation of purpose of this research.

[17] Vide Section 1.5 for the explanation of research questions.

[18] Vide Section 2.5 for the explanation of technology adoption and information behaviour frameworks.

RQ1. What patterns of e-book use exist in the case study academic and research library?

RQ2. How can these patterns of e-book use be understood?

RQ3. Are use and behaviour consistent with the major models of technology adoption?

RQ4. What intervening or control variables significantly affect use and behavior?

The research questions reveal that this study is both exploratory and explanatory in nature. Since the state and success of e-book adoption and user acceptance is not universal (Brown, 2013; Catalano, 2013; Kim, 2006; Safley, 2006), the RQs are appropriate. As discussed in the Literature Review, Chapter Two, there is a modest evidence of comprehensiveness in existing research (Al, Soydal, & Tonta 2010; Moore, MacCreery, & Marlow, n.d) in terms of interactional effects of different variables (Shin, 2011) especially in an Australian context (D'Ambra & Wilson, 2012; Kumbhar, 2013).

3.4 Research Paradigm

Three research paradigms widely used in information systems research are *positivism*, *interpretivism* and *critical theory* (Cecez-Kecmanovic & Kennan, 2013; Hjorland, 2005).

- The positivist paradigm, also called traditional or scientific research, is based on objectivist or realist assumptions, and uses empirically testable hypothetic-deductive logic dominantly with quantitative approaches and instrumental research techniques. The reason is to discover causal laws to explain, predict, and control events and processes (Cecez-Kecmanovic & Kennan, 2013).
- Interpretive paradigm, which is based on subjectivist and relativist assumptions, uses hypothetic-inductive logic dominantly with practical, qualitative research methods to describe and understand phenomena in the social world and their contextual meaning (Cecez-Kecmanovic & Kennan, 2013).
- Critical paradigm exceeds the objective-subjectivist dichotomy and assumes reality is socially constructed but perceived as objectively existing. Critical

researchers take a dialectical approach and use not only deductive or inductive but also abductive logic (Cecez-Kecmanovic & Kennan, 2013).

Such paradigms are also called philosophies or traditions (Williamson, 2013a). The research questions addressed and the theoretical (technology adoption and information behaviour) frameworks to be explored guide the researcher in the selection of appropriate research paradigm.

There are many different terms found in the discussion of positivism paradigm, for example, objectivity, realism, empiricism, deductive logic/reasoning, quantitative, and measurement:

- Objectivity is "Judgment based on observable phenomena and uninfluenced by emotions or personal prejudices [of researcher]" (WordWeb, 'objectivity').
- Realism is a "belief that the "real world" exists independently of humans and their interpretations of it" (Neuman, cited in Williamson & Johanson, 2013, p. 507). Also "person (researcher) and reality are separate" (Hjorland, 2005, p. 140).
- Empiricism: "is the view that experiences, observations or sense data are the only or the most important way of acquiring knowledge" (Hjorland, 2005, p. 130).
- Deductive logic/reasoning "begins with a generalisation and then moves to inferences about particular circumstances" (Williamson & Johanson, 2013, p. 503).
- Quantitative refers to quantity "the amount of something that can be measured, weighted, counted, etc, or a fixed amount or number" (Cambridge International Dictionary of English, 1995, p. 1158) or something that is "expressible as a quantity or relating to or susceptible of measurement" (WordWeb, 'quantitative').
- "Measurement is the "act or process of assigning numbers to phenomena according to a rule" (WordWeb, 'measurement').

The aim of positivist research is to confirm or reject research hypotheses using general to specific, top-down (deductive) logic (i.e. theory – hypotheses – data - confirmation).

Specific research questions (or expressed as hypotheses) are precisely defined before empirical research starts for a positivist, deductive research (Cecez-Kecmanovic & Kennan, 2013).

Since an aim of this study is to apply general frameworks (theories of technology acceptance and information behaviour) as an aid to understanding instances of user behaviour recorded as transactions in datasets, leading to deductions about the consistency and adequacy of such frameworks, the positivist paradigm is clearly suggested. Further since the study has been granted access to e-book transaction *data* that reliably describe *real* user *information behaviour* consisting mostly of numeric data, positivism presents as the best option for working with this data.

There are limits however to what can be achieved with data describing real behaviour. For example, dimensions of user psychology and technology acceptance are not captured in these datasets. Thus to answer RQ2-RQ4 further iteration of the research design is required involving potentially positivist or interpretivist paradigms. While this will be discussed later, it is worth noting that research of user attitudes, culture of use, expectations, gratifications and the many other sub theories of technology acceptance, lend themselves to the use of scales within the positivist paradigm.

3.5 Research Approach

Research approaches, often divided into two as quantitative and qualitative, are linked to research methodologies (Sutharshan, 2013). Cecez-Kecmanovic and Kennan (2013) argue that research methods may be quantitative or qualitative.

- Quantitative research involves "a problem-solving approach that is highly structured in nature and that relies on the quantification of concepts, where possible, for purposes of measurement and evaluation" (Glazier & Powell, cited in Connaway & Powell, 2010, p. 2).
- Qualitative research focuses on "observing events from the perspective of those involved and attempt to understand why individuals behave as they do" (Connaway & Powell, 2010, p. 2).

While quantitative approaches with positivism predominate, this is not inevitable. Table 3.1 compares both the quantitative and qualitative approaches (Cecez-Kecmanovic & Kennan, 2013, pp. 120-121; Cook & Reichardt, cited in Sutharshan, 2013, p. 90; Weber, cited in Hjorland, 2005, p. 140).

Table 3.1. Quantitative versus Qualitative Research

Assumption	**Quantitative Research**	**Qualitative Research**
Paradigm	Positivist	Interpretivist
Ontology	Static: Researcher and reality are separate	Dynamic: Researcher and reality are inseparable
Epistemology/ object	Objective	Subjective
Data/Method	Numerical/Statistics	Non-numerical/Hermeneutics, phenomenology, etc.
Validity	Certainty: data truly measure reality	Defensible knowledge claims
Reliability	Replicability: research results can be reproduced	Interpretive awareness: researchers recognise and address implications of their subjectivity
Logic	Deductive	Inductive
Orientation	Outcome	Process
View	Natural science	Anthropological
Control	Attempted control of variables	Relative lack of control
Nature	Confirmatory	Explanatory

Consistent with the criterion of the selected paradigm (positivism), this study follows a quantitative approach for the following reasons:

- Firstly, this study utilises e-book transaction log files which consist mainly of scale data (describing information behaviour such as downloads, sessions and minutes browsed/read). The approach of best fit to such data is quantitative. Further, Connaway and Powell (2010) citing Hider and Pymm assert that “the

largely quantitative technique of transaction log analysis has grown rapidly to become a major instrument" (p. 4).

- Secondly, to achieve fuller understanding of technology adoption in a population of academics and students, a survey of e-book user demographics, attitudes and culture of use is proposed, aimed at explaining analysis outcomes from transaction log analysis. Since such investigation lends itself to survey and operationalisation of variables with categorical scales, once again a quantitative approach is suggested. Connaway and Powell (2010) citing Liebscher assert that "quantitative research is appropriate where quantifiable measures of variables of interest are possible, where hypotheses can be formulated and tested, and inferences drawn from samples to populations" (p. 77).

3.6 Research Methods

Cecez-Kecmanovic and Kennan (2013) argue that research methods are not directly linked to research paradigms but are more or less affiliated with them. According to Galliers (1991) what is at issue with the research method is the object of the research itself (vide Table 3.2). His taxonomy of information systems research methods described in Table 3.2 links objects to modes of scientific (positivist) and interpretivist research. Applying Galliers, *case study* and *survey* are two research methods displaying good fit to scientific research with an organisational object. These methods can also be used for theory building and testing, for example, testing the relevance of technology acceptance theory to adoption outcomes.

Table 3.2. Taxonomy of Information Systems Research Approaches (Galliers, 1991, p. 339)

	Modes for Scientific Research							**Modes for Interpretivist Research**			
Object	**Theorem proof**	**Laboratory experiment**	**Field experiment**	**Case study**	**Survey**	**Fore-casting**	**Simulation**	**Futures research**	**Role/game playing**	**Subjective/ argumentative**	**Descriptive/ Interpretive (inc. Reviews)**
Society	No	No	Possibly	Possibly	Yes	Yes	Possibly	Yes	Possibly	Yes	Yes
Organisation/ group	No	Possibly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual	No	Yes	Yes	Possibly	Possibly	Possibly	Yes	Possibly	Yes	Yes	Yes
Technology	Yes	Yes	Yes	No	Possibly	Yes	Yes	Yes	Yes	Possibly	Possibly
Methodology	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Theory building	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Theory testing	Yes	Yes	Yes	Possibly	Possibly	No	Possibly	No	Possibly	No	Possibly
Theory extension	Possibly	Possibly	Possibly	Possibly	Possibly	No	No	No	No	No	Possibly

3.6.1 Independent Case Study

Appropriate research methods, consistent with the criteria of research paradigm and research approach, selected from Galliers' taxonomy are highlighted in Table 3.2. Can case study research be positivist as Galliers (1991) implies? Despite the traditionally qualitative spirit of case study research, quantitative data can also be used with case study (Eriksson & Kovalainen, 2008). Myers (2013) also thinks so. He argues by quoting Yin and Walsham that "case study research can be positivist" (p. 2). Moreover, according to Myers (p. 3), the term 'case study' in this research is used as a unit of analysis, i.e. a case study of a particular organisation. Further explanations of the selected modes/methods (independent case study, system-generated datasets, and survey) follow.

As this study proposes to employ more than one method (case study, survey, and log analysis) it may be said to involve 'mixed' methods. Creswell (2009), and Gorman and Clayton (2005) favour mixed methods, because confining an investigation to particular investigative method does not yield the fullest understanding of a phenomenon. They argue that in mixed methods the researcher is able to address different aspects of the same research question, thereby extending the breadth of the project. Gorman and Clayton further assert that this improves the quality of the research; obviously, "conclusions are more likely to be correct, and accepted as such" and the "research is able to compensate for inherent weaknesses" in each method (pp. 12-13). The study might also be considered to be an example of triangulation. According to Eriksson and Kovalainen (2008), triangulation in data collection and analysis means that findings generated with certain methods and techniques (e.g. system-generated datasets – deep log analysis) are crosschecked and validated with another (e.g. survey – questionnaire) and as such it can be regarded as an example of 'independent case study'.

3.6.1.1 System-generated Datasets: Role and Limitations of Transaction Log Analysis

The need for a mixed methods approach to studying e-book adoption behaviour can also be understood in terms of the nature and analysis limitations of this study's primary data

set – e-book system-generated datasets. E-book system-generated datasets are automatically generated web server log records of e-book transactions.

Raw transactional datasets in the form of server log files describe users' digital behaviour regarding information seeking and reading, and usage of e-books. System-generated datasets utilised for the study have advantages such as they avoid sampling biases and errors as virtually everyone and everything is recorded automatically (Nicholas et al., 2010). In this study two databases of log transactions are used -- Ebook Library (EBL) and Ebrary. Both the platforms generate COUNTER-compliant usage reports. Project COUNTER (Counting Online Use of Networked Electronic Resources), launched in 2002, is a UK-based international initiative serving librarians, publishers, and intermediaries (COUNTER, 2013). This collaboration sets the standards that facilitate the recording and reporting of online use statistics in a consistent, credible, and compatible way. EBL and Ebrary record each and every e-book transaction as and when it happened. The following log extract, describes a transaction record for the EBL and Ebrary platforms respectively:

***EBL*:**

Usage Date, Time, Title, Print13, eISBN13, Item Type, Minutes, User ID, Publisher

***Ebrary*:**

Title, Publisher, Platform, ISBN, ISSN, Month & Year, YTD Total

Usage date is the date when a user accesses that book/title. Print13/eISBN13/ISBN/ISSN are the unique international standard numbers assigned to books and serials. Item type shows the ownership of the book either by library or supplier. YTD (year to date) total refers to the total number of section requests (accesses) of a particular book/title in one calendar year, 1st January to 31st December. The remaining labels are self-explanatory. However, the usage data somewhat vary in detail at both the platforms. For example, Ebrary does not record user ID and duration of usage.

System-generated datasets are useful to find answers of *what* and *how* much (sometimes when, how many, by whom) type of questions but they cannot answer questions such as *why* and *how,* for example, why users use/do not use e-books and how users perceive their e-book experience (Connaway & Snyder, 2005). Blecic, Fiscella, and Wiberley (2007) suggest advances in electronic resource usage measures to describe use meaningfully, especially measures of sessions and searches. Abdullah and Gibb (2008a, p. 2) acknowledge the limitations of summary data extracted from system-generated datasets:

> "The [e-book] providers normally supply [usage] reports to monitor overall e-book usage which are useful for collection development and circulation purposes. These reports however provide only shallow information on e-book access which is usually limited to reports on which e-book have been accessed based on the subject discipline, rather than how users actually interact with an e-book (i.e. browsing, or in-depth reading), although some providers supply reports on the duration readers use a specific e-book. As a result, assumptions are often made about features which readers find useful when viewing or consulting e-books. The reports are also not in a standard format and differ from provider to provider. It is, therefore, difficult to make comparisons."

Therefore, log analysis must be supplemented by other methods, for example, surveys (Cox, 2008; Lamothe, 2010; Nicholas et al., 2010).

3.6.2 Survey

Consistent with Galliers (1991) taxonomy, survey suggests as a 'good fit' method for discovery of the why and how of e-book use. Survey means "to look at or to see over or beyond or to observe" (Connaway & Powell, 2010, p. 107). Reitz defines survey as "a scientifically conducted study, or account of a study, in which data is systematically collected from a selected group of sources or informants, usually concerning general

conditions, practices, habits, preferences, etc" (2014c, survey, para. 1). Keeping in view ECU's large population and dispersion[19] survey method also suggests as a 'good fit' because it is generally considered to be more appropriate for studying personal/behavioural factors and their relationships (Connaway & Powell). Further, Baily (2006) argues that "purpose of [e-book] use, or why the patron is using a certain title, can only be provided through the use of surveys, something out of scope of much of the current literature" (p. 57) and "... user surveys might give a better indication of how the electronic collection is being used" (p. 59). Descriptive survey is appropriate for gathering quantitative data to be analysed statistically. Connaway and Powell citing Leedy argue that descriptive survey method is "appropriate for data that are quantitative in nature and that need statistical assistance to extract their meaning" (p. 109).

Lamothe (2010) argues that "the use of a survey would supplement the quantitative [log] data in a more direct and unambiguous manner" (p. 15). Nicholas et al. (2010) assert the importance of surveys for getting a better, richer picture of e-book user behaviour in conjunction with system-generated datasets. Survey methods are helpful for exploring context, which is not accessible via system-generated datasets. Survey in this research will therefore be used to get a clearer picture of the why and how of e-book use, investigating parameters to do with technology, platforms, attitudes, expectations, culture of use and the many other factors suggested by the theoretical frameworks used. Lastly, Abdullah and Gibb (2008a) argue that well-constructed survey may reveal features of e-books that may be useful in designing more valuable and usable e-books.

3.7 Research Techniques

Consistent with the criteria of selected research paradigm, research approach, and research methods, research techniques are required for the study.

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[19] Section 4.2.2.1 explains ECU population and dispersion.

RQ1 and RQ2 involve the analysis and interpretation of system-generated datasets for which Deep Log Analysis (DLA) presents as a 'best fit' technique for this work. RQs are aimed at explicating patterns of use observed and additionally, survey method has been selected involving questionnaire technique. Each of these techniques is explained in this section.

3.7.1 Deep Log Analysis (DLA)

E-book suppliers maintain a real-time record of every transaction in automatically generated log files. Tracking and mapping the usage patterns and information seeking behaviour of the users is possible by analysing their "digital information footprints" and "when enhanced -- something we call deep log analysis (DLA), they can tell us something about the kinds of people that use the services" (Nicholas et al., 2005, p. 1445). With DLA, a data mining technique gaining currency for researching user interaction with online information environments, system-generated raw transactional datasets are analysed to provide analysis and interpretation of users' digital information seeking and reading behaviour (Ahmad & Brogan, 2012; CIBER, 2009b; JISC, 2009; Nicholas, Clark, Rowlands, & Jamali, 2009a). Nicholas et al. (2010) assert that "[log] data reflect what people actually do online not what they think they did, and not what they think they ought to say to a researcher" (p. 267). Data are therefore more reliable as a source of evidence of user behaviour, than data based on self-reporting or interview. Researchers who used this technique referred to it alternately as "deep log analysis (DLA)" (CIBER, 2009b; JISC, 2009; Nicholas et al., 2005, 2009a, 2010), "evidence-based methodology," "pebble in the pond experiment," and "watching and describing" (CIBER, 2009b), "data mining" and "process of reverse engineering" (Nicholas et al., 2009a) and "action research" (Nicholas et al., n.d.).

3.7.2 Questionnaire

A questionnaire can be thought of as "a form containing a set of questions, especially one addressed to a statistically significant number of subjects as a way of gathering information from a survey" (American Heritage Dictionary of the English Language, cited in Connaway & Powell, 2010, p. 146). Advantages claimed for the technique

(Connaway & Powell, pp. 146-147; Schwab, 2005, pp. 39-40; Williamson, 2013b, pp. 350-351) include.

- Efficiency- A large number of subjects can be targeted with online and email questionnaires facilitating the collection of large amounts of data in a relatively short period of time which is not possible with interviews and focus groups. The target audience can complete the questionnaire with greater flexibility as per their convenient time, space, and environment and without the presence of the researcher. This will encourages frank, well thought out, and accurate answers to measure their knowledge, attitudes, motivations, perceptions, preferences, abilities, evaluations, characteristics, intentions, interests, and opinions effectively.
- Standardisation- The format of the questionnaire may be set in a manner to eliminate variation in the questioning process. Questionnaires also facilitate flexibility to include close-ended structured or semi-structured questions. Similarly, different and varied types of scales can be used to help participants rate their answers precisely.
- Reduction in researcher bias -Self-reported questionnaires do not involve influence of researcher over respondents' answers thus reducing the likelihood of researcher bias.
- Instrument and construct availability. Instruments and constructs already defined by prior researchers (as in my case) minimise the issues (e.g. validity and reliability). Measures can be taken to check that the answers given by the participants are valid.

3.8 Summary

The purpose of this study is to investigate and explain patterns of e-book user behaviour in a case study academic library.

The research questions are described in Section 1.5. Table 3.3 summarises the mapping of research questions with the paradigm, approach, methods, and techniques selected rationally to answer these questions.

Table 3.3. Mapping of Research Questions

Research Question (RQ)	Paradigm	Approach	Method	Technique
RQ1	Positivist	Quantitative	Independent Case study (ICS); Survey	Deep log analysis (DLA); Questionnaire
RQ2	Positivist	Quantitative	ICS; Survey	DLA; Questionnaire
RQ3	Positivist	Quantitative	ICS; Survey	Questionnaire
RQ4	Positivist	Quantitative	ICS; Survey	Questionnaire

Choices made demonstrate 'good fit' not only with the RQs, but with properties of the evidential sources and population of users to which the researcher has access within the context of case study.

CHAPTER 4: RESEARCH DESIGN

In Chapter Three, the researcher outlined research paradigms, approaches, methods, and techniques and explained why and how they are appropriate for this study. This chapter (an extension of Chapter Three) describes research design, including an explanation of the variables that shape the study, data collection instrument and procedures, data analysis techniques, scope and limitations of the research design, and ethics clearance. Figure 4.1 presents a broader map of this study.

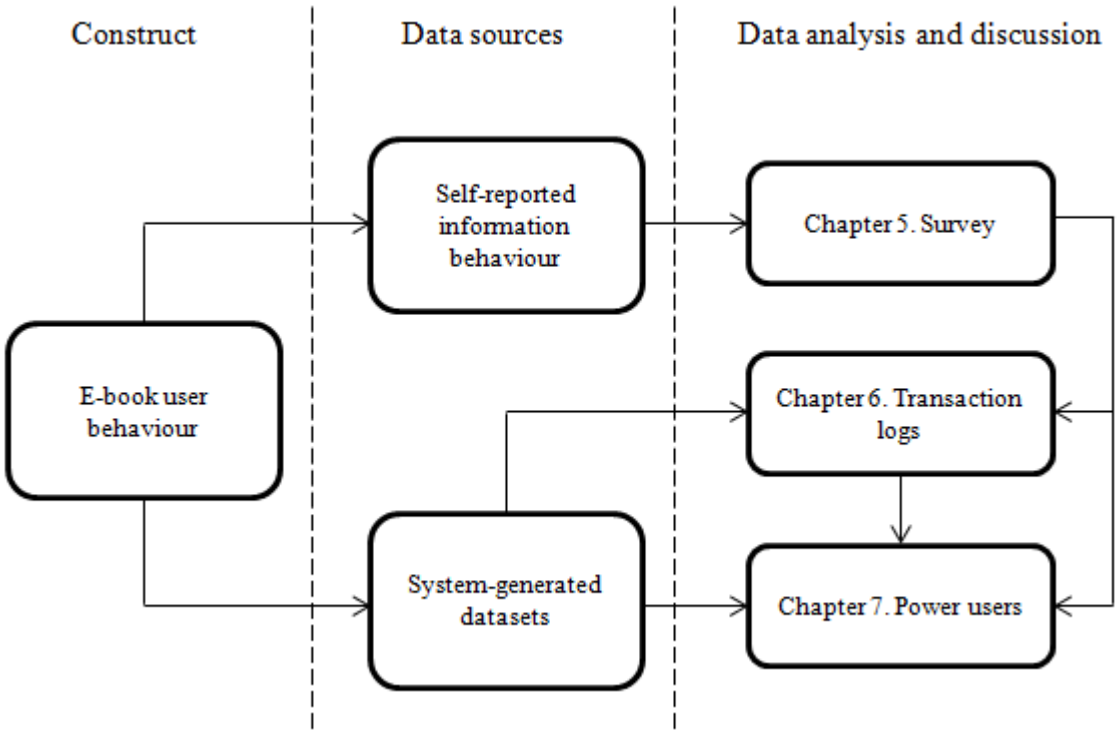

Figure 4.1. Map of research

4.1 Focal Relationship

This research aims to explore and explain patterns of e-book user behaviour in an academic and research library context, using technology adoption and information behaviour frameworks. The problem can be conceptualised in terms of a hypothesised focal relationship between control and other variables and e-book user behaviour. Figure 4.2 shows a general or generic model of independent, dependent, control,

antecedent, intervening, and consequent variables and the focal relationship between the independent variable and dependent variable.[20]

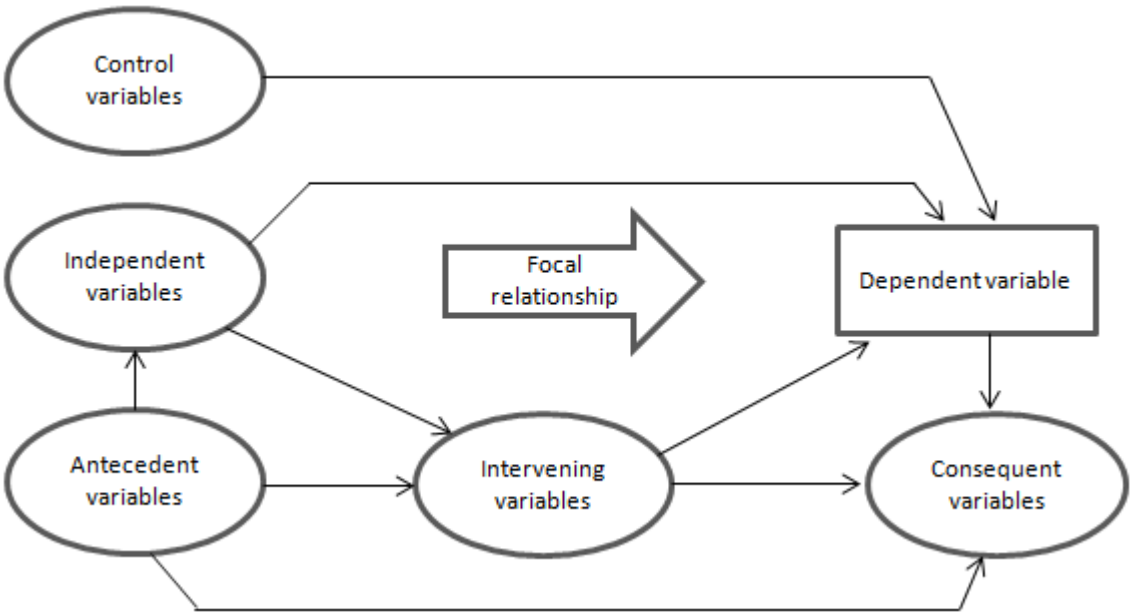

Figure 4.2. Generic model describing variables (adapted from Aneshensel, 2002, p. 13)

Figure 4.3 contextualises the generic model in terms of the e-book problem. The model is pluralistic in nature encompassing theories and models describing acceptance of technology and information behaviour in general and e-books in particular. Pluralism here refers to a diversity of views in lieu of a single interpretation or approach ("Pluralism," 2011). According to Eck (2006), pluralism is "the active seeking of understanding across lines of difference" (para. 3).

The focal relationship in figure 4.3 is the relationship between various kinds of variables in the problem domain that impact on e-book user behaviour and acceptance and engagement subject to testing.

[20] Vide Appendix A for definitions of terms used in this thesis.

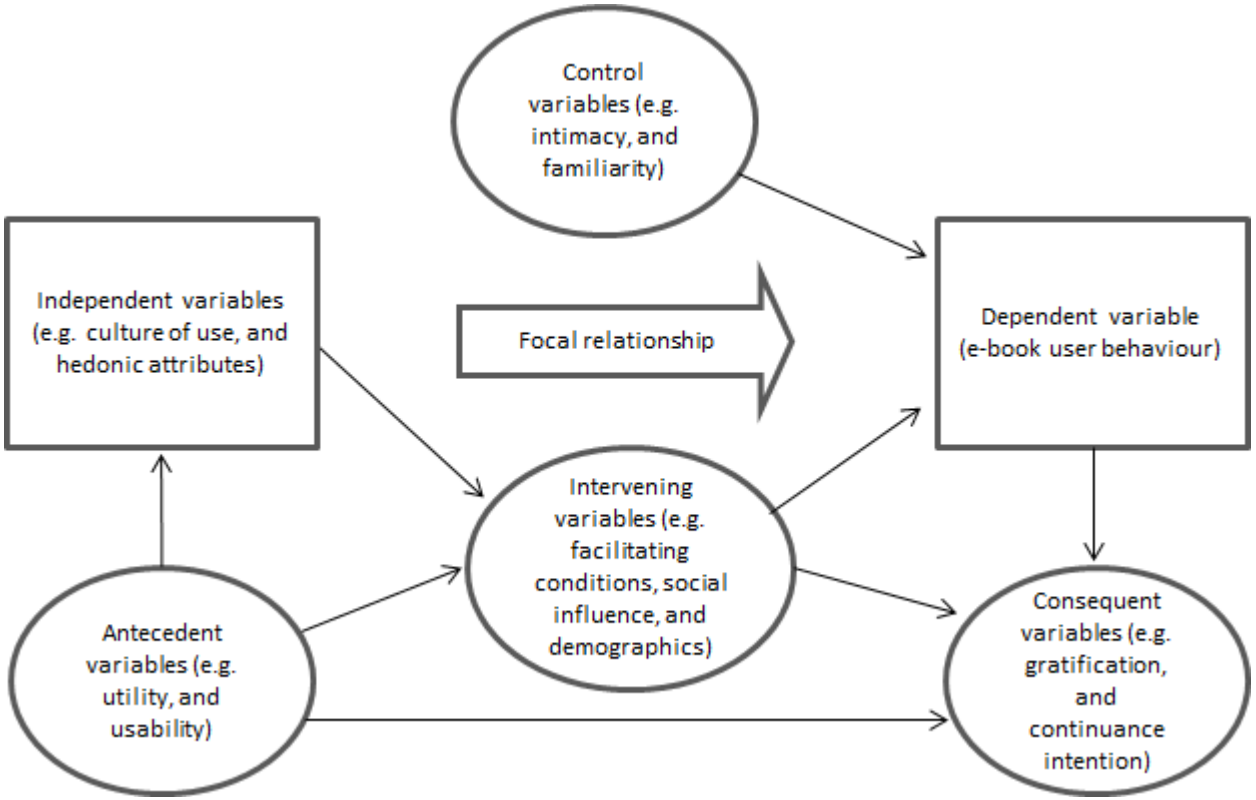

Figure 4.3. Unification of generic model (Figure 4.2) and baseline model (Figure 2.7)

4.2 Data Collection Procedures

This research investigates patterns of user behaviour with e-books in an academic library setting, i.e. Edith Cowan University (ECU) Library. Whilst planning had initially favoured multiple independent and international case study involving three participating libraries, two from Australia and one from Pakistan, ECU Library was the only library to respond favourably to the researcher's invitation to participate in the study. The perceived confidentiality of user data contained in logs was a significant impediment to data collection, even where the real identities of individuals could only be obtained by decryption. Reluctance by other ARLs to make datasets available necessarily reduced what was planned as a multiple independent, international case study, to a single entity study (see Section 4.4 for more details).

To investigate the research questions, two types of data are proposed to be collected, system-generated datasets and survey, in accordance with ECU regulations.[21]

4.2.1 System-generated Datasets

System-generated datasets, the target of Deep Log Analysis (DLA) are to be sourced with the co-operation of ECU Library management. The cooperation of ECU Library in the research is subject to an approved ethics application, describing protocols for data privacy, use and retention.[22] E-book usage log data (delivered in spreadsheet .xlsx format) sourced in this way comprise transaction records for the Ebook Library (EBL) and Ebrary platforms. The data provided is longitudinal in nature comprising EBL data for the years 2010, 2011 and 2012 and Ebrary data for 2011 and 2012. The usage data of print books for a *comprehensive comparison* with e-books were not available from the ECU Library.

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[21] Vide Section 4.5 at the end of this chapter for a note on ethics clearance.

[22] Ibid.

4.2.2 Survey

The second type of data to be collected, survey data, is also the subject of an approved ethics application, describing protocols for data privacy, use and retention (Section 4.5). User surveys are common in library settings. Reitz defines a user survey as "a questionnaire administered to users of a library or library system to find out what brings them to the library, how they normally use the sources and services it provides, their subjective evaluation of the quality of their library experiences, and any suggestions for improvement (feedback)" (2014d, user survey, para. 1). Based on the literature review, theoretical framework, formulated model, and the DLA results, a semi-structured questionnaire was designed to obtain data from ECU academic and research library e-book users and non-users -- faculty, staff, and students. ECU population figures for 2012 (Edith Cowan University, 2013) were used to draw a sample size for the survey.

4.2.2.1 Target population

Table 4.1 describes the target population by subject category. These are the total figures inclusive of all categories of academic/general staff (permanent, temporary, casual, full-time, and part-time) based on full-time equivalency, and the students of all categories (full-time/part-time, male/female, on-campus/off-campus, onshore/offshore, domestic/international, all education levels, all four faculties and 16 schools, and all disciplines and courses) based on the number of persons, as at 23 January, 2013 (Edith Cowan University, 2013, pp. 142 & 148).

ECU maintains 16 schools under four faculties, (1) Faculty of Health, Engineering, and Science (FHES), (2) Faculty of Education and Arts (FEA), (3) Faculty of Business and Law (FBL), and (4) Faculty of Regional Professional Studies (FRPS), located at three campuses, Mount Lawley, Joondalup, and Bunbury.

Table 4.1. ECU Population 2012

Category	**Number**	**%**
Academic staff	752	2.96
General staff	1,137	4.48
Students	23,515	92.56
Total	**25,404**	**100**

The dispersion of ECU's student population across other binary demographic factors is given in Table 4.2 (Edith Cowan University, 2013, pp. 142-143).

Table 4.2. ECU Student Demographics 2012 (N = 23,515)

Demographic Factor	**# of Students**	**%**
A. Enrolment		
Full-time	17,646	75
Part-time	5,869	25
B. Gender		
Female	14,541	62
Male	8,974	38
C. Programme		
Undergraduate	18,568	79
Graduate/Postgraduate	4,947	21
D. Type		
Domestic	19,506	83
International	4,009	17
E. Location		
Onshore	22,188	94
Offshore	1,327	6

4.2.2.2 Design of the Survey Instrument

As shown in the general/generic and formulated models (Figures 4.2 and 4.3), and established in the baseline adoption models developed in the Literature Review (Section 2.6), the study involves independent, dependent, control, antecedent, intervening, and consequent variables that shape behaviour. Variables operationalise constructs presented in the baseline model (Figure 2.7) and are represented by survey items.

4.2.2.3 Scale Selection

The most widely used scaling in survey methodology in education and social science, the 5-point Likert-type scale (Barnette, 2010; Connaway & Powell, 2010) was selected for use in assessing respondents' attitude/perception, frequency, and satisfaction to different e-book dimensions. According to Williamson and Johanson (2013), a Likert scale "is a rating scale (usually five-point) frequently used in quantitative research, on which respondents are asked to rate their preferences or the frequencies of their activities (p. 506). Williamson (2013b) argues that opinion questions are often measured on a Likert scale for their provision of easy pre-coding. Moreover, unlike other scales, Likert-type scales, labels and points were selected for their easy understandability (Williamson) as well as for not being onerous to respondents (Barnette).

4.2.2.4 Construction of the Survey Instrument

The construction of the survey instrument, a semi-structured questionnaire, was influenced by multiple studies, mainly CIBER (2008) (later published as Jamali, Nicholas, & Rowlands, 2009), JISC (2009), Shin (2011), and Venkatesh et al. (2003). As Tanner (2013b, p. 143) suggests, a comprehensive review of the questionnaire was made under the guidance of peers ('face validity'), senior LIS faculty having PhD qualifications (mostly from Pakistan), ECU Library professionals and FHES statistician ('content validity'). Tips for a good questionnaire design given by Connaway and Powell (2010) and Williamson (2013b) were followed. For example, a comprehensive covering letter was used. The wording in the covering letter and questionnaire was kept very simple, concise and precise, and unambiguous. Crystal clear instructions were given in the beginning of every part of the questionnaire. Only the essential questions to

accomplish the objectives of the study were included. Questions were organised into related groups with logical sequencing and smooth transition. More than one construct in one item or double-barrelled question was avoided. Qualifiers were used where needed. Moreover, no more than 10 items were placed on one page. Multiple choices were offered, where applicable. Some of the questionnaire items were reversely worded for consistency (O'Brien & Toms, 2010; Sundar & Marathe, 2010). Then the survey was piloted using a convenience sample. A final, comprehensive review of the instrument was made by an experienced supervisory panel. Additionally, to minimise the ambiguity of syntax and semantics, the participants were advised to ask any question about any questionnaire item not understood. These precautionary measures minimised the possibility of respondents' answering the questions without exactly understanding their content.

4.2.2.5 Parts of the Survey Instrument

As designed, the instrument comprises eight parts. The first part comprises only two items used to determine e-book users and non-users including ECU and third party e-books. Part two is aimed at non-users and consists of multi-choice reasons for non-use of ECU e-books consistent with previous research (e.g. Armstrong & Lonsdale, 2009; CIBER, 2008; Content Complete and OnlyConnect Consultancy, 2009; Shelburne, 2009; Shin, 2011). Part three aligns with technology adoption, IB models, and other frameworks discussed in Chapter Two and consists of items of awareness and perception of ECU e-books with the option of skipping inapplicable items. Part four aligns with culture of use and assesses respondents' frequency of using electronic resources and platforms and e-book users' satisfaction level with e-book agents or use platforms. Part five comprises e-book users' rationale and methods of accessing e-books with multiple choices. Part six invites participants' open-ended comments and suggestions.

Part seven consists of demographic factors represented in the survey as moderating variables, including respondent category (academic/student/staff), gender (male/female), mode of student study (on-campus/off-campus or both/mixed mode), programme of student study (undergraduate, graduate/masters by coursework, honours/higher degree by research, and specified other), discipline/subject/major field

of study/work (coded in four categories), age (six ranges starting from 18-24 and ending at 61 or older), and number of year(s) studying/working at ECU (five categories starting from less than a year and ending with 10 or more years). Part or full-time status of students is operationalised as mode of study.

Demographic information is sought at the end to avoid psychological effects and bias in responses to other parts (Lee & Schuele, 2010). Finally, the survey seeks the participants' consent for matching of survey data with e-book usage log data, and a prize draw for participation.

4.2.2.6 Sample frame

The researcher concluded that it is not possible to go for census, i.e. to survey the whole ECU population of 25,404 (Table 4.1). Considering the distribution of ECU's population across different dimensions, the appropriate sampling techniques were selected so that the representativeness of each type of population segment could be ensured. First, the ECU total population (N = 25,404) was divided into clusters or groups, one cluster for one respondent category, making a total of three clusters based on three respondent categories, academics, staff, and students. Connaway and Powell (2010) recommend that cluster sampling may be used effectively when it is not possible or impractical to compile an exhaustive list (sample frame) of the elements of a total population for random sampling; it involves dividing a population into clusters or groups and then drawing a sample of those clusters (p. 102). Second, within clusters, non-probability sampling (convenience and voluntary/self-selection) was adopted for the study. Convenience and self-selection have been preferred to probabilistic sampling because of the low response rate problem commonly identified with probabilistic sampling (Williamson, 2013c).

4.2.2.7 Sample Size

Various experts, such as House, Weil, and McClure (cited in Hernon & Altman, 1998, p. 121) have suggested that a sample of at least 100 is acceptable for a small population, but for larger population it should preferably be between 300 and 400. However, the sample size according to clusters was determined scientifically. The determination of

sample size depends on three factors, confidence level, degree of precision, and degree of variability; by assuming a 95% confidence level, precision rate of ± 5% and the degree of variability D=0.05 (Israel, 2009). The following formula was used to determine the sample size of ECU population (academics, students, and staff) for the survey (Israel).

$$\text{Overall} \quad n = \frac{N}{1 + N\,(e)^2} = \frac{25{,}404}{1 + 25{,}404\,(.05)^2} = 394$$

Where 'N' is the population size of the research study and 'n' is the sample size to be taken and 'e' is the degree of precision in the above-mentioned formula. When this formula is applied to the clusters (Table 4.1) the following cluster sample size is obtained.

$$\text{Academics:} \quad n = \frac{N}{1 + N\,(e)^2} = \frac{753}{1 + 753\,(.05)^2} = 261$$

$$\text{Students:} \quad n = \frac{N}{1 + N\,(e)^2} = \frac{23{,}515}{1 + 23{,}515\,(.05)^2} = 393$$

$$\text{General staff:} \quad n = \frac{N}{1 + N\,(e)^2} = \frac{1{,}137}{1 + 1{,}137\,(.05)^2} = 296$$

4.2.2.8 Administration and Distribution

It was decided that the survey should be administered online, to allow for participation by distance education students. The web survey tool, Qualtrics, was selected to host the survey and for data collection. Participation in the survey was planned as voluntary, based on self-selection, in accordance with an ethics protocol for collection and data retention. The researcher could not require participation in accordance with ECU research protocols for projects of this kind. A convenience-based invitation to

individuals/groups to participate in the survey was planned to be distributed via in-person class visits, emails, Graduate Research School (GRS) listserv, handouts, and Blackboard announcements. This additional level of engagement proved subsequently productive in lifting the response rates. In employing a convenience/availability or accidental sampling technique, the researcher selects those cases that are at hand, whereas, a self-selected or volunteer sample is a group of people who have essentially selected/volunteered themselves for inclusion in a study against notice or invitation (Connaway & Powell, 2010, pp. 94-96).

Another tactic widely used to get a better response rate, is to offer incentives to respondents. An incentive of two cash prizes worth AU$50 each was also offered to two participants through a random draw after finalising the valid and usable survey responses. The words, valid and usable responses, were used in the survey owing to two reasons, to get better response rate and to get accuracy and completeness in responses in that the participants give all answers after understanding each and every question. However, the participants were also allowed to skip all those questions which did not apply to them, particularly in Part 3.

The questionnaire link along with introduction was distributed to several (convenience-based) academics, students and general staff of ECU, inviting members of the target population to participate voluntary. A covering letter with a brief introduction of the researcher, explanation of the purpose of research and the assurance of confidentiality was attached to the questionnaire. Assistance from some academics and professional staff was also sought to obtain the better response rate.

The courses/programmes (arts, business, nursing, science, social work, and teacher education) offered at Bunbury campus under FRPS are the same offered at Mount Lawley and Joondalup under other three faculties. Hence, the academics, general staff, and on-campus students of FRPS at Bunbury and other ECU off-campus/offshore academics, staff, and students having no online programme/unit under other three faculties could not be approached for the survey and no such figures were available as well. The majority of all other academics, staff, and students were approached either directly or indirectly.

The researcher's supervisors assisted in this regard particularly in inviting academics and in-class visits. ECU Graduate Research School assisted in sending listserv email to research academics, students, and staff. The ECU Library professionals also extended their assistance in inviting the feedback from their staff.

The researcher with the assistance of his principal supervisor and prior consent of the academic concerned personally visited classrooms, workshops, and labs to invite voluntary participation of the target, especially student, population. This approach was extremely useful to get quick and accurate responses because the participants were first briefed about the research project and then they were requested to ask any question during taking the survey where they felt any ambiguity in understanding any question. Most student survey data (approximately 70%) was collected through this procedure.

Target population was also invited via emails to take the survey voluntarily. The online forum/listserv of the Graduate Research School was used to reach the target academics and HDR and honours students including the remote ones. With the assistance of the researcher's supervisors, Blackboard announcements were used to enlist off-campus students.

Invitation handouts (approximately 200) with a brief introduction of the researcher, research project, research protocol, assurance of confidentiality and the link to survey were either distributed directly among the target population in the ECU public areas or placed alongside brochures, information booklets and pamphlets in different schools, offices and library buildings at Mount Lawley and Joondalup. The handout procedure did not prove to be successful.

4.2.2.9 Survey Responses

The survey was launched online using the Qualtrics engine on 02 May 2013 and was closed after more than four months of collection on 25 September 2013. This long duration was owing to two reasons, (a) student exams in June, and (b) semester break in June-July. There were 344 respondents with 283 completions. The response is therefore greater for some items than for others. Data cleaning to remove responses where the response was insufficient for inclusion resulted in 315 usable responses, both fully and

partially completed. A desired target of 500 responses could not be achieved despite significant efforts made to ensure representation of every segment of the target population and a good response rate. Extra-length of the survey instrument (10 pages long) also impacted upon full responses and the desired response rate.

4.2.2.10 Validity Testing of the Survey Instrument

Items in the survey (Appendix C) are based on constructs found within major technology adoption and IB models and allied frameworks. Table 4.3 maps most of the survey items to these models and frameworks.

Table 4.3 Mapping of Survey Items to Models and Frameworks

Questionnaire Item(s) #	**Technology Adoption, IB Models & other Frameworks (Figures 2.7 and 4.3)**
2.3; 2.13; 3.6; 3.8; 3.12; 3.17; 3.25; 3.26; Part 5a	1. E-book utility / performance expectancy (TAM/UTAUT/IDT/IB)
2.4; 3.4; 3.7; 3.10; 3.14; 3.16; 3.18; 3.20;	2. E-book usability / effort expectancy (TAM/UTAUT/IDT)
2.2; 2.6; 2.7; 2.8; 2.11; 3.3; 3.5; 3.21; Part 5b	3. Facilitating conditions (UTAUT/IDT/IB)
3.22; 3.23	4. Social influence (UTAUT/IDT/IB)
2.5; 3.9; 3.13; 3.19	5. Hedonic attributes (UTAUT/IB)
2.10; 2.12; Part 4a; Part 4b	6. Culture of use (IB)
Part 6	7. Expectations / perceptions (ECT/IDT/IB)
3.28	8. Gratification (UGT/IB)
3.29	9. Continuance (ECT/IB)
5b.2	10. Forced adoption (IDT)
2.9; 3.2; 3.11; 3.15; 3.27	11. Intimacy
2.1; 3.1; 3.24; 3.30	12. Familiarity
Part 7	13. Demographics / moderators (UTAUT/IDT/IB)

Criterion and construct validity testing. These types of validity tests require statistically quantifiable measures or correlation coefficients (Tanner, 2013b). Based on Section 4.2.2.9, a principal axis factoring test with varimax rotation was used to investigate the underlying structure (dimensionality and validity) of 30 items in Part 3 of the survey instrument assessing 315 participants' perceptions about ECU e-books. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (.774, >.50) and Bartlett's test of sphericity at 2503.255, df = 435, $p = .000$, ensured suitability, factorability and validity. A linear relationship was also found among the variables. Nine factors with Eigenvalues > 1 were identified as underlying the 29 questionnaire items. The sums of squared loadings from the nine factors cumulatively accounted for 47.27% of the variance in this part of the survey data.

4.2.2.11 Scale Reliability Testing

Based on Section 4.2.2.9, all the numerically coded variables in the survey (six of eight parts) had a categorical level of measurement. Since the measurement scale used in the survey was not the same for all applicable parts, the scale reliability analyses for internal consistency produced different results for each part of the survey. Scales of some of the negatively worded items were also reversed through recoding in SPSS. Cronbach's alpha for attitudinally scaled items (30 in part three, and 8 in part 4b) was respectively 0.79, and 0.73. The Cronbach's alpha collectively for five parts (56 items) of the questionnaire was 0.72, which exceeds the cutoff value 0.60 and is considered adequate/acceptable for research purposes (Allen & Bennett, 2010).

4.3 Data Analysis Procedure

4.3.1 System-generated Datasets

After cleaning and preparation of data initial arithmetic analysis was carried out in MS Excel-2007. DLA datasets were then imported into an MS Access-2007 database for analysis using query formulation techniques. Predictive Analytics Software (PASW) (Macer, 2009) or SPSS-21, was also utilised for descriptive and inferential statistics. Owing to the non-normal distribution of transaction log data non-parametric statistical

procedures were used (Sheard, 2013). Because the researcher had identified research aims that related to exceptional or power users, the data were not screened for outliers of this kind. Thus, the data were used as it were, i.e. non-normalised. Particular analysis techniques proposed to be used include:

Descriptive statistics comprise at least four basic functions that can be performed (Connaway & Powell, 2010; Sheard, 2013) including:

- Frequency distribution which is the basic statistical calculation to indicate how many persons, objects, scores, or whatever achieved each value/category for every measured variable. These are usually reported in tables or pictorially (graphs/charts, pie charts, histograms, and polygons);
- Central tendency measures to describe what is typical in a group of cases commonly include mean (average: sum of the scores divided by the total number of cases involved), median (value of the middle item/score according to size), and mode (most frequently occurred category/score);
- Dispersion or variability measures to indicate how widely cases in a group vary, include the range of scores (highest minus lowest), their mean deviation (the arithmetic mean of the absolute differences of each score from the mean), the standard deviation (the square root of the arithmetic mean of the squared deviations from the mean), and the variance (the mean squared deviation). Assumptions testing indicated that e-book usage log data of both the platforms (EBL and Ebrary) was non-normally distributed across all numerically testable variables suggesting the use of non-parametric procedures for inferential interpretation (Allen & Bennett, 2010); and
- Crosstabulation or bivariate frequencies (for survey data).

Other techniques include correlational or associational statistics, two independent samples tests, one-way (k samples) ANOVA tests, and logistic regression. Correlational or associational statistics is used to indicate the degree to which two variables are related (Gay, 2000, p. 619) or to allow prediction of one variable based on another (Connaway & Powell, 2010, p. 235). Two-sample tests are used to compare two independent variables (e.g. power and non-power users), whereas one-way (k samples)

ANOVA compares more than two samples (Allen & Bennett, 2010), e.g. comparison of minutes distribution across three years of log data. Logistic regression is used to assess the impact of independent variables to predict membership of the dependent variable categories (R. B. Burns & R. A. Burns, 2008). Receiver Operating Characteristic (ROC) analysis is conducted to test validity of the regression model (IBM, 2013).

Table 4.6 compares the type of information available to researcher from both the platforms (EBL and Ebrary) for DLA in which only two (highlighted) of 20 areas are common – insufficient for comparison.

Table 4.4. Type of Information on E-book Platforms for DLA

Sr	Type of Information	EBL	Ebrary
1	User ID	x	
2	Usage date	x	
3	Time	x	
4	Title (with ISBN and Publisher)	x	x
5	Minutes spent by users on using e-books	x	
6	Item type (owned vs. un-owned e-books)	x	
7	Usage report by browsing (with variables 1-6)	x	
8	Usage report by reading (with variables 1-6)	x	
9	Number of successful, unique title requests by month and title (with ISBN and publisher)	x	
10	Number of successful section requests by month and unique title (with ISBN and publisher)		x
11	Number of user sessions by month	x	
12	Number of user sessions per year		x
13	Number of searches run by month	x	x
14	Number of pages viewed		x
15	Number of pages copied		x
16	Number of pages printed		x
17	Number of unique documents used		x
18	Number of Wait queues & online turnaways		x
19	Number of chapter/range downloads		x
20	Number of full title downloads		x

It is worth noting as Cox (2008) reports inconsistencies in log metrics recorded by different e-book suppliers/aggregators and publishers. He further claims that "in reality, raw [e-book transaction log] usage data can offer only limited assistance with understanding e-book user behaviour and tend to support speculation rather than authoritative comment" (p. 199).

4.3.2 Survey Data

Tanner (2013b) claims that assumptions of normality in regard to the distribution of data do not apply and the degree of sampling error cannot be determined if non-probability sampling is selected. Consequently, this as well as nominal and ordinal levels (Likert-type scaling) of the questionnaire data suggests the use of non-parametric procedures for inferential statistics (Connaway & Powell, 2010; Sheard, 2013).

Descriptive statistics are also proposed to be used particularly crosstabulation. Crosstabulation or bivariate frequencies are the product of tables in which two variables are cross-classified, usually the independent variable as column, and the dependant variable as row. Throughout the analysis of survey data, where important and applicable, Pearson's chi-square test of independence/contingencies (χ^2) at 95% confidence interval with 2-sided asymptotic significance level at ($\alpha = 0.05$) is proposed to be used where the condition of expected cell frequencies is satisfied. Monte Carlo (MC) method with 99% confidence interval at ($\alpha = 0.01$) presents in lieu of asymptotic significance level (1) where the expected cell frequencies lower than five are more than 20% (Allen & Bennett, 2010), and (2) in accordance with IBM instructions with regard to computing exact significance level in SPSS (IBM, n.d).

Other techniques with potential applicability include chi-square test for goodness of fit, and correlation or associational statistics. The chi-square test for goodness of fit assesses the difference between the observed group/category and the hypothesised or expected membership frequencies (Allen & Bennett, 2010) and is used on single items, e.g. part 3 of survey. Correlational or associational statistics are relevant in the assessment of the direction and relation between the use of ECU Library and third party e-books. Textual data are proposed to be analysed thematically.

4.4 Scope and Limitations of Research Design

Initially, three academic and research libraries, two from Australia and one from Pakistan, were selected for a multiple independent and international case study, but only ECU Library (Australia) participated in this study. The other two libraries (Queensland University of Technology, Brisbane, Australia, and Government College University, Lahore, Pakistan, via Higher Education Commission 'HEC' Pakistan) did not participate owing to privacy concerns regarding e-book transaction log data – a factor beyond the researcher's control. Other reasons cited for non-participation included non-availability of EBL platform and availability of only one-page, one-year summary statistics of Ebrary platform with HEC in Pakistan (H. Zaidi, personal communication, various dates between June, 2011 and October, 2012). Therefore, the intention of pursuing a design based on multiple independent case studies could not be realised, and the design became one of case study. Without sponsorship from platform providers, obstacles faced by this research in accessing transaction log data are likely to be encountered by other researchers going down this path.

As a case study based on a single ARL, clearly issues of generalisability arise in regard to knowledge claims that might arise from such research, forming an acknowledged limitation. However, according to Eriksson and Kovalainen (2008), it is important to note that the case can incrementally increase the ability to generalise findings. They further argue that a case can be an instrument that generates knowledge that extends beyond the case itself, particularly where other like case study research exists; a case study can extend emergent theory in this way. Santos and Eisenhardt (2004) assert that the primary advantage of case study research lies in its deeper understanding of specific instances of a phenomenon.

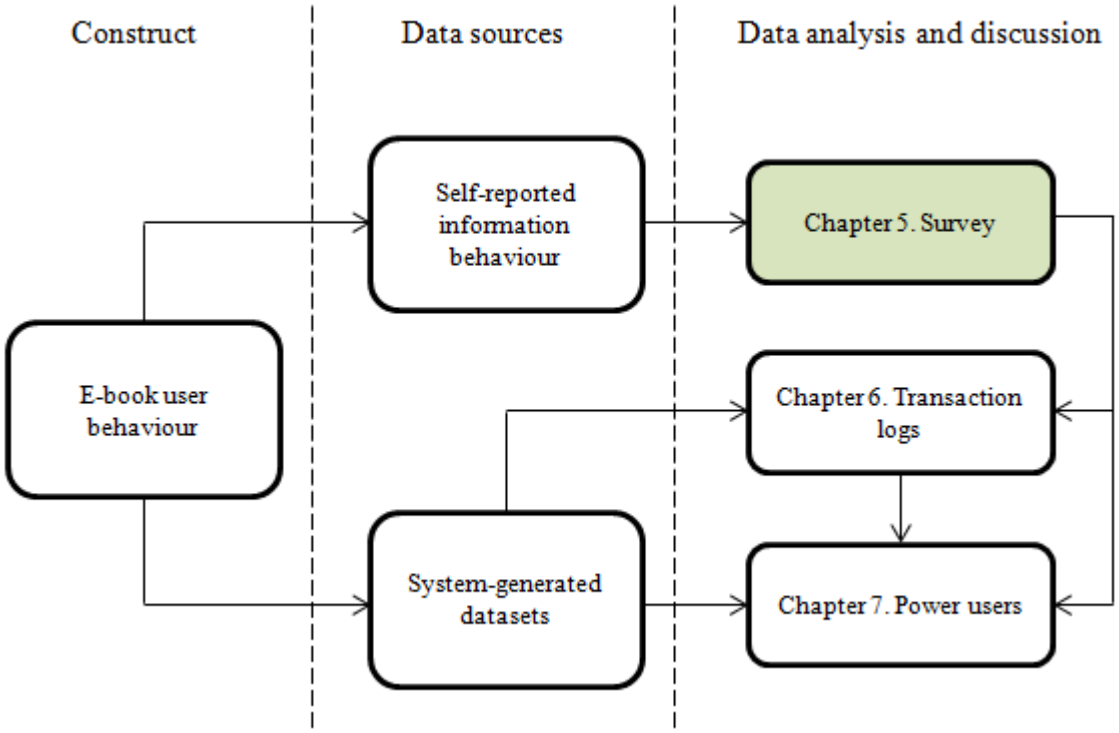
Survey research also has issues of reliability and validity. Response rates are an example of the former and construct operationalisation an example of the latter. The relevant statistical techniques were employed to test for validity and reliability. Since it was not possible to frame the whole University population of the case study ARL, a sampling approach was used, based on convenience and voluntary participations. Other acknowledged limitations concern the fact that the EBL and Ebrary datasets are different, suggesting that for some variables both datasets may not be available. There

are both for and against expert opinions regarding generalisability of research findings beyond sample itself in non-probability sampling (Tanner, 2013b).

4.5 Ethics Clearance

This study contains research data (system-generated datasets and survey) that were collected and used in a manner consistent with ECU research ethics requirements and appropriate faculty risk assessment. Written approval from the ECU Ethics Committee, safety and/or other regulatory bodies was obtained as per ECU rules and regulations, regarding data collection instrument and procedures, data retention, privacy, and use. Permission to decrypt users' EBL log data, if any, to match with their survey data after their consent was also obtained from the ECU Ethics Committee in accordance with cited rules and regulations.

CHAPTER 5: DATA ANALYSIS AND DISCUSSION: SELF-REPORTED INFORMATION BEHAVIOUR



The data analysis and interpretation comprises three chapters in all. Chapter Five (this chapter) analyses and interprets self-reported information behaviour. The role of this analysis is to explore how users perceive their own behaviour and to provide an explanation of the role of user and other variables in shaping behaviour. The data for this study was sourced from a survey[23] based on a cluster-cum-convenience/self-selected sample[24] of the ECU population, consisting of academic teaching and research staff, undergraduate and postgraduate students and general staff. Chapter Six provides an analysis and interpretation of EBL and Ebrary transaction data using deep log analysis. The analysis is comprehensive of three years of EBL (2010-2012 inclusive) and two years of Ebrary (2011-2012) data comprising transaction and aggregated

[23]Vide Appendix C for an instrument (questionnaire) used for the survey.

[24] Vide Section 4.2.2.6 for an explanation of the theoretical sampling.

descriptions of user e-book interactions. Chapter Six also compares findings of its DLA with survey (Chapter Five). Chapter Seven reports results from an analysis of power or elite users.

Analysis and interpretation of the survey data addresses all the research questions fully or partially that motivated the study in terms of self-reported behaviour and attitudes towards e-books. Since these research questions are linked to each other, findings of one research question may also be linked to other research question(s). For example, findings of RQ1 may also incorporate RQ2. Similarly, findings of RQ1 and RQ2 may also be interpreted under RQ3 and RQ4. RQ3 may cover all other RQs as well. RQ4 may also fit in the findings of other RQs.

5.1 Respondent Demographics and Sample Attributes

Demographics (Part 7 of the survey questionnaire) included respondent category, mode and programme of study of students, major field of study/work, gender, age, and number of years of studying/working at ECU. The full data analysis is available as an appendix.[25] This section provides an overview of the sample and an evaluation of sample attributes in terms of limitations.

5.1.1 Overview of Sample

As discussed in Chapter Four (Sections 4.2.2.6 and 4.2.2.8), a semi-structured questionnaire was distributed online among ECU community using a cluster-cum-convenience/voluntary sample. The survey obtained 33.16% response rate overall for 315 responses against a summed size of 950 for three clusters.[26] Respondents comprised role-based (academics 26, general staff 33, students 232, undeclared 24), mode of student (on-campus 162, off-campus 29, mixed mode 39) programme of student

[25] Vide Appendix E, Analysis of sample demographics and attributes.

[26] Vide (a) Section 4.2.2.7 for an explanation of the sample size; (b) Table E1 in Appendix E for the calculated response rate.

(undergraduate 137, graduate coursework 62, honours and HDR 28), major field of study/work (FHES 166, FEA 69, FBL 12, other 26), gender (female 147, male 141), age (18-24 years 116, 25-33 years 53, 34-42 years 63, 43-51 years 31, 52-60 years 18, and 61 or above 6), and span at ECU (less than a year 100, 1-2 years 63, 3-5 years 80, 6-9 years 19, 10 or more years 26).

5.1.2 Discussion of Limitations

This section examines features of the response and biases. The faculty and general staff responses remained around 10% (26) and 11% (33) against a calculated sample size of 261 and 296, respectively. However, the student response rate just over 59% (232) for a sample size of 393 was better. The responses of three clusters (faculty, general staff, and students) were aggregated for most of the data analysis in this chapter. The current survey is also placed in the context of populations and samples tested in previous studies that used this method.

In summary, analysis of the survey response showed low faculty and general staff participation and much stronger student participation based on new/fresh, young, on-campus, undergraduate, and Faculty of Health, Engineering and Science (FHES) and Faculty of Education and Arts (FEA) students. This representation of new/fresh, young, on-campus, undergraduate, students was consistent with demographics of the ECU population (students 93%, undergraduates 79%)[27] (Edith Cowan University, 2013). Relative to the ECU population, over representation of FHES and FEA subjects can be attributed to the convenience nature of the sample. Participant recruitment relied substantially on the academic network of the researcher's supervisor, concentrated primarily in FHES and FEA. This network was most effective in recruiting early career undergraduate students.

[27] Vide Table 4.2 in Section 4.2.2.1 for the bifurcation data of ECU population.

Online students potentially have most to gain from increasing levels of e-book adoption. However, efforts to engage online students with the survey were not successful. Owing to the dependence of this online survey on a convenience and voluntarily self-selected sample as well as response biases demographically (except gender), generalisation of the results should be treated with caution.

In terms of research-oriented publication, the student participation is similar to the CIBER (2008) study where a questionnaire was open to both UCL staff and students, but the responses were almost wholly student-based. The McLure and Hoseth's (2012) survey at the Colorado State University obtained 753 responses from a population of around 32,000 comprising students (578, 77%), faculty (92, 12%), and staff (83, 11%), a similar result in terms of percentage. The Smyth and Carlin's (2012) e-book use and perception survey at the University of Ulster received 109 responses from a student population of 5,524 in which they recruited more participants in the 18-24 years' old age group (65%), more undergraduates (87%), and displayed a gender bias (65% of respondents were male). The Cumaoglu, Sacici, and Torun (2013) student survey of 36 different universities across Turkey, regarding their preferences for e-books and print materials, could obtain responses only from 222 students (preparatory 2.71%, graduate 9.50%, undergraduate 87.78%; male 40.72%, female 59.28% - displaying bias towards student level and gender). Academic participation was similar to Brown's (2013) 10% response rate for an online survey of professors at the University of Mary Hardin-Baylor, USA, regarding their e-textbook use and acceptance. Brown invited participation of 450 professors and adjunct faculty but could obtain only 47 responses. Bierman, Ortega, and Rupp-Serrano (2010) could recruit only 11 academics from pure and applied sciences at the University of Oklahoma to survey their e-book perceptions. While comparing aggregate percentages it is important to mention that many of the reported studies vary in terms of samples and their sizes, and number of responses.

5.2 Analysis of Self-reported Use of E-books

This section reports results and findings from analysis of selected parts 1 to 7 of the survey[28] arranged according to research questions. Sections 5.2.1 to 5.2.7 report findings for RQ1 and RQ2. Later sections 5.2.8 onwards report findings for RQ3 and RQ4.

RQ1- What patterns of e-book use exist in academic and research libraries?
RQ2- How can these patterns of e-book use be understood?

5.2.1 Status of E-book Use

The initial survey item (1.1) was designed to identify e-book users versus non-users. There were 315 responses in which respondents attributed ECU Library and/or third party e-book use. The responses for ECU Library comprise *yes* (213, 67.62%), *no* (99, 31.43%), and *don't know* (3, 0.95%) compared to third party's *yes* (190, 60.32%), *no* (112, 35.55%), and *don't know* (13, 4.13%).

Based on clusters (faculty, staff, and students), slightly more than two thirds (67.35%) of respondents were ECU e-book users and slightly less than one third did not use e-books (31.62%). Adoption percentages are consistent with previous studies based on self-reported behaviour (e.g. Cumaoglu, Sacici, & Torun, 2013; Li et al., 2011; McLure & Hoseth, 2012; Nicholas et al., 2008).

Table 5.1 shows e-book users and non-uses by cluster/occupation (faculty, staff, and students). Twenty-four (24) of 315 respondents did not mention their occupation.

[28] Vide Appendix C for the survey questionnaire.

Table 5.1. E-book Use by Occupation

Respon-dent category	**Item 1.1. I use ECU Library e-books (r = 291)**			**Item 1.2. I use e-books sourced from other providers (r = 291)**		
	Yes	No	Don't know	Yes	No	Don't know
Faculty	19	7	0	16	10	0
General staff	21	12	0	21	12	0
Students	156	73	3	136	84	12
Total & (%)	196 (67.35%)	92 (31.62%)	3 (1.03%)	173 (59.45%)	106 (36.43%)	12 (4.12%)

Finding 5.1:
Overall, slightly more than two thirds (67.62%) of respondents self-reported as ECU e-book users and slightly less than one third did not use e-books (31.43%). All three clusters of ECU population used e-books.

5.2.2 Demographic Patterns in ECU Library E-book Use

The effect of demographic factors was also scrutinised using Pearson chi-square contingency testing at $\alpha = 0.05$ (asymptotic) or, where specified, $\alpha = 0.01$ (Monte Carlo 'MC').[29] Table 5.2 presents the statistically significant results.

[29] Monte Carlo (MC) method with 99% confidence interval at ($\alpha = 0.01$) was used in lieu of asymptotic 95% significance level ($\alpha = 0.05$) (both two-sided) (1) where the expected cell frequencies lower than five were more than 20% (Allen & Bennett, 2010), and (2) in accordance with IBM instructions with regard to computing exact significance level in SPSS (IBM, n.d).

Table 5.2. Demographics in ECU E-book Adoption: Crosstabs

Sr	I use ECU Library e-books (survey item 1.1) vs. demography (part 7 of survey)	n	df	χ^2	*p*	Effect Size Phi φ [30]
1	Programme of Student Study (survey item 7.1.2) (Undergraduate/Graduate/HDR)	225	2	11.34	.003	.22
2	Gender (item 7.3)	286	1	9.68	.002	.18
When gender controlled for respondent category (item 7.1) (Academic/Student/Staff)		215	1	16.44	.000	.28
3	Age of respondent (item 7.4)	261	3	8.78	.032	.18
4	Years at ECU (item 7.5)	286	4	12.58	.014	.21
When years controlled for respondent category (item 7.1) (Academic/Student/Staff)		227	4	13.45	.008 (MC)	.24

Serial-wise findings of Table 5.2 and their contingency tables[31] are appended below.

Finding 5.2:

1. A weak, but significant association was seen between programme of study and e-book adoption. Graduate (coursework) students were likely to be more e-book users than students in other programmes proportionately.
2. A week but significant association was observed with gender. Females were likely to be more users of ECU e-books than males proportionately. Controlling for other demographic variables, students demonstrated the association with small effect size.
3. Age group "18-24" was likely to be having proportionately more non-users of ECU Library e-books (44/115, 38.26%) than other age groups. The association was significant, but weak. No significant association was found when controlled for other demographic variables.

[30] In case of Pearson chi-square crosstabulation effect size Phi (φ) has been reported (Note: Phi and Cramer's *v* will be identical for 2 x k design, while Cramer's *v* will be around half of Phi in k x k design); Cohen's *w* in case of chi-square test for goodness of fit. Effect size < .3 is small/weak, => .3 and < .5 is medium/moderate, and => .5 is large/strong (Allen & Bennett, 2010, p. 228 & 236).

[31] Vide Appendix F for contingency data tables.

4.	Years at ECU also displayed significant, but weak association with adoption. Respondents with "3-5 years" at ECU were likely to be more users of ECU Library e-books proportionately than those in other year categories. Controlling for other demographic variables, students demonstrated the association with small effect size. Wells and Dumbell (2010) citing Grigson concur that e-book use increases over time when users become more accustomed to them (p. 2).

Note: These findings are standalone, in aggregate terms and, therefore, may not be interpreted in combination with the other, for example, finding 5.2.1 (graduate coursework students) may not be combined with finding 5.2.2 (female students) and so on. This also applies to other findings in this chapter, where not specified.

Finding 5.2 is consistent with previous studies (e.g. Folb, Wessel, & Czechowski, 2011; Li et al., 2011; Nicholas et al., 2008; Posigha, 2012; Rowlands et al., 2007; Shelburne, 2009) that have explored the role of demographic variables in e-book adoption behaviour.

5.2.3 ECU Library vs. Third Party E-books

Questionnaire items 1.1 and 1.2 invited respondents to describe their use of ECU Library and third party e-books, respectively. A crosstabulation with Pearson chi square was used to determine whether *ECU Library e-book use/non-use was associated with the use/non-use of third party e-books (e.g. Amazon, iTunes, Google)*? The association between use/non-use of ECU Library and third party e-books (n = 315, df = 4) was found to be statistically significant (χ^2 = 22.22, Monte Carlo (MC) sig. at $\alpha = 0.01$ level < .006, effect size overall Phi ϕ = .27, small/weak). Weakness was also demonstrated using Cohen's kappa measure κ = 0.18, p <.001 and a two-tailed Spearman's correlation r_s = .138, p <.015). Table 5.3 shows crosstabulated contingency frequencies. Figure 5.1 describes the crosstabulation in chart view.

Table 5.3. Use of ECU Library and Third Party E-books: Crosstabs

			Use of third party e-books (item 1.2)			
			Yes	No	Don't Know	ECU **Total**
Use of ECU Library e-books (item 1.1)	Yes	Count	140	62	11	213
		Expected count	128.5	75.7	8.8	213.0
	No	Count	48	50	1	99
		Expected count	59.7	35.2	4.1	99.0
	Don't know	Count	2	0	1	3
		Expected count	1.8	1.1	.1	3.0
Third party **Total**			190	112	13	315

The diagonal column (left to right) in Table 5.3 shows that there are only 51 respondents (both no 50; both don't know 1) who are non-users of e-books of both ECU and third party providers. In other words, 264 of 315 respondents (83.81%) are users of either ECU or third party e-books. This study confirms aspects of a related investigation of students at the Royal Roads University (Canada) by Croft and Davis (2010).

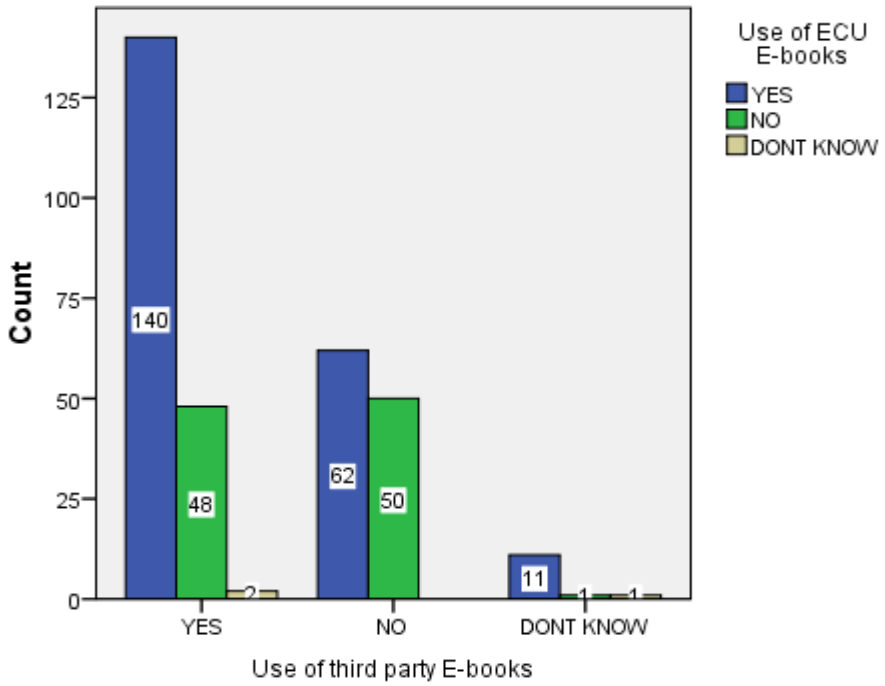


Figure 5.1. ECU Library vs. third party e-books (Crosstabulation)

Finding 5.3: Significant association exists between ECU Library e-book adoption and use of third party e-books, however the effect size was found to be weak. Non-use of Library e-books was associated with non-use of the format more generally inclusive of third party providers.

5.2.4 Patterns of Non-use of ECU E-books

The research (Part 2 of survey) sought to explore reasons for non-adoption in the cohort of 102 non-users who responded "no" (99) or "don't know" (3) to item 1.1 of the survey. The non-users comprised academics 7, students 76, general staff 12, and undeclared 7. Non-users were advised to select all reasons that apply and/or write in the textbox. Four of the student non-users did not attribute responses. Statements were aimed at exploring practical reasons of non-use of this service. The rank-wise, main reasons selected by 98 respondents are shown in Table 5.4.

Table 5.4. Reasons of Non-use of ECU E-books (r = 98)

Rank	Statement/Reason	Faculty (r = 7)	Student (r = 72)	Staff (r=12)	Un-declared (r = 7)	Row Total (r = 98)
1	Unaware of the service	3	28	4	6	41
2	Prefer and use hard copy books exclusively	1	32	2	1	36
3	Don't know how to find them in the library catalogue	2	22	3	4	31
4	Limitations on access, copying, printing and download frustrate me	1	19	4	0	24
5	Unpleasant to use	2	19	0	0	21
6	Login (authentication) is frustrating	1	11	1	0	13
7	Cumbersome interface	0	9	2	0	11
8	Insufficient titles	1	8	1	0	10
9	Incompatibility with my mobile agent (e.g. iPad, Kindle e-book reader, smart phone)	0	6	1	1	8

The result suggests that some explanations for non-use are stronger than others. The top-ranked factor was lack of awareness (41.84%). Other main reasons from all respondent categories ranked preference for hard copy books (36.73%), issues with discovery (31.63%), certain limitations on e-books due to DRM (24.49%), perceived unpleasantness (21.43%), login/authentication issues (13.27%), cumbersome interface (11.22%), insufficient titles (10.20%), and incompatibility with mobile agent (8.16%). In their textual responses "no need" was the major reason reported by seven of the non-users. Furthermore, no statistically significant association was found between the reasons of non-use and non-users' demographics.

Comparatively, prior studies produced similar results. For example, Croft and Davis' (2010) survey at the Royal Roads University (RRU), Canada, found the reasons of non-use of RRU e-books ranked (i) unawareness (151/376 responses, 40.2%), (ii) preference for print books (112/376 responses, 29.8%), (iii) issues of findability (98/376 responses, 26.1%), (iv) insufficient titles (51/376 responses, 13.6%), and other factors (93/376 responses, 24.7%). Schomisch, Zens, and Mayr (2013) with regard to user test of different mobile agents assert that "... e-readers do not yet fit seamlessly into the established chain of scholarly text-processing..." (p. 388).

Finding 5.4: The major reasons for not using ECU Library e-books ranked as approximate % of responding non-adopters were (1) unawareness (42%), (2) preference for hard copy books (37%), (3) issues with discovery (32%), (4) certain limitations on e-books due to DRM (24%), and (5) perceived unpleasantness (21%).

5.2.5 Patterns of E-book Use: Task Fit

This section of the survey (Part 5a) was intended for e-book users who selected "yes" to using either ECU or third party e-books in Part 1 (n=264). Statements were aimed at exploring the purpose of using e-books comprising eight (8) multiple choices. The last choice was for a textual answer. The respondents were required to check all boxes that apply and/or to use the text field for any additional explanation not covered by check box items.

In total 245 respondents (faculty 22, students 194, general staff 26, undeclared 3) selected/wrote one or more purposes of e-book use. The rank-wise purposes are appended in Table 5.5.

Table 5.5. Frequency of Purpose of E-book Use (r = 245)

Rank	**Purpose**	**Faculty** (r = 22)	**Student** (r = 194)	**Staff** (r =26)	**Un-declared** (r = 3)	**Row Total**	**%**
1	Assignments (coursework)	7	158	3	3	171	69.80
2	Study (course reading)	11	140	3	2	156	63.67
3	General knowledge	14	97	18	3	132	53.88
4	Thesis/Research	17	87	12	3	119	48.57
5	Fun/recreation	5	57	21	1	84	34.29
6	Exams	3	67	0	1	71	28.98
7	Writing curriculum and courseware	9	0	2	0	11	4.49

The major purposes of student e-book use was for coursework assignments (158/194, 81.44%), study (course reading) (72.16%), and general knowledge (50%). Overall, assignments ranked one (69.80%), followed by study (course reading) (63.67%). Reading e-books for general knowledge (53.88%) or fun/recreation (34.29%) obtained third and fifth rank respectively. Thesis/research was rated at four (48.57%). Studying e-books by students especially for exams seems to be least preferred (sixth) (28.98%). Since writing curriculum and courseware belonged to academicians this option obtained 7th rank (4.49%) owing to fewer faculty respondents.

5.2.5.1 Association between Purpose and Use of ECU E-books

The association between purposes of e-books use (items 5a.1 to 5a.7) and use of ECU e-books (item 1.1) was crosstabulated using Pearson chi-square at $\alpha = 0.05$ level, n = 243, df = 1. ECU e-book use is significantly associated with (1) assignments (χ^2 = 14.73, $p < .001$, effect size overall ϕ = .25, small/weak), (2) study (course reading) (χ^2

= 5.67, $p < .018$, $\phi = .15$, small), (3) thesis/research ($\chi^2 = 7.78$, $p < .006$, $\phi = .18$, small), (4) fun/recreation ($\chi^2 = 7.45$, $p < .007$, $\phi = .17$, small), and (5) exams ($\chi^2 = 4.12$, $p < .043$, $\phi = .13$, small).[32] No statistically significant association was found for general knowledge and writing curriculum/courseware (Figure 5.2).

The findings of this section are also compared with log data in terms of e-book month-wise use as per ECU academic cycles (Chapter Six).

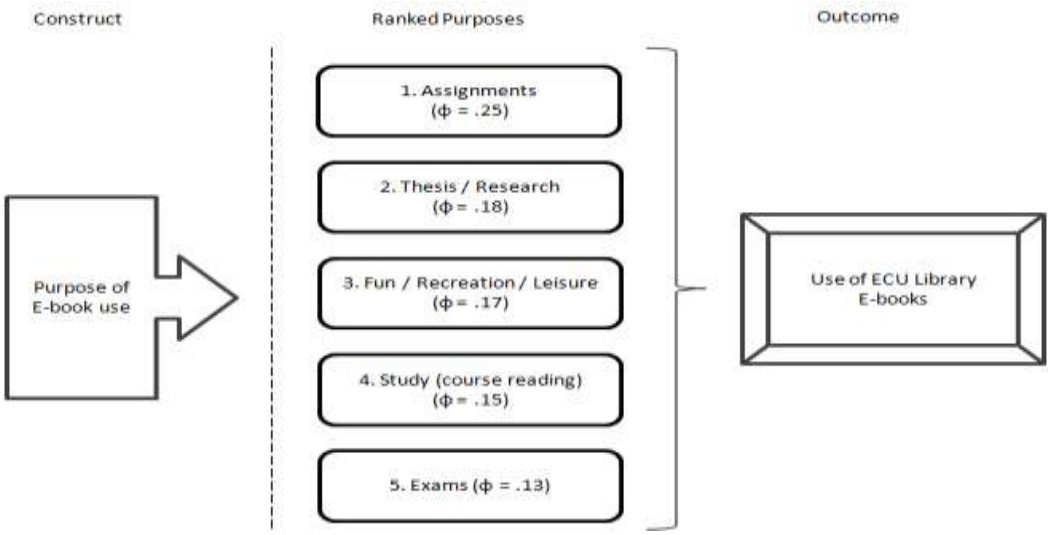


Figure 5.2. Purpose and use of ECU e-books: Crosstabulation

Finding 5.5: (1). The major, reported purposes of e-book use ranked (1) Assignments (70%), (2) study (course reading) (64%), (3) general knowledge (54%), (4) thesis/research (49%), (5) fun/recreation (34%), and (6) exams (29%).

(2). Significant associations exist between ECU Library e-book adoption and purposes (assignments, study/course reading, thesis/research, fun/recreation, and exams) of e-books use. These associations were found to be significant, but the effect size was found to be weak. Satisfied users are more likely to display task diversification, a hallmark of exploratory searching and mature information behaviour.

[32] Vide Appendix G for contingency tables.

The purposes of using e-books by the ECU community are consistent with prior studies (e.g. Croft & Davis, 2010; Cumaoglu, Sacici, & Torun, 2013; Folb, Wessel, & Czechowski, 2011; Gregory, 2008; Rajan, Jasimudeen, & Mathew, 2012; Roesnita & Zainab, 2005; Rowlands et al., 2007; Shelburne, 2009; Walton, 2008). There were variations in the percentages of use purposes possibly owing to samples (e.g. all university community or only one or two clusters with/without particular discipline; all students or students in a particular level or discipline) and their sizes. There were very few studies that used associational stats between the purpose and uptake of e-books. For example, Walton (2014) indicated without effect size that undergraduate students' use of e-books was positively related to leisure reading and conducting research.

5.2.5.2 Demographic Patterns in Purpose of E-book Use

The moderating effects of demographic variables (Part 7) were tested against purpose of e-books use (Part 5a) using crosstabs with Pearson chi-square. Table 5.6 presents the statistically significant results at $\alpha = 0.05$ or $\alpha = 0.01$ (MC, where specified) level.

Table 5.6. Demographic Variables vs. Purpose of E-book Use: Crosstabs

Sr	**Demographic variable**	**Purpose of e-book use**	**n**	**df**	χ^2	***p***	**Effect ϕ *overall***
1	Respondent category	Fun/recreation	242	2	28.31	.000	.34
1	Years at ECU	Fun/recreation	239	4	22.79	.000	.31
2	Respondent category	Writing curriculum and courseware	242	2	76.88	.000 (MC)	.56
3	Programme/level of student study	Assignments (coursework)	190	2	77.66	.000	.64
3	Years at ECU	Assignments (coursework)	239	4	60.35	.000	.50
4	Respondent category	Study (course reading)	242	2	38.36	.000	.40
4	Age	Exams	238	5	24.84	.000 (MC)	.32
5	Programme/level of student study	Thesis/research	190	2	21.87	.000	.34

Serial-wise interpretation of the results in Table 5.6 and their contingency tables[33] is appended below.

Finding 5.6:

1. General staff and users who had spent six or more years at ECU were more likely to use e-books for fun/recreation. Effect size of the relationship is medium. This is suggestive of general staff comprising a different cohort.
2. Faculty/academics were much more likely to use e-books for writing curriculum and courseware (strong relationship).
3. Graduate (coursework) students, and users with '3-5' years at ECU were more likely to use e-books for assignments (coursework) purposes (strong relationship).
4. Students, and age group 18-24 were more likely to use e-books for study (course reading), and exams, respectively. Effect of relationship is medium.
5. Honours/HDR students were more likely to use e-books for thesis/research purpose. Effect size of the relationship is medium.

5.2.6 Patterns of E-book Use: Discovery and Access

This section of the survey questionnaire (Part 5b) was intended for e-book users who selected "yes" to using either *ECU* or *third party* e-books in Part 1 (n=264). Statements (5b.1 to 5b.16) were aimed at exploring the preferred access methods used by respondents. This part comprised 16 multiple choices for access methods. The last choice was for textual answer. The respondents were required to check all boxes that apply and/or to use the text field for any additional explanation not covered by check box items.

The rank-wise, *major* methods are presented in Table 5.7.

[33] Vide Appendix H for contingency tables.

Table 5.7. Frequency of Methods of Accessing E-books (r = 240)

Rank	Access method	Faculty (r = 22)	Student (r = 192)	Staff (r=25)	Un-declared (r = 1)	Row Total	%
1	Library catalogue	19	130	20	0	169	70
2	Library's OneSearch	10	118	16	0	144	60
3	Library databases	18	110	14	1	143	60
4	Google Scholar	15	96	7	1	119	50
5	Embedded links via unit's/subject's suggested reading(s)	10	102	2	1	115	48
6	Embedded links via unit's/subject's compulsory reading(s)	8	91	0	0	99	41
7	Google search engine	9	80	9	1	99	41
8	Google e-books	10	74	4	0	88	37
9	Publisher websites	9	47	8	0	64	27
10	Bookseller websites (e.g. Amazon)	5	43	9	0	57	24
11	Other e-book websites	4	33	11	0	48	20

ECU Library's catalogue, the Summon discovery tool (Library's OneSearch) and databases were the most frequently used methods to find and access e-books, respectively. Suggested courseware embedded links were used more (rank 5) than compulsory ones (rank 6). Google's popularity was still there for scholarly content (rank 4), search engine (rank 6) and free e-books (rank 7). Other e-book websites (e.g. preloaded with e-reader devices, directly from suppliers, iTunes Store) where users may be required to pay for titles ranked last.

There were 10 textual responses from students (6) and staff (4). The majority (7) found easy to access e-books via pirate and torrent sites. Other three respondents each used reference help (from librarian), public library collection (via catalogue), and subscription to book reviews and email alerts.

The findings are consistent with prior research (for example, Cumaoglu, Sacici, & Torun, 2013; Foote & Rupp-Serrano, 2010; JISC, 2009; Li et al., 2011).

5.2.6.1 Association between Access Methods and Use of ECU E-books

The association between methods of accessing e-books (items 5b.1 to 5b.15) and use of ECU e-books (item 1.1) was crosstabulated using Pearson chi-square at $\alpha = 0.05$ level, n = 238, df = 1. ECU e-book use is significantly associated with certain access methods, (1) embedded links via unit's/subject's suggested reading(s) ($\chi^2 = 5.87$, $p < .016$, effect size overall $\phi = .16$, small), (2) embedded links via unit's/subject's compulsory reading(s) ($\chi^2 = 4.73$, $p < .031$, $\phi = .14$, small), (3) Library catalogue ($\chi^2 = 38.59$, $p < .001$, $\phi = .40$, medium), (4) Library's OneSearch ($\chi^2 = 35.81$, $p < .001$, $\phi = .39$, medium), (5) Library databases ($\chi^2 = 24.43$, $p < .001$, $\phi = .32$, medium), (6) Bookseller websites ($\chi^2 = 15.69$, $p < .001$, $\phi = .36$, medium), and (7) Google scholar ($\chi^2 = 9.00$, $p < .004$, $\phi = .19$, small).[34] No statistically significant association was found for other access methods. Figure 5.3 describes the statistically significant results of crosstabulation in chart view.

[34] Vide Appendix I for contingency tables.

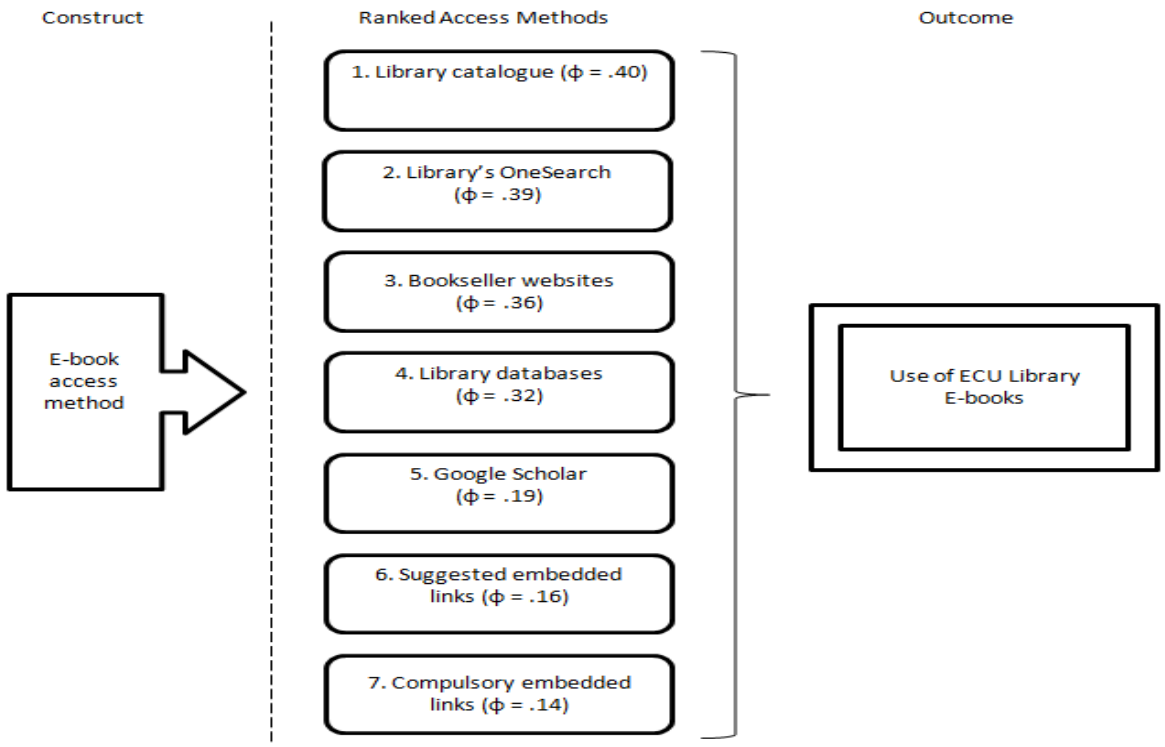


Figure 5.3. Access methods and use of ECU e-books: Crosstabulation

Finding 5.7:

(1). The major e-book access methods reported ranked (1) Library catalogue (70%), (2) Library's OneSearch (60%), (3) Library databases (60%), (4) Google scholar (50%), (5) Embedded links via unit's/subject's suggested reading(s) (48%), (6) Embedded links via unit's/subject's compulsory reading(s) (41%), (7) Google search engine (41%), and (8) Google e-books (37%).

(2). Significant associations exist between ECU Library e-book adoption and e-book access methods (suggested and compulsory embedded courseware links, Library catalogue, Library's OneSearch, Library databases, bookseller websites, and Google scholar). These associations were found to be significant at $\alpha = 0.05$, but the effect size was found to be medium for Library catalogue, Library's OneSearch, Library databases, and bookseller websites, and small/weak for embedded courseware links (compulsory and suggested), and Google scholar.

Since no data were gathered that mapped the availability of embedded links in enrolled subjects to users (an intervening variable) the finding must be treated with caution as a dimension of user information behaviour.

5.2.6.2 Demographic Patterns in E-book Discovery and Access

The moderating effects of demographic variables (Part 7 of survey) were tested against e-book access methods (Part 5b) using Pearson chi-square crosstabs. Appendix J presents the statistically significant results. Associations were found to be small.

Serial-wise interpretation of the results of Table J1 and their corresponding contingency tables[35] is appended below.

Finding 5.8:

1. Students, especially coursework students (undergraduate and graduate), and new entrants with less than a year at ECU were more likely to access e-books via embedded links in unit's/subject's suggested and compulsory reading(s). However, the effect of relationships was small.
2. Graduate (coursework) students were more likely to use Library catalogue to access e-books. Off-campus students were more likely to access e-books via Library Catalogue as well as bookseller websites. However, the effect of relationships was small.
3. Honours/HDR students were more likely to access e-books via publisher websites. However, the effect of relationship was small.
4. Users who had spent six to nine years at ECU were more likely to access e-books directly from supplier websites. However, the effect of relationships was small.
5. Academics, on-campus and honours/HDR students were more likely to access e-books via Google scholar. However, the effect of relationships was small.

Findings are consistent with other findings suggesting maturation of information behaviour with years spent in higher education. The hallmarks of this maturity are:-

- Greater familiarity with discovery pathways and tools for accessing e-books;
- Greater appetite of e-book information sources including third party providers.

[35] Vide Appendix J for Table J1 and contingency tables.

Evidence from self-reported behaviour describing supporting the idea of an evolving maturity is discussed in Section 5.3.3.

5.2.7 Patterns of Using Electronic Resources and Platforms

A five-point scale from 1 (Never) to 5 (often, one or more times a day) with no labels for 2, 3, and 4 was used to assess how often the participants made use of various kinds of online resources and platforms for online work of all kinds, not just e-books (Part 4a of survey). Descriptive statistics (Mode) and chi-square test for goodness of fit with four (4) degrees of freedom at $\alpha = .05$ was used to test each item. Table 5.8 presents the statistics.

Table 5.8. Use of Electronic Resources and Platforms: Goodness of Fit

Resource	**r**	**1-never**	**2**	**3**	**4**	**5-often**	**Mode**	χ^2	***p***	***Effect size w***
Social media (e.g. facebook, twitter, youtube)	296	44	42	34	49	127	5	99.03	.000	0.58
Library e-journals	296	57	67	80	61	31	3	21.91	.000	0.27
Online games	296	142	56	35	23	40	1	154.24	.000	0.72
Platform/ agent										
Laptop, netbook	296	17	18	31	48	182	5	329.03	.000	1.05
Smartphone	296	64	28	21	27	156	5	217.28	.000	0.86
Desktop PC	296	51	44	34	37	130	5	108.76	.000	0.61
iPad	295	149	19	29	24	74	1	204.24	.000	0.83
E-book reader	296	195	43	33	15	10	1	401.43	.000	1.16
Tablet (other than iPad)	295	205	27	24	10	29	1	455.36	.000	1.24

A chi-square test for goodness of fit test shows that responses for each platform/resource were statistically significantly different with large effect size for all except Library e-journals which had small effect.

Descriptive statistics (Mode values) show that the most frequently used platforms and resources were respectively laptop/netbook, smartphone, social media, and desktop PC. Library e-journals received medium level of use. The other platforms and resources could not get a considerable standing as the frequently selected option was "1-never" for them. These include online games, iPad and other tablets and e-books readers.

Finding 5.9: The most frequently used electronic resources and platforms according to number of mode values (5-often) ranked (1) Laptop, netbook (61%), (2) Smartphone (53%), (3) Desktop PC (44%), and (4) Social media (43%). While, the majority of respondents never used (a) Tablet (other than iPad) (69%), (b) E-book reader (66%), and (c) iPad (51%). Online games received the most frequent value (1-never) from 48% of respondents. Library e-journals received the most frequent value (3-medium use) from 27% of respondents.

Wells and Dumbell (2010), citing Safley, and Cox, argue that platforms may lead to e-books being used more often and e-book usage is also influenced by the different access models provided by different platforms (p. 2). Prior studies demonstrated mixed results. For example, Croft and Davis (2010) found laptop (91.1%) and Blackberry smartphone (36.4%) as the most frequently used devices by students both for general and particular (e-book) use.

5.2.8 E-book User Behaviour and Technology Adoption and Information Behaviour Frameworks

Part 3 and 4b of the survey on awareness and perception of ECU Library e-books and satisfaction with e-book use platforms contained items that provided evidence in connection with two further questions earmarked for investigation:

RQ3- Are use and behaviour consistent with the major models of technology adoption?

RQ4: What intervening or control variables significantly affect use and behavior?

Hence the analysis and interpretation of patterns of use expands to encompass the construct of technology acceptance and role of intervening and control variables.

Findings flag technology acceptance models or frameworks to which they relate with an expanded discussion to be found in Section 5.3.

5.2.9 User Perception of ECU Library E-books

Data in this section describe respondents' awareness and perception of ECU Library e-books. A five-point Likert type scale (Strongly Disagree "SD" - Disagree "D" - Undecided "U" - Agree "A" - Strongly Agree "SA") was used to measure the level of agreement/disagreement of participants against selected items.

A chi-square test for goodness of fit (with $\alpha = 0.05$, df = 4) was used to assess whether respondents' awareness and perceptions for ECU Library e-books (selected items from 3.1 to 3.30 of survey) were equal or different (n=315). Appendix K describes the number of respondents (r) and test statistics for each item.

Serial-wise interpretation of the test results presented in Table K1 and their corresponding frequency charts[36] is appended below.

Finding 5.10:

1. Respondents agreed or strongly agreed that ECU Library hosted e-books in its collection (item 3.1). The effect size is large. There is good awareness in the sample of ECU Library e-books. *This finding is consistent with Borchert et al. (2009) and Rowlands et al. (2007) and supportive of the role of familiarity from Shin's (2011) uses and gratification expectancy (UGE) model.*[37]
2. Respondents agreed or strongly agreed that the Library interface for finding e-books was easy to use (item 3.3). The effect size was large. This sample of users does not have discovery issues with e-book titles. *The finding supports the role of UTAUT's facilitating conditions and IDT's compatibility.*

[36] Vide Appendix K for test results and frequency data charts.

[37] Vide Section 2.5.5.1.

3. Respondents did not find e-books hard to read on their screens (item 3.4). The effect size was large. This finding is consistent with (e.g. Abdullah & Gibb, 2008a; JISC, 2009) and contradicts (e.g. Borchert et al., 2009; CIBER, 2008; JISC, 2009; Li et al., 2011; Shelburne, 2009). *The finding is supportive of the role of TAM's usability and UTAUT's effort expectancy.*

4. Respondents disagreed with the proposition of problems in accessing e-books over the Internet (item 3.5). The effect size was large. This finding suggests that issues with accessibility (e.g. Asunka, 2013; CIBER, 2008; Huthwaite et al., 2011; Letchumanan & Tarmizi, 2011a), connectivity and authentication (e.g. Bierman, Ortega,, & Rupp-Serrano, 2010; JISC, 2009) have been resolved in the minds of users (e.g. Camacho & Spackman, 2010). *The finding is also supportive of the role of UTAUT's facilitating conditions and IDT's compatibility.*

5. Respondents were largely disagreeing that the Library e-book text window was too small (item 3.7). The effect size is large. This finding suggests that issues with the size of e-book text window or screen (e.g. Brahme & Gabriel, 2012; Broadhurst & Watson, 2012; Jamali, Nicholas, & Rowlands, 2009; Pattuelli & Rabina, 2010) have been resolved in the minds of users.

6. Respondents agreed that Library e-book access, copy and print limits were frustrating (item 3.8). The effect size was large. In common with previous studies (e.g. Bucknell, 2010; Hoseth & McLure, 2012; Jamali, Nicholas, & Rowlands, 2009; McLure & Hoseth, 2012) respondents in this study find DRM frustrating. *The finding is aligned with the role of TAM's utility and UTAUT's performance expectancy.*

7. Respondents largely found searching e-books easy for the information they needed (item 3.10) (consistent with, e.g. Foote & Rupp-Serrano, 2010; Jamali, Nicholas, & Rowlands, 2009). The effect size was large. This aspect of e-book usability is not an issue with this sample of users. *Finding is supportive of ECT and usability as discussed in TAM and UTAUT.*

8. Respondents largely agreed that they typically skim read Library e-books (item 3.14). The effect size was large. This finding is consistent with many previous studies (for example, Jamali, Nicholas, & Rowlands, 2009; Letchumanan & Tarmizi, 2011a; McLure & Hoseth, 2012) and suggests that reading behaviour is similar to other online formats. *The finding is aligned with the role of TAM's utility, UTAUT's effort expectancy and culture of use (habituation).* There was also a medium-sized, Spearman's two-tailed positive correlation at

$\alpha = 0.01$ level between skim reading and quick fact finding (n = 210, r_s = .37, p <.001).

9. Respondents largely disagreed that Library e-books were suitable for longer reading (item 3.16) (consistent with e.g. Borchert et al., 2009; CIBER, 2008; Li et al., 2011; Staiger, 2012). The effect size was large. *The finding is consistent with ECT (the expectation that e-books are useful for quick fact finding) (see below) and user preference for skim reading of e-books.*

10. Respondents largely agreed that they mostly used Library e-books for quick fact finding (item 3.17). The effect size was large. Previous studies (e.g. Abdullah & Gibb, 2008a, 2008b; Gregory, 2008; Nicholas, Rowlands, & Jamali, 2010; Rajan, Jasimudeen, & Mathew, 2012; Roesnita & Zainab, 2005) reported similar findings. *The finding is supportive of the role of TAM's usability (they are less usable for extended reading) and UTAUT's effort expectancy (extended reading is not ingrained in user expectation of this format).* Pearson chi-square crosstabulation of items (3.16 and 3.17) produced statistically significant result (n = 210, df = 16, chi-square = 48.45, MC sig. at $\alpha = 0.01$ level = .001, ϕ = .48, medium). Users who found e-books unsuitable for longer reading were most likely using e-books for quick, fact finding information (see Appendix K for contingency data table).

11. Respondents largely disagreed that they mostly, only viewed Table of contents (TOC) pages of Library e-books (item 3.18). The effect size was large. According to CIBER (2009), 11% of views to MyiLibrary e-books were to TOC and overall, "...a higher proportion of users spend time on the foreword, ToC and cover than they do on actual content pages" (p. 33). The research provides no explanation of users in this study in terms of self-reported behaviour as they did not see themselves in terms of this earlier finding.

12. Respondents largely disagreed that finding information in e-books was difficult (item 3.20). The effect size was large. This finding is consistent with (e.g. Bierman, Ortega,, & Rupp-Serrano, 2010). *This aspect can also be attributed to the role of TAM's utility, usability and UTAUT's effort expectancy.*

13. Respondents largely agreed that they typically used unit's/subject's embedded links to access e-books (item 3.21). The effect size was large. This finding is consistent with (e.g. Broadhurst & Watson, 2012; JISC, 2009; Nicholas, Huntington, Jamali, Rowlands, & Fieldhouse, 2009b). The effect size was larger than finding 5.7.2, and more supportive of the view from the literature that e-book use as mainly determined by textbook application supported by embedded links (CIBER, 2009b). *Embedded courseware links may also be viewed in terms of the role of UTAUT's facilitating conditions and IDT's compatibility.*

The bias of the current study towards undergraduate early career students is likely a factor in the large effect size observed. E-books are commonly used as textbooks in ECU undergraduate programmes.

14. Respondents largely disagreed that they used Library e-books because of friend or peer group use (item 3.22). The effect size was large. This finding is consistent with Rowlands et al. (2007) and prima facie, suggests that social influence plays no significant role in e-book adoption behaviour. However, social influence was found to be significant when the moderating effect of program of study was considered (see Finding 5.12.5, p. 148).

15. Respondents were either in disagreement or strongly in disagreement that they used Library e-books on the recommendation of their lecturer/tutor (item 3.23). The effect size was large. This finding is not consistent with Rowlands et al. (2007) and prima facie, discounts the role played by instructors in e-book adoption behaviour. However, recommendation was found to be significant when the moderating effect of programme of study was considered (see Finding 5.12.5, p. 148).

16. Respondents largely agreed that they used Library e-books because they had prior personal experience of using e-books (item 3.24). The effect size was large. This finding is consistent with previous studies (e.g. Woody, Daniel, & Baker, 2010). Awareness (item 3.1 of survey) is also positively associated with prior experience of using e-books ($n = 204$, $df = 16$, chi-square = 46.62, MC sig. < .002, effect size $\phi = .48$, medium) (see Appendix K for contingency data table). *The finding is supportive of the role of familiarity from Shin's (2011) UGE model and culture of use (habituation)*

17. Respondents were either in agreement or strongly in agreement that they used Library e-books due to convenience (item 3.25). The effect size was large. This finding is consistent with previous studies (e.g. CIBER, 2008; Huang, 2013; Nicholas, Rowlands, & Jamali, 2010; Rowlands et al., 2007). *The finding is supportive of the role of TAM's utility.*

18. Respondents largely agreed that they used Library e-books due to functionality features (item 3.26). The effect size was large. This finding is consistent with previous studies (e.g. CIBER, 2008; Jamali, Nicholas, & Rowlands, 2009). *The finding is supportive of the role of TAM's utility, UTAUT's performance expectancy and ECT's expectation confirmation.*

19. Respondents largely disagreed that they preferred audio version of Library e-books (item 3.27). The effect size was large. Audio versions of e-books may also be viewed as an accessibility feature aligned with the role of UTAUT's facilitating conditions and IDT's compatibility. However, as a multimedia feature, no support could be found in the sample.

20. A large cohort of respondents either agreed (117) or strongly agreed (64) that e-books and e-journals were different (item 3.30). However, some users were undecided (85),

disagreeing (22), and strongly disagreeing (3). The effect size was large. Levine-Clark (2006) and Hernon, Hopper, Leach, Saunders, and Zhang (2007) also found that some students did not distinguish between e-books and e-journals. A Pearson chi-square crosstabulation showed that users who had prior experience of using e-books (item 3.24) were more likely to differentiate e-books and e-journals (n = 205, df = 16, chi-square = 40.03, MC sig. < .006, effect size ϕ = .44, medium) (see Appendix K for contingency data table). *The finding is supportive of the roles of familiarity from Shin's (2011) UGE model, as well as culture of use.* Importantly the finding is suggestive of maturation in use of electronic sources manifested by increased awareness of difference between formats i.e. e-resources information literacy.

21. Respondents were largely undecided that current Library e-book collections satisfied their needs (item 3.12). The effect size was large. *The finding is related to the role of perceived content quality from Shin's (2011) UGE model aligned with TAM's utility and UTAUT's performance expectancy.*

5.2.9.1 Preference for Format (Item 3.2)

A chi-square test for goodness of fit (with α = 0.05, df = 4) indicated that respondents in response to the survey item (3.2 for all respondents, n=315) "I prefer hard copy books to e-books" agreed that they preferred hardcopy books to e-books with medium effect size (*w* = .39). Table 5.9 describes the frequency data.

Table 5.9. Frequency of Preference for Format of Book (r = 273)

	I prefer hard copy books to e-books (item 3.2)					
Respondent Category	SD	D	U	A	SA	Row total
Faculty	0	6	3	8	7	24
General staff	2	6	6	11	5	30
Students	10	39	47	55	47	198
All respondents	15	58	59	80	61	273

Overall, 51.65% of respondents (r = 141) preferred physical books to e-books. Preference for e-books was 26.7% (r = 73) of all users (r = 273). A further chi-square test for goodness of fit indicated that distribution of only student responses for preference of format was statistically significantly different (n = 198 (sum of row total), df = 4, chi-square = 30.89, $p < .001$, $w = .39$). Students prefer hardcopy books with medium effect size.

Other related survey findings indicated the same, for example, respondents in response to the item (3.11) largely preferred physical books to e-books when both were available with medium effect size ($w = .44$). Similarly, respondents in response to the item (3.15) largely agreed that they used Library e-books when their physical counterparts were not available with large effect size ($w = .88$). The result is consistent with previous studies identifying hardcopy books as preferred (e.g. Abdullah & Gibb, 2008a; Bierman, Ortega, & Rupp-Serrano, 2010; Bratanek, 2013; CIBER, 2008; Li et al., 2011; McGowan, Stephens, & West, 2009; McLure & Hoseth, 2012; Smyth & Carlin, 2012; Shelburne, 2009; Taylor, 2013; Walton, 2008; Woody, Daniel, & Baker, 2010; Zhao & Abuizam, 2013). Why do users prefer hard copy books to e-books? Other findings in the survey show that user attitudes are shaped by utility, usability and intimacy, found in the TAM, UTAUT and Shin's (2011) UGE model. The finding is also supportive of the roles of intimacy (MacWilliam, 2013; Shin) and habituation (Park, 2007) with particular format.

Free-text comments describe perceptions and attitudes that assist in explaining what is observed in the test result. Table 5.14 provides a classification by theme of open ended comments concerning issues with the technology. The top ranked issues in descending order were related to DRM (TAM/UTAUT), usability (TAM/UTAUT), verisimilitude/intimacy (UGE) and platform/devices.[38] Examples include:

[38] Vide Section 5.2.15.

- "... Most of the time it [e-book] freezes and cuts you off while doing downloads".
- "Paper books are easier to read and quicker to scan through".
- "... The actual sensory feeling of picking up a book and reading it, adds to the pleasure - while reading a book on a tablet is devoid of that sense and seems abstract".

CIBER (2008) and Li et al. (2011) argue that preference for print books is attributable to the discomfort of on-screen extended reading for long periods. According to Zhao and Abuizam (2013), reading traditional, print books was easier and more pleasurable. Data in the current study is supportive. For example, this study found that respondents disagreed that Library e-books were suitable for longer reading with large effect size (Finding 5.10.9, p. 142). A Pearson chi-square crosstabulation (survey items 3.2 and 3.16) also confirmed that users who found Library e-books unsuitable for longer reading were more likely to prefer hardcopy books to e-books (n = 262, df = 16, chi-square = 64.07, MC sig. = .000, effect size ϕ = .50) with large effect size.[39]

Finding 5.11:

(1). Overall, approximately 52% of respondents (n= 273) preferred physical books to e-books, while around 22% were undecided. Around 26% of respondents' first choice was an e-book.

(2). The findings that (a) students prefer hardcopy books to e-books (medium-effect), (b) users prefer physical books to e-books when both were available (medium effect), and (c) they use Library e-books when their physical counterparts are not available (large effect), were statistically significant. Finding 5.10.9 and the results of crosstabulation (in this section) suggested that the unsuitability of Library e-books for longer reading is an important reason of preferring hardcopy books to e-books. *The finding endorses the usability/effort expectancy factor (TAM, UTAUT) in shaping behaviour.*

[39] Vide Appendix L for test results, data charts, and contingency table of this Section 5.2.9.1.

5.2.9.2 User Perception of ECU E-books and Demography: Crosstabulation

(Survey items 3.1-3.30 vs. items 7.1 -7.5)

Crosstabs and chi-square tests of independence/contingencies were used to analyse the role of demographic control variables in user perception of ECU e-books. Statistically significant results are produced in Appendix M.

Serial-wise findings related to Table M1 and their corresponding contingency tables[40] are appended below. The table below describes findings with medium or better effect size.

Finding 5.12:

1. By age cohort, awareness of ECU e-books was different, with the following ranked findings: age 25-33 years (95% were aware), 34-42 years (93.33%), and 18-24 years (86.11%). The effect size was medium. Controlling for other demographic variables, students (medium effect size) and males (large effect size) demonstrated the association. *Differences in awareness by age suggest nascent and mature patterns of e-books user behaviour in terms of awareness.*
2. Respondents with 3-5 years at ECU were more likely to be frustrated with Library e-book access, copy and print limits. The effect size of association was large. Controlling for other demographic variables, senior undergraduate students demonstrated the association with large effect size. *This finding suggests that DRM concerns grow with familiarity with e-books and this represents a dimension of maturation of e-book reading behaviour.*
3. Graduate (coursework) students were more likely to be satisfied with current Library e-book collections. The effect size of association was medium. *The finding is suggestive of maturation of e-book reading behaviour involving exploration of e-book collections and can also be related to task fitness, which demonstrated graduate*

[40] Vide Appendix M for test results and contingency tables.

(coursework) students' propensity to use e-books for assignment (coursework) purposes.[41]

4. Respondents with 3-5 years at ECU were more likely to be skim readers of Library e-books, typically. The effect size of association was medium. Controlling for other demographic variables, senior undergraduate students demonstrated the association with large effect size. *The finding connects with previous studies that also showed student preferences for skim reading (e.g. Nicholas et al., 2010).*
5. Students enrolled in undergraduate programmes were more likely to (a) access/use e-books via courseware embedded links, (b) demonstrate the effect of social or peer group influence and/or as a consequence of lecturer recommendation. The effect size was found to be medium. The finding on social influence (e.g. Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010; Rowlands et al., 2007) is consistent with UTAUT and the use of embedded links by this group has been observed in previous studies (e.g. Bierman, Ortega, & Rupp-Serrano, 2010; CIBER, 2009b; Nicholas et al., 2009b). *This kind of pattern of use suggests a phase of nascent information behaviour.*
6. Honours/HDR students were more likely to attribute their use of Library e-books to prior personal experience of using e-books. The effect size of association was medium. *The finding is suggestive of familiarity (Shin's UGE model), maturation of behaviour and information literacy as contributors to e-book information behaviour.*

5.2.9.3 Use of Electronic Resources/Platforms and User Perception: Crosstabulation

(Items 4a.1-4a.9 vs. Items 3.1-3.30)

Users were asked on an ordinal scale to self-assess their frequency of using electronic platforms according to agent type (PC, Laptop, Tablet, iPad, Smartphone, E-book reader). In the same section, users described their frequency of using electronic resources (online games, social media and e-journals) for online work of all kinds.

[41] Findings 5.2.1, p. 125, and 5.6.3, p. 133.

These items were crosstabulated using Pearson chi-square with 16 degrees of freedom with user perception items 3.1-3.30. The analysis was expected to shed light on culture of use, facilitating conditions (UTAUT), utility and usability (TAM and UTAUT), familiarity (UGE), hedonic attributes (TAM), and information behaviour as moderated by agent type. The analysis consists firstly of crosstab results followed by findings. Table 5.10 presents the statistically significant results (n=315).

Table 5.10. Use of Electronic Resource/Platform vs. Perception/Attitude: Crosstabs

Sr	**E-Resource / Platform (Frequency of use) (Part 4a)**	**Perception/Attitude (Part 3) (Items 3.1-3.30)**	**Pearson Chi-square statistics**			
			r	χ^2	*Sig (MC)*	Effect Size ϕ
1	4a.1. Desktop PC	3.1. The ECU Library has e-books in its collection	202	35.64	.004	.42, Medium
2	4a.9. Library e-journals	3.3. The Library interface for finding e-books is easy to use	263	36.73	.002	.37, Medium
3	4a.9. Library e-journals	3.5. I have experienced problems accessing Library e-books over the Internet	287	39.91	.001	.37, Medium
4	4a.9. Library e-journals	3.7. The Library e-book text window is too small	285	39.99	.001	.38, Medium
5	4a.1. Desktop PC	3.10. Searching e-books for the information I need is easy	203	35.80	.003	.42 Medium
6	4a.9. Library e-journals	3.12. Current Library e-book collections satisfy my needs	270	36.04	.003	.37, Medium
7	4a.9. Library e-journals	3.13. Library e-book formats are attractive	287	34.92	.004	.35, Medium
8	4a.6. E-book reader	3.14. Typically, I skim read Library e-books	203	52.90	.001	.51, Large
9	4a.9. Library e-journals	3.30. E-books and e-journals are different	289	44.71	.000	.39, Medium

Serial-wise findings related to Table 5.10 and their contingency tables[42] are as follows.

Finding 5.13:

1. Frequent Desktop PC users were more likely to be aware of ECU Library e-books. The effect showed medium level strength. The peer reviewed literature is also supportive of desktop PC as a preferred agent for using e-books (e.g. Nicholas et al, 2010). The preferred agents for viewing library e-books are Desktop PC and laptop (see Finding 5.14, p. 154). The explanation is inclusive of usability factors (TAM/UTAUT) such as screen size (Finding 5.10.5, p. 141).
2. Users of Library e-journals are more likely to find the Library interface for finding e-books easy to use. Library e-journals are routinely used by students and academics. In the Library One Search interface, e-journals appear in results lists and e-books are signposted as a format in the results list, describing a common point of entry. More broadly this medium strength association suggests that users comfortable with the discovery interface for journal searching find this an efficient interface for accessing e-books as well. This points to the importance of facilitating conditions in technology adoption and habituation to e-resources (Figure 2.7, p. 68).
3. Users of Library e-journals at any level (n = 234) who experienced no access problems of Library e-books over the Internet were more (111, 47.44%) than those who experienced problems (83, 35.47%) or were undecided (40, 17.09%). The effect had medium level strength. Finding suggests that users efficient at connecting with one resource are likely to be efficient at connecting with other resources. In other words, where users identify an issue (or no issue) with facilitating conditions (Figure 2.7, p. 68) with one electronic format (e-journals), this is also likely to apply to another (e-books). Analysis is consistent with the observation that in practical terms, issues with platforms and connections will likely affect both formats in a similar manner. Other explanation includes accessing a shorter length journal article might be less problematic than accessing a whole e-book of longer length, especially if Internet speed plays a role (JISC, 2009). Previous research has also highlighted e-book access issues such as unsmooth browsing, accessing page-by-page, error

[42] Vide Appendix N for contingency tables.

messages and lock-out in rapid paging, and latency (Armstrong & Lonsdale, 2009).

4. Users of Library e-journals largely disagreed that the e-book text window was too small. Since the e-journal is a mature and well accepted format it appears that users of e-journals are well adapted to online formats including e-books i.e. users who find e-journals usable in terms of window size, are not likely to be troubled by this with e-books. This points to the importance of culture of use and usability (UTAUT/TAM) in technology adoption (Figure 2.7, p. 68). The preferred agents/platforms for viewing library e-books are Desktop PC and laptop (see Finding 5.14, p. 154). The explanation is inclusive of usability factors such as screen size (Finding 5.10.5, p. 141).
5. Desktop PC users found searching e-books for the information they need easy. In this study, the laptop and desktop PC are the preferred platforms for using e-books. Searching an e-book on desktop PC with a large display, involves better usability and hence less frustration to users. The effect had medium level strength. The finding points to the importance of usability and culture of use in technology adoption (Figure 2.7, p. 68).
6. Often and frequent users of e-journals largely agreed about the Library e-book collection sufficiency. The effect had medium level strength. The finding suggests that users who are receptive to or seek out e-journals are efficient at connecting with e-books and hence are more likely to be satisfied with collections. Information literacy required for efficient use of e-journals is similar to e-books. The finding is an endorsement of culture of use (user preference for online resources), and utility (Figure 2.7, p. 68), since e-journals and e-books commonly appear together in results lists.
7. Often and frequent users of e-journals largely agreed that the Library e-book formats were attractive. The effect had medium level strength. Thus users satisfied with the e-journal experience are more likely to be satisfied with the e-book experience in terms of perceived pleasantness. The finding is consistent with the similarity of the formats and endorses the idea of hedonic attributes as important in acceptance. It is also a reflection on habituation and culture of use.
8. The data show that no or infrequent users of e-book readers typically skim read Library e-books. Respondents who self-reported as frequent users of e-book readers were less likely to self-report as skim readers. The effect size was large. The result suggests that habituation in reading habits can grow from platform characteristics and shape information behaviour. Peer reviewed literature shows that e-book readers are

typically used for leisure/fictional, linear reading (e.g. Browne & Coe, 2012); also consistent with an open-ended comment "I use a kindle for 'recreation reading' and laptop for acessesing [sic] library ebooks for uni coursework & assignments" (see Appendix R4). Browne and Coe further note that current academic/non-fiction e-books are less successful where navigation through browse, search, and indexes is crucial, and where complex formatting (e.g. tables, figures, and sidebars) may make it difficult. The finding is an endorsement of automaticity/habituation and culture of use.

9. Users of e-journals were more likely to differentiate e-book and e-journals. Consistent with finding 6 above as users of both the formats are in a better position to know the difference between both the resources. Information literate users of information sources are equipped at making this distinction.

5.2.10 Satisfaction with E-Book Use Platforms and Expectation Confirmation

This part of the survey (Part 4b) invited ECU or third party e-book users (Part 1, n=264) to assess their satisfaction level with e-book use media/platforms on a five-point scale (r = # of responses, VU = Very Unsatisfied, U = Unsatisfied, N = Neutral, S = Satisfied, VS = very Satisfied). Descriptive statistics (Mode) and chi-square test for goodness of fit with four (4) degrees of freedom at $\alpha = 0.05$ was conducted for each item.

A chi-square test for goodness of fit test showed that users' satisfaction level with each e-book use platform was statistically significantly different with large effect sizes for all platforms. According to descriptive statistics (Mode) and the effect size of chi-square goodness of fit test only laptop/netbook ($w = .68$) and desktop PC ($w = .75$) rated well in terms of user satisfaction. All other platforms showed ambivalent (neutral) responses and the results were found to be significant accordingly. At this point in time, platforms other than laptop/netbook and desktop PC do not provide a satisfying experience with library e-books. Table 5.11 reports the statistics.

Table 5.11. Users' Satisfaction Level with E-book Use Platforms: Goodness of Fit

Platform	**r**	**1-VU**	**2-U**	**3-N**	**4-S**	**5-VS**	**Mode**	χ^2	***p***
Laptop, netbook	237	0	14	42	124	57	4	110.43	.000
Desktop PC	230	2	10	63	93	62	4	130.13	.000
iPad	221	6	12	113	48	42	3	164.00	.000
Smartphone	218	15	50	92	45	16	3	90.95	.000
Tablet (other than iPad)	210	6	12	143	31	18	3	311.76	.000
Kindle	202	11	7	145	22	17	3	341.76	.000
Other E-book reader	204	7	11	153	25	8	3	390.80	.000
Kobo	198	13	9	164	5	7	3	489.37	.000

These findings are comparable with prior studies, for example, Broadhurst and Watson (2012) argue that "students also agreed that even if they were supplied with an iPad or other tablet PC, they would still want laptops for other study purposes as it would not fulfil all of the functions required for their day-to-day study" (p. 175). In their survey of distance university students, Brahme and Gabriel (2012) reported that "no participants preferred reading on a tiny, smartphone-sized screen" (p. 190). After two trials of seven, popular e-book readers by staff and students followed by discussion Huthwaite et al. (2011) found that no device could come up to the expectations against the predetermined criteria of usability, functionality, accessibility and compatibility with QUT Library's e-book collection and DRM issues. Richardson and Mahmood's (2012) evaluation of user satisfaction and usability concerns related to five of the leading e-book readers (Amazon's Kindle, Apple's iPad, Barnes & Noble's Nook, Borders' Kobo, and Sony's Digital Reader) through a survey of 81 information studies graduate students at the University of California found that despite having advantage of portability and multiple books the respondents were unsatisfied with the navigation, loaning, and licensing of titles. Schomisch, Zens, and Mayr (2013) with regard to user test of Amazon Kindle 2, Sony Reader, Onyx Boox, and Apple TabletPC iPad assert

that "... e-readers do not yet fit seamlessly into the established chain of scholarly text-processing..." (p. 388).

Finding 5.14:

In terms of agent/platform satisfaction, Desktop PC (*w* = .75) and Laptop/netbook (*w* = .68) had most satisfied users. The chi-square test for goodness of fit was significant with large effect size. Users of agents/platforms with small screen sizes demonstrated ambivalence.

5.2.11 Expectation Confirmation and Gratification for ECU E-books

A five point Likert scale was used to rate overall satisfaction with ECU Library e-books (item 3.28). A chi-square test for goodness of fit (with $\alpha = 0.05$, df = 4) indicated strong agreement with the proposition of overall satisfaction with a large effect size (*w* = .93). Other studies showing satisfaction with their library e-books include, for example, Croft and Davis (2010), Li et al. (2011), Zhao and Abuizam (2013: with a survey sample of 25 business students). The finding is supportive of the role of gratification as a result of expectation confirmation (ECT /UGT) frameworks.

Which factors of e-book use are related to overall user satisfaction with ECU e-books? Do the data support a role for expectation confirmation as expressed in the (ECT /UGT) frameworks? ChanLin (2013) citing Wilson et al. argues that on the basis of their prior, online experiences users exhibit definite preconceived expectations regarding how e-book tools should operate (p. 331). The analysis that follows seeks to understand the phenomenon of satisfaction in terms of confirmation of expectations of collection relevancy, sufficiency, customisation, format attractiveness and discovery.

5.2.11.1 User Perception and Satisfaction Overall for ECU E-books

Table 5.12 presents the statistically significant relationships between ranked perception factors (part 3 of survey, items 3.1-3.30) and satisfaction overall (item 3.28) with 16 degrees of freedom.

Table 5.12. User Perception and Satisfaction for ECU E-books: Crosstabs

		Item 3.28. I am satisfied overall with ECU Library's e-books			
Rank	**User Perception (with survey item #)**	n	χ^2	*Sig (MC)*	Effect Size ϕ
1	Current Library e-book collections satisfy my needs (3.12).	205	88.59	.000	.66, large
2	The Library interface for finding e-books is easy to use (3.3).	203	77.86	.000	.62, large
3	Existing Library e-book customisation features are inadequate to meet my needs (3.6).	205	56.52	.000	.53, large
4	Library e-book formats are attractive (3.13).	205	48.34	.001	.49, medium
5	I use Library e-books due to convenience (3.25).	205	47.06	.001	.48, medium
6	Using library e-books is a pleasant experience (3.19).	205	45.19	.001	.47, medium
7	I have experienced problems accessing Library e-books over the Internet (3.5).	205	40.77	.002	.45, medium
8	Finding information in e-books is difficult (3.20).	205	32.86	.010	.40, medium

Rank-wise interpretation of the results in Table 5.12 and their contingency tables[43] is appended below.

<u>Finding 5.15</u>:

1. Users who were satisfied with e-book collection titles sufficiency were more likely to be satisfied overall, with a large effect size. Satisfaction increases when perception of e-book collection sufficiency increases. The effect size was large. *The finding endorses utility (TAM/UTAUT), expectation confirmation (ECT), and gratification (UGT) as important in user acceptance of e-books.*

[43] Vide Appendix O for contingency data tables.

2. Users who found the Library discovery interface easy to use for finding e-books were more likely to be satisfied overall, the second largest effect factor. The effect size was large. *The finding endorses facilitating conditions (UTAUT) and gratification (UGT) as important in user acceptance of e-books.*
3. Users who were disagreeing or undecided that existing Library e-book customisation features were *inadequate* to meet their needs were more likely to be overall satisfied e-book users, the third largest effect factor. The effect size was large. *The finding endorses utility (TAM/UTAUT), expectation confirmation (ECT), and gratification (UGT) as important in user acceptance of e-books.*
4. Users who found e-book formats attractive were more likely to be satisfied overall. The effect size was medium. *The finding endorses hedonic attributes (TAM), confirmation (ECT), and gratification (UGT) as important in acceptance of e-books.*
5. Users who found library e-books convenient to use were more likely to be satisfied overall. The effect size was medium. *The finding endorses utility (TAM/UTAUT), confirmation (ECT), and gratification (UGT) as important in acceptance of e-books.*
6. Users who found library e-books pleasant to use were more likely to be satisfied overall. The effect size was medium. *The finding endorses hedonic attributes (TAM), confirmation (ECT), and gratification (UGT) theories as important in user acceptance of e-books*.
7. Users who disagreed that they experienced problems accessing Library e-books over the Internet were more likely to be overall satisfied e-book users. The effect size was medium. *The finding endorses UTAUT's facilitating conditions (e.g. accessibility) and gratification (UGT) as important in user acceptance of e-books.*
8. Users who disagreed that finding information in e-books was difficult were more likely to be overall satisfied e-book users. The effect size was medium. *The finding endorses utility and usability (TAM/UTAUT), expectation confirmation (ECT), and gratification (UGT) as important in user acceptance of e-books.*

Shin (2011) empirically found positive effects of expectation confirmation, perceived usefulness (utility), and perceived ease of use (usability) on perceived gratification (satisfaction) with e-books without mention of particular items in each construct and their effect sizes.

5.2.11.2 E-Book Discovery Pathways and Satisfaction Overall with ECU E-books

The relationship between e-book access method (Part 5b) and satisfaction overall with ECU e-books (item 3.28) was assessed using Pearson chi-square crosstabs with n = 198, df = 4. Two statistically significant associations of satisfaction overall for ECU e-books were found with Library's OneSearch (item 5b.4) (χ^2 = 14.69, p < .006, φ = .27, small), and Library databases (item 5b.5) (χ^2 = 9.95, p < .043, φ = .22, small).[44]

5.2.11.3 Satisfaction with E-Book Use Platforms and Satisfaction overall with ECU E-books

In Section 5.2.10, it was described how users were invited on a Likert scale to rate their satisfaction with various user agents (Desktop PCs, laptops, tablets and e-book readers). The investigation showed strong preference for Desktop PCs and laptops. The investigation in this section is based on a crosstabulation of platforms used and overall satisfaction with ECU e-books. Confirmation of the earlier finding was obtained with statistically significant relationship found between satisfaction with laptop, netbook (item 4b.2) and satisfaction overall with ECU e-books (item 3.28) (n = 196, df = 12, χ^2 = 42.26, MC sig = .000, ϕ = .46, medium).[45] Of 153 users satisfied with laptop/ netbook, 122 (79.74%) were also satisfied with ECU e-books (sum of response values 4 and 5 of both the variables).

<u>Finding 5.16</u>:

1. Users satisfied with the performance of (a) discovery tool (Library's OneSearch) and (b) Library databases were more likely to be satisfied overall with ECU e-books. However, the effect size was small. *The finding endorses facilitating conditions (UTAUT) and gratification (UGT) as important in user acceptance and engagement of e-books.*

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[44] Vide Appendix O for contingency data tables.

[45] Vide Appendix O for contingency data table.

2.	Users satisfied with laptop, netbook as a user agent were likely to be satisfied overall with ECU e-books. The effect of the relationship had medium-sized strength. *The finding endorses culture of use, usability (TAM/UTAUT), confirmation (ECT), and gratification (UGT) as important in user acceptance and engagement of e-books.*

5.2.12 Expectation Confirmation and Continuance Intention for ECU E-books

In Section 5.2.11, strong agreement with the proposition of overall satisfaction with e-books was reported with a large effect size (w = .93). Continuance intention overall (survey item 3.29) was measured with a five-point Likert scale. Does such *satisfaction* translate into *continuance intention?*

5.2.12.1 Association between Satisfaction Overall and Continuance Intention

According to Bhattacherjee (2001) and Zhou (2011) users compare their expectation and perception of performance of a product to form satisfaction. They further argue that a user is satisfied if perceived performance equals or exceeds user expectation, and is dissatisfied, if this condition is not met. Satisfied users reuse or form an intention to reuse the product in future, whereas dissatisfied patrons do not.

In this survey continuance intention (item 3.29) as DV was crosstabulated with IV (item 3.28. satisfaction) using Pearson chi-square. The test was found to be statistically significant (n = 205, df = 16, χ^2 = 68.19, MC sig = .000, effect size ϕ = .58, large).[46] Satisfaction has a large effect on continuance intention. There is a great probability that a satisfied user would continue using e-books in future (Figure 5.4). Another noteworthy finding (5.15.3) concerns user reaction to customisation and its implications for overall satisfaction with e-books. This is discussed in sections 5.2.14 and 5.3.5.1.

[46] Vide Appendix P for contingency data table.

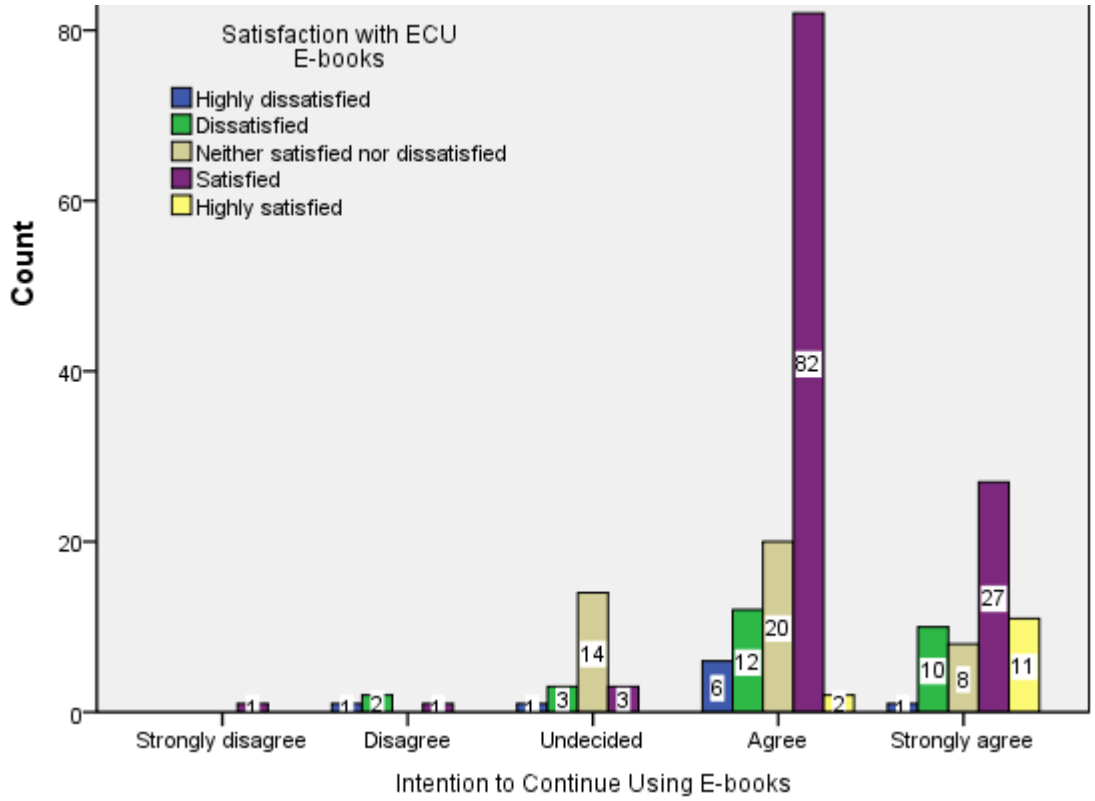

Figure 5.4. Satisfaction vs. continuance intention for ECU e-books

<u>Finding 5.17</u>:

Users satisfied overall with ECU Library e-books were much more likely to express continuance intention. The effect size was large. *The finding consistent with Shin (2011) endorses expectation confirmation (ECT) and gratification (UGT) as important in user acceptance and re-engagement of e-books.*

5.2.12.2 User Perceptions and Continuance Intention

Are user perceptions of e-book convenience, pleasantness, information retrieval and usability for extended reading related to overall user continuance intention for ECU e-books? In this round of testing overall continuance intention (item 3.29) was crosstabulated with items (3.1-3.30) of the survey using Pearson chi-square contingencies.

Table 5.13 presents the statistically significant relationships between ranked factors of user perception and continuance intention overall with n = 205, df = 16.

Table 5.13. User Perception and Continuance Intention for ECU E-books: Crosstabs

		Item 3.28. I intend to continue using e-books		
Rank	**User Perception (with survey item #)**	χ^2	*Sig (MC)*	Effect Size ϕ
1	I use Library e-books due to convenience (3.25)	152.61	.000	.86, Large
2	Using library e-books is a pleasant experience (3.19)	84.24	.000	.64, Large
3	Library e-book formats are attractive (3.13)	81.87	.000	.63, Large
4	Finding information in e-books is difficult (3.20)	76.45	.000	.61, Large
5	I use Library e-books because I have prior personal experience of using e-books (3.24)	71.36	.000	.59, Large
6	Searching e-books for the information I need is easy (3.10)	66.96	.000	.57, Large
7	Library e-books are hard to read on my screen (3.4)	60.04	.000	.54, Large
8	I use Library e-books due to functionality features (3.26)	52.76	.000	.51, Large
9	Library e-books are suitable for longer reading (3.16)	47.83	.008	.48, Medium
10	Typically, I use unit's/subject's embedded links to access e-books (3.21)	44.44	.007	.47, Medium
11	I prefer Library e-books to physical books when both are available (3.11)	42.87	.000	.46, Medium
12	I have experienced problems accessing Library e-books over the Internet (3.5)	41.74	.005	.45, Medium
13	Mostly, I only view Table of contents (TOC) pages of Library e-books (3.18)	38.78	.008	.44, Medium

Rank-wise interpretation of the results in Table 5.13 and their contingency tables[47] is appended below.

[47] Vide Appendix P for contingency data tables.

Finding 5.18:

1. Users who used Library e-books due to convenience (anywhere, always accessibility without subject to physical book lending rules) were more likely to express continuance intention, the largest effect factor. The effect size was large. *The finding endorses the notions of utility and performance expectancy (TAM/UTAUT) as important in user engagement with e-books, as measured by continuance intention.*
2. Users who found using library e-books a pleasant experience were more likely to express continuance intention, the second largest effect factor. The effect size was large. *The finding endorses perceived hedonic attributes (TAM, Venkatesh, 2000) as important in user acceptance of and re-engagement with e-books.*
3. Users who found Library e-book formats attractive were more likely to express continuance intention, the third largest effect factor. The effect size was large. *The finding endorses perceived hedonic attributes (TAM) as important in user acceptance of and re-engagement with e-books.*
4. Users who did not experience finding information in e-books difficult were more likely to express continuance intention. The effect size was large. *The finding endorses performance and effort expectancies (UTAUT) as important in user acceptance and engagement of e-books.*
5. Users who used Library e-books because of their prior personal experience of using e-books were more likely to express continuance intention. The effect size was large. *The finding endorses culture of use, habituation, and familiarity (Shin, 2011: UGE model) as important in user acceptance and engagement of e-books.*
6. Users who found searching e-books for the needed information easy were more likely to express continuance intention. The effect size was large. *The finding endorses facilitating conditions and effort expectancy (UTAUT) as important in user acceptance and engagement of e-books.*
7. Users who did not find Library e-books hard to read on their screens were more likely to express continuance intention. The effect size was large. *The finding endorses culture of use, usability and effort expectancy (TAM/UTAUT) as important in user acceptance and engagement of e-books.*
8. Users who used Library e-books due to functionality features (full-text searching, highlighting, bookmarking, annotating, downloadability, user customisation) were more likely to express continuance intention. The effect size was large. *The finding endorses utility and performance expectancy (TAM/UTAUT) and gratification (ECT/UGT) as important in user acceptance and engagement of e-books.*

9. Users who found Library e-books either suitable or unsuitable for longer reading expressed continuance intention. The effect size was medium. It appears that utility or performance expectancy overcomes usability and effort expectancies (TAM/UTAUT). According to Venkatesh (2000), perceived enjoyment or playfulness (a hedonic attribute in TAM) lowers the perceptions of effort.
10. Users who typically accessed e-books via embedded courseware links were more likely to express continuance intention. The effect size was medium. *The finding endorses facilitating conditions (UTAUT) as important in user acceptance and engagement of e-books.*
11. Users who agreed or disagreed that they preferred Library e-books to physical books when both were available expressed continuance intention. The effect size was medium. The interpretation of this finding is similar to finding 9 above as well intimacy for a particular format from Shin's (2011) UGE model.
12. Users who did not experience problems accessing Library e-books over the Internet were more likely to express continuance intention. The effect size was medium. *The finding endorses facilitating conditions (UTAUT) as important in user acceptance and engagement of e-books.*
13. Users who disagreed that they mostly, only viewed Table of contents (TOC) pages of Library e-books were more likely to express continuance intention. The effect size was medium. *The finding endorses the notions of utility and performance expectancy (TAM/UTAUT), and culture of use and habituation as important in user engagement with e-books*

Shin (2011) empirically found positive effects of gratification (satisfaction), intimacy, and familiarity on continuance intention of using e-books without mention of particular items in each construct and their effect sizes.

5.2.12.3 Task Fit and Continuance Intention

Data analysis also showed statistically significant association between e-book use for reasons unconnected with study programme and continuance intention. Continuance

intention (item 3.29) apparently benefits from fun/recreational use (item 5a.2), but the effect size was small (n = 201, df = 4, χ^2= 15.47, MC sig = .002, effect size overall ϕ = .28). Crosstabulation showed 61 respondents using e-books for fun/recreation, of these 56 (92%) expressed continuance intention.[48]

5.2.12.4 E-Book Discovery Pathways and Continuance Intention

Relationship between e-book access methods (Part 5b) and continuance intention (item 3.29) was assessed using Pearson chi-square crosstabs. The only statistically significant association was found between Library's OneSearch (5b.4) and continuance intention (n = 198, df = 4, χ^2 = 21.25, MC sig = .000, φ = .33, medium).[49]

Finding 5.19:

1. Users who used e-books for fun/recreation purpose were more likely to express continuance intention. However, the effect size was small. *The finding endorses utility (TAM/UTAUT), confirmation (ECT), and gratification (UGT) as important in user re-engagement of e-books.*
2. Users satisfied with the performance of discovery tool (Library's OneSearch) were likely to express continuance intention (relationship with medium-level strength). *The finding endorses facilitating conditions (UTAUT) and expectation confirmation (ECT) as important in user re-engagement of e-books.*

5.2.13 Other Factors affecting E-book Use Behaviour

The effect of different factors and use of ECU e-books (item 1.1) were crosstabulated using Pearson chi-square testing. Appendix Q presents the statistically significant

[48] Vide Appendix P for contingency data table.

[49] Vide Appendix P for contingency data table.

results with four (4) degrees of freedom. Serial-wise interpretation of the findings based on results presented in Table Q1 and their contingency tables[50] is appended below.

Finding 5.20: Respondents who used ECU e-books were:

1. In agreement that Library interface for finding e-books was easy to use. The effect size was medium. *The finding endorses facilitating conditions (UTAUT) as important in shaping use behaviour.*
2. In disagreement that they had experienced problems accessing Library e-books over the Internet. The effect size was medium. *The efficient facilitating conditions (UTAUT) are likely to shape use behaviour.*
3. In disagreement with the idea of the Library e-book text window being too small. The effect size was medium. *The lower the usability effort (TAM/UTAUT) the greater likely of adoption.*
4. In agreement that Library e-book access, copy and print limits were frustrating. The effect size was medium. *Finding 5.12.2 showed that DRM concerns grow with years at ECU and hence represents a dimension of maturation of e-book information behaviour.*
5. In agreement that current Library e-book collections satisfied their needs. The effect size was medium. *Finding 5.12.3 showed that graduate (coursework) students displayed this association involving exploration of e-book collections and hence represents a dimension of maturation of e-book information behaviour. The finding endorses the role of utility and performance expectancy (TAM/UTAUT) or task fitness in shaping use behaviour.*
6. In agreement that Library e-book formats were attractive. The effect size was medium. *The finding endorses the role of hedonic attributes (TAM) in shaping use behaviour.*
7. In agreement that using Library e-books was a pleasant experience. The effect size was small. *The finding endorses the role of perceived enjoyment or hedonic attributes (TAM) in shaping use behaviour.*
8. In disagreement that finding information in e-books was difficult. The effect size was medium. *The finding endorses performance and effort expectancies (UTAUT) as*

[50] Vide Appendix Q.

important in shaping use behaviour.

9. Also users of library e-journals. Conversely, non-users of e-journals were also likely to be non-users of ECU e-books. The effect size was medium. *The finding endorses culture of use as important in shaping use behaviour. Users of one digital format are likely to be users of another like format.*

5.2.14 User-based E-book Customisation

Customisation is the tailoring of e-book content to user needs within the boundaries defined and allowed by the e-book system (e.g. EBL, Ebrary). There were two items in the survey (3.6 and 3.26) which aimed to measure attitude towards customisation aligned with TAM's utility and UTAUT's performance expectancy. A chi-square test for goodness of fit (with $\alpha = 0.05$, df = 4) indicated that respondents were largely undecided about the inadequacy of existing Library e-book customisation features (item 3.6) (consistent with e.g. Bierman, Ortega, & Rupp-Serrano, 2010). The effect size was large ($w = .81$). Such ambivalence is consistent with a sample skewed towards immature, unsophisticated undergraduate users who have little experience of online customisation and personalisation. The result is also consistent with the observation that currently few opportunities exist for customisation of e-books offered on library platforms. It is also consistent with a finding from transaction log analysis that few power users exist in the sample.[51]

Elsewhere, findings were more supportive of the role of customisation in adoption and formation of continuance intentions. For example, crosstabulation of responses to items on functionality (including customisation) (3.26) and continuance intention (3.29) showed customisation as one of the functionality features underpinning adoption of library e-books and continuance (Findings 5.10.18 and 5.18.8; the user response was emphatic involving large effect sizes ($w = .57$; $\varphi = .51$). In this respect, this research is

[51] Vide Chapter Seven, Section 7.4.5.

supportive of a finding from other research of the importance of customisation, including work by Bierman, Ortega, and Rupp-Serrano (2010). The role of customisation in shaping user experience is explored further in section 5.3.5.1.

5.2.15 Reported Issues with E-books: Open-ended Comments

This part of the survey (Part 6) collected open-ended additional information in the form of comments or suggestions. In total 100 respondents (academics 7, students 73, staff 19, unknown 1) contributed to this section. Some comments were those that had already been covered in other sections of the survey, for example, advantages of e-book use (convenience, functionality) and reasons of non-use. After cleaning there remained 67 usable responses. Table 5.14 ranks these comments theme-wise.

Table 5.14. Themes of Open-ended Comments (r = 67)

Theme	**No.**	**%**
Limitations/DRM	10	14.92
Usability	10	14.92
Verisimilitude, Intimacy, and Preference	9	13.43
Platform/Devices	9	13.43
Collection insufficiency and integration	6	8.96
Accessibility	5	7.46
Miscellaneous	5	7.46
Circumstantial use	4	5.97
Facilitating conditions	3	4.48
Forced adoption	2	2.99
Format	2	2.99
Target audience/Age factor	2	2.99
Total	**67**	**100**

The respondents commented on the issues and benefits involved in e-book adoption. Their major e-book concerns addressed DRM restrictions, usability issues, agent limitations and as a result preference for physical books. Respondents rejected e-book loan periods and argued that e-book loan periods should be similar to physical books. Respondents also registered their concerns with different formats, download procedures

and apps associated with e-reader devices. They observed different experiences of using e-books on different agents and wanted uniform experience across devices. As evidenced by open ended comments, some respondents experienced eye strain and headache especially in extended reading, describing an important usability issue. Other issues involved jarring text when scrolling, small viewing area, unsmooth and time-consuming navigation between pages, and uneasy flicking. Issues with the ECU Library interface and e-book access and discovery pathways were also highlighted by some respondents. Three of the respondents asserted the need for more titles available in e-book format, describing an issue in perceived title insufficiency. Two of the respondents rejected forced e-book adoption [e.g. tasks and assignments based on e-book readings embedded in courseware, particularly when their physical counterparts were not available]. One of the older respondents observed visual issues (e.g. font size), while another was of the view that e-books are more suitable for the younger, more computer literate users. Appendix R analyses these comments in detail.

These findings are consistent with previous studies, for example, DRM restrictions (Hoseth & McLure, 2012; Jamali, Nicholas, & Rowlands, 2009), usability issues (Armstrong & Lonsdale, 2009; JISC, 2009) especially in longer reading (Li et al., 2011; Staiger, 2012), verisimilitude, intimacy, and preference for physical books (Bratanek, 2013; MacWilliam, 2013; Taylor, 2013; Zhao & Abuizam, 2013), issues with platform/devices and format (Armstrong & Lonsdale, 2009; CIBER, 2008; Huthwaite et al., 2011; JISC, 2009; Schomisch, Zens, & Mayr, 2013), collection insufficiency (Brahme & Gabriel, 2012; Letchumanan & Tarmizi, 2011a; Shin, 2011), discovery, access, and other facilitating conditions (Borchert et al., 2009; CIBER, 2008, 2009b; JISC, 2009; Konappa, 2014; Shelburne, 2009), task fit (Croft & Davis, 2010; Cumaoglu, Sacici, & Torun, 2013; Folb, Wessel, & Czechowski, 2011; Rajan, Jasimudeen, & Mathew, 2012; Rowlands et al., 2007; Shelburne, 2009; Walton, 2014), embedded courseware links (Bierman, Ortega, & Rupp-Serrano, 2010; CIBER, 2009b; Nicholas et al., 2009b), forced adoption (Walton, 2012), and age factor and target audience (Shin, 2011; Venkatesh et al., 2003).

5.3 Discussion and Summary of Findings on Self-reported Information Behaviour

This section summarises the key findings of this chapter. Analysis and interpretation of survey data addressed first two research questions partially and the next two fully from the perspective of self-reported information behaviour as given below.

RQ1 & RQ2: What patterns of e-book use exist in the case study academic and research library and how can such patterns of use be understood?

5.3.1 Adoption Behaviour

Analysis of self-reported e-book user behaviour showed that in a convenience sample (consistent with Abdullah & Gibb, 2008a; Cumaoglu, Sacici, & Torun 2013; Roesnita & Zainab, 2005; Walton, 2012, 2014) of ECU users, awareness of e-books existed with a large effect size.[52] Participants are well informed about the existence of e-books (consistent with Borchert et al., 2009). However, comparable with previous studies (e.g. Borchert et al.; JISC, 2009; Nicholas et al., 2008), adoption behaviour for library e-books encompasses only two-thirds (213/315, 67.62%) of users, with 31.43% (99/315) of sample respondents comprising non-users.

Participants self-report good literacy in term of capacity to discriminate online formats efficiently[53] (consistent with Hernon et al., 2007; Levine-Clark, 2006). Information literacy also facilitates e-book use as positive association exists between ECU Library e-book adoption and e-book access methods via Library catalogue, Library's OneSearch, Library databases, and bookseller websites, respectively, with medium effect.[54] Findings on e-book discovery pathways are consistent with previous studies

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[52] Finding 5.10.1 p. 140.

[53] Finding 5.10.20, pp. 143-144.

[54] Finding 5.7.2, p. 136.

(e.g. Borchert et al., 2009; Cumaoglu, Sacici, & Torun, 2013; Foote & Rupp-Serrano, 2010; JISC, 2009; Li et al., 2011). Findings on the role of information literacy inclusive of format discrimination and information retrieval knowledge and skill, point to information literacy as a facilitating factor for e-book adoption and use (see Section 5.3.3). Subject to the limitations of sampling and the response, the study has been able to demonstrate this relationship quantitatively and appears to be pioneering in this way.

Patterns of e-book use also showed that the e-book has yet to fully strengthen its roots against physical/print book (p-book) with large to medium effect sizes. Users' first preference was a p-book and users mostly used e-books when there was no alternative. In terms of information behaviour, e-book usage largely circled around quick browsing for fact extraction, rather than extended reading suggestive of higher level cognitive activity.[55] Findings in this area are consistent with previous research (e.g. Abdullah & Gibb, 2008a, 2008b; Bierman, Ortega, & Rupp-Serrano, 2010; Bratanek, 2013; CIBER, 2008; Gregory, 2008; Jamali, Nicholas, & Rowlands, 2009; Letchumanan & Tarmizi, 2011a; Li et al., 2011; McGowan, Stephens, & West, 2009; McLure & Hoseth, 2012; Nicholas, Rowlands, & Jamali, 2010; Rajan, Jasimudeen, & Mathew, 2012; Roesnita & Zainab, 2005; Smyth & Carlin, 2012; Shelburne, 2009; Taylor, 2013; Walton, 2008; Woody, Daniel, & Baker, 2010; Zhao & Abuizam, 2013).

5.3.2 Other Facilitating Factors: Culture of Use, Habituation/Automaticity and Peer Effects

No large-scale discovery issues with e-book titles were found (consistent with Cumaoglu, Sacici, & Torun, 2013; Foote & Rupp-Serrano, 2010; JISC, 2009; Li et al., 2011). Consistent with culture of use, users of other digital formats (e.g. Library e-journals) found the Library interface for finding e-books easy to use.[56]

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[55] Findings 5.10.8 (p. 141) and 5.10.10 (pp. 142).

[56] Findings 5.13.2 (p. 150).

Elsewhere, self-reported data on agents and reading habits also suggest crossover effects.[57] Reading habits shaped by one agent type (e.g. an e-book reader) are significantly associated with other agents (e.g. desktops). Reading habits with e-journals are also manifested with e-books; also non-users of e-journals were likely to be non-users of e-books as well.[58] Frequent users of e-book readers with features that support extended reading were much *less* likely to skim read e-books.[59] Further evidence of culture of use is provided by significant association between use of Library e-books and third party e-books.[60]

Analysis of self-reported e-book non-users showed that non-use of Library e-books was associated with non-use of the format more generally inclusive of other third party providers (e.g. Google, Amazon).[61] Reasons for non-use include lack of awareness, preference for hard copy books, issues with discovery, certain limitations on e-books due to DRM, and perceived unpleasantness.[62] Findings are consistent with previous research (e.g. CIBER, 2008; Croft & Davis, 2010; JISC, 2009; Shelburne, 2009).

However, subject to its limitations, findings in this research extends current understanding of the respective roles of habituation/automaticity and culture of use as factors shaping e-book adoption and behaviour. Subject to the limitations of the sample and the reliability of self-reported data, culture of use and habituation/automaticity involving preference for digital formats, agent types, and third party e-books have been revealed as important factor in e-book adoption and use. These factors can also be linked to growth in reader maturity (see Section 5.3.3).

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[57] Findings 5.13 (pp. 150-152).

[58] Findings 5.13.4, 5.13.6, 5.13.7 (p. 151) and 5.20.9 (p. 165)

[59] Finding 5.13.8 (p. 151).

[60] Finding 5.3 (p. 128).

[61] Ibid.

[62] Finding 5.4 (p. 129).

Social factors (Venkatesh et al., 2003) were considered by some authors to impact upon adoption (e.g. Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010; Rowlands, 2007). However, in these terms, this study has found the opposite, with users discounting the role played by instructors and peers in adoption behaviour with the exception of demographic moderation (i.e. early career students).[63] In this sense, outcomes from this study are discordant in terms of previous research.

5.3.3 Maturity and User Behaviour

Analysis of self-reported behaviour showed adoption behaviour is strongest in graduate coursework students, mature age students, and students with more years in higher education (consistent with Rowlands et al., 2007).[64] Intensity of engagement with e-books increases with familiarity as measured by programmes of study and years at ECU (consistent with Grigson as cited in Wells & Dumbell, 2010, p. 2; Woody, Daniel, & Baker, 2010). Patterns of use also encompassed the phenomenon of increasing information behaviour maturity. Findings showed that commencing undergraduate early career students were more likely to use e-books in the context of embedded links and more experienced users as measured by programme, age, and years of study/work displayed more sophisticated information behaviour.[65] Data analysis also showed that familiarity and culture of use (e.g. preference for digital formats) work as facilitating factors for maturation of e-book user behaviour.[66] The data analysis also suggests the role of information literacy as a contributor to mature behaviour.[67]

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[63] Findings 5.10.14 and 5.10.15 (p. 143); and 5.12.5 (p. 148).

[64] Findings 5.2.1 and 5.2.3 and 5.2.4 (pp. 125-126).

[65] Findings ibid; 5.8.1 (p. 137); and 5.12.3 and 5.12.5 and 5.12.6 (pp. 147-148).

[66] Finding 5.13.6 and 5.13.7 and 5.13.9 (pp. 151-152).

[67] Finding 5.10.20 (p. 143); 5.13.9 (p. 152); 5.20.9 (p. 165).

The research also shows that frustration with Digital Rights Management (DRM) (Armstrong & Lonsdale, 2009; CIBER, 2008; JISC, 2009) is also a facet of mature behaviour as users grow more familiar with the nature and limitations of ARL e-book platforms.[68] Mature users were also more likely to demonstrate exploratory behaviours (Marchionini, 2006) in task repurposing. For example, mature users were more likely to use e-books for research and recreational use.[69] Conversely, nascent or immature users were more likely to access e-books via embedded links (Broadhurst & Watson, 2012; CIBER, 2009b; JISC; Nicholas et al., 2009b) for coursework purposes (Croft & Davis, 2010; Cumaoglu, Sacici, & Torun, 2013; Folb, Wessel, & Czechowski, 2011; Rajan, Jasimudeen, & Mathew, 2012; Shelburne, 2009) and to be influenced by lecturers and peer users[70] (Content Complete and OnlyConnect Consultancy, 2009; JISC; Rowlands et al., 2007). Data analysis shows that culture of use is also shaped by hedonic attributes. For example, users found formats of Library e-books attractive,[71] specifically, prolific users of e-journals were more likely to perceive this pleasantness[72] with medium effect sizes. Table 5.15 summarises the findings.

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[68] Finding 5.12.2 (p. 147).

[69] Findings 5.6.1 and 5.6.5 (p. 133).

[70]Findings 5.8.1 (p. 137); 5.6.3 and 5.6.4 (p. 133); 5.12.5 (p. 148).

[71] Finding 5.20.6 (p. 164).

[72] Finding 5.13.7 (p. 151).

Table 5.15. E-book User Behaviour Maturity Model: Summary of Findings

Finding(s) #	Behavioural trait	Nascent behaviour	Mature behaviour	Facilitating factor(s)
5.4.1; 5.12.1; 5.12.6	Awareness	Developing	Established	Familiarity; information literacy; culture of use/habituation/ automaticity
5.10.20; 5.13.9; 5.20.9	Format differentiation (e-journals v. e-books)	Confused	Clear	Information literacy; familiarity(years in tertiary study)
5.4.3; 5.10.4; 5.10.7; 5.10.12	Findability and searching	Inefficient	Efficient	Information literacy
5.2.4; 5.3; 5.8; 5.12.5; 5.12.6	Use of e-books	Programmatic via embedded links	Exploratory	Culture of use; information literacy; familiarity (years in tertiary study)
5.6	Focus/Task	Singular (coursework specific)	Plurality (coursework, research, recreational)	Collection sufficiency; familiarity (years in tertiary study)
5.6.1; 5.6.5; 5.10.8; 5.10.10	Reading	Skim & fact finding	Mixed (skim and extended)	Information need (fact finding v. learning); culture of use/habituation
5.12.2; 5.20.4	Perception of DRM	Unimportant	Important	Functionality, Familiarity (years in tertiary study); Focus/Task
5.10.21; 5.12.3; 5.13.6; 5.20.5	Perception of collection sufficiency	Developing	Established	Functionality, Familiarity (years in tertiary study); Focus/Task
5.10.14; 5.10.15; 5.12.5	Influence of peers and tutors	Contributing	Non-contributing	Familiarity (years in tertiary study); Focus/Task

Subject to its limitations, the current study is a first or early attempt at developing a notion of e-book information behaviour maturity grounded in self-reported information behaviour.

5.3.4 E-book User Behaviour and Technology Adoption Frameworks

This section summarises the key findings of the next two research questions from the perspective of self-reported information behaviour as given below.

RQ3: Are use and behaviour consistent with the major models of technology adoption?
RQ4: What intervening or control variables significantly affect use and behaviour?

This section expands on the discussion of self-reported behaviour by answering the question of whether such behaviour could be explained in terms of frameworks and models that describe technology adoption. It also expands on the discussion of intervening and control variables first introduced in discussion of information behaviour maturity above. Consistency of e-book use and user behaviour with the major models and frameworks of technology adoption was observed and information behaviour and role of intervening and control variables was understood in terms of varied factors.

5.3.4.1 Role of Intervening and Control Variables

Users showed resistance to DRM restrictions (copy, print, download limits) resulting in some disaffection with the format with large effect size.[73] DRM works as an intervening variable in adoption and use. Data analysis also showed that agents (media of e-book use) are a control variable in behaviour - users were more satisfied with desktop PC and laptop as Library e-book use platforms with large effect sizes, and smartphones, tablets and e-book readers did not provide a satisfying experience with library e-books.[74] Format has implications for information behaviour. Users self-reported that Library e-books were not suitable for longer reading with large effect size posing obstacles to knowledge acquisition and learning. The unsuitability of Library e-books for extended reading is the main reason of preferring hardcopy books to e-books with large effect

[73] Findings 5.10.6 (p. 141) and 5.20.4 (p. 164).

[74] Finding 5.14 (p. 154).

size.[75] The student cluster also preferred hardcopy books to e-books with medium effect size. Findings point to the role of usability as an intervening variable in reading behaviour and also satisfaction with information retrieval. Verisimilitude, intimacy, and preference for hardcopy also ranked third by volume of the response in open-ended comments.[76]

As the literature review explained (Section 2.7.3.2), individualisation encompasses the dimension of customisation and personalisation. This research supports findings from other research of the likely importance of individualisation as an intervening variable in e-book use.[77]

5.3.4.2 Tabular Summary of Findings and Models/Frameworks

Table 5.16 below presents findings in terms of the principal technology adoption models and frameworks. The table shows that behaviour found is consistent with factors found in TAM, UTAUT, ECT, IDT, UGT, UGE, and culture of use.

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[75] Finding 5.11.2 (p. 146).

[76] Section 5.2.15 and Appendix R.

[77] Vide Section 5.2.14.

Table 5.16. E-book User Behaviour and Technology Adoption Frameworks: Summary of Findings

Finding(s) #	**Factor(s)**	**Model/ framework**
5.10.1; 5.10.16; 5.10.20; 5.12.1; 5.12.6	Familiarity and self-acquired information literacy (e.g. awareness, prior experience, differentiation between formats)	UGE (Shin, 2011)
5.10.6; 5.10.10; 5.10.12; 5.10.17; 5.10.18; 5.10.21; 5.12.2; 5.12.3; 5.20.4; 5.20.5; 5.20.8	Utility and performance expectancy or perceived features (e.g. DRM, quick fact finding, findability of information, convenience, functionality, collection sufficiency)	TAM/UTAUT/ IDT
5.10.3; 5.10.5; 5.10.7; 5.10.8; 5.10.9; 5.10.12; 5.11.2; 5.12.4; 5.20.3	Usability and effort expectancy or complexity (e.g. screen size & reading, searchability, skim reading, extended reading, findability of information, preferring hardcopy books for extended reading)	TAM/UTAUT/ IDT
5.10.2; 5.10.4; 5.10.7; 5.10.12; 5.10.13; 5.10.19; 5.12.5; 5.20.1; 5.20.2	Facilitating conditions and self-acquired information literacy or adopter personality traits or compatibility (e.g. Library interface, discovery, searchability, findability of information, embedded links, audio e-books)	UTAUT/IDT
5.10.14; 5.10.15; 5.12.5	Social influence or interpersonal channels or image (e.g. influence of peers and lecturers/tutors)	UTAUT/IDT
5.11.2	Intimacy (e.g. preference for format, e-book vs. p-book)	UGE
5.13 (9 findings); 5.14; 5.20.9	Preference of using e-resources and platforms/agents and user perception of ECU e-books; satisfaction with e-book platforms, using multiple formats	Culture of use, habituation/automaticity; ECT/UGT
5.15; 5.16	Gratification overall for ECU e-books or trialability and result-demonstrability	ECT/UGT/IDT
5.17; 5.18; 5.19	Continuance intention overall for ECU e-books or trialability and result-demonstrability	ECT/UGT/IDT
5.20.6; 5.20.7	Hedonic attributes (e.g. attractiveness of e-book formats, pleasantness)	TAM

5.3.4.3 Gratification Overall

Findings 5.15 (pp. 155-156) and 5.16 (pp. 157-158) revealed factors of overall satisfaction (ECT/UGT) with ECU e-books with large to medium effect sizes. Factors include *utility (collection sufficiency, convenience), usability (discovery, information retrieval, interface ease of use, agent/platform), expectation confirmation, facilitating*

conditions (customisation), culture of use (agents/platforms), habituation/automaticity and hedonic attributes (attractiveness, pleasantness). Subject to its limitations, findings in this research extend current understanding of the impact of different factors on overall e-book user satisfaction with Library e-books through statistical inferences grounded in self-reported information behaviour. Previous studies measured satisfaction either simply by frequency counts (e.g. Croft & Davis, 2010; Li et al., 2011; Rojeski, 2012; Zhao & Abuizam, 2013) or with fewer broader factors without mentioning particular items and their effect sizes (e.g. Shin, 2011). While others (e.g. Khan, Ahmed, & Masrek, 2014) measured overall satisfaction of research students in one construct (inclusive of all types of library and open-access e-resources) with pre-determined parameters (accuracy of information, file formats, interface, download speed, help function on homepage, browsing facility, and display of search results) using descriptive statistics.

5.3.4.4 Continuance Intention

Findings 5.17 to 5.19 (pp. 159-163) revealed factors statistically significant in the formation of continuance intention (ECT/UGT) with large to medium effect sizes. These include *performance expectancy/utility (convenience, overall satisfaction, functionality), hedonic attributes (pleasantness, attractiveness), effort expectancy/usability (discovery, findability, extended reading), familiarity (prior experience of using e-books), gratification, information literacy, intimacy, and culture of use (preference for p-books v. e-books) and facilitating conditions (such as embedded links).*

Subject to its limitations, findings in this research extends current understanding of the impact of different factors on overall e-book user continuance intention for Library e-books. This also appears to be an original contribution to the literature arising from this study. Most previous studies measured continuance intention either simply by frequency counts (e.g. Bennett & Landoni, 2005; Zhao & Abuizam, 2013), or without any contributing/associational factor (e.g. Khan, Ahmed, & Masrek, 2014), or for all electronic resources overall (e.g. Tao, 2009) or with one factor, i.e. trialability (e.g. Lee, Choi, & Kim, 2012), or fewer factors (e.g. Lee, 2013) or without mentioning particular items and their effect sizes (e.g. Shin, 2011, with a main focus on e-book readers).

5.3.5 Researcher Reflections

This section consists of researcher reflections on the data analysis and interpretation of data collected on self-reported information behaviour. The reflection attributes significance to findings and shows how findings contributed to the evolution of the research design and remaining data analysis and interpretation.

5.3.5.1 Reflection on E-book Individualisation

Bennett and Landoni (2005) citing Wilson et al. predict that "personalisation and user customisation will be the core of the next generation of e-books and e-readers" (p. 10). Huang and Hsieh (2012) suggest a simple design, user friendly interface, and customisation capability of e-books to enhance users' perception and acceptance level. Supporting these views this research also found a positive relationship between user attitude to customisation (perception of adequacy/inadequacy) and overall satisfaction of e-books with large effect size.[78]

The capability of distinguishing user cohorts on the basis of information behaviour is one way in which customisation might become a reality. Sundar and Marathe (2010) distinguish cohorts of power and non-power users. They argue that customisation matters most for 'power' users whereas 'non-power' users feel satisfied with personalisation, i.e. tailoring of content by the system based on observation of user habits.

The question as to whether power users might be dynamically distinguished from other users via transaction log analysis occurred to the researcher and this question shapes the investigation found in Chapter Seven.

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[78] Finding 5.15.3 (p. 156).

5.3.5.2 Reflection on Early Career and Experienced E-book User Behaviours

Table 5.15 (p. 173) summarises findings on information behaviour inclusive of nascent (early career) and mature (experienced) e-book users. It also provides an explanation of facilitating factors which form intervening variables. These include familiarity (years in tertiary study), information literacy, culture of use (habituation/automaticity), collection sufficiency, information need (fact finding v. learning) and focus/task. Most factors are familiar from the broader literatures on information behaviour, information literacy and user education (ACRL, 2013; Mahmood, 2013; Spink & Heinstrom, 2011a; Wilson, 2000). In this sense, the research has shown that such understanding applies to the new medium of the e-book. Noteworthy, as a new addition is the importance of culture of use in terms of habituation and automaticity. Dimensions include format preference (print vs. electronic) and crossover effects (e.g. extended vs. skim reading). Adaptations to user education programmes are suggested that will improve programme effectiveness. This issue is revisited in the conclusions (Chapter Eight) where findings are developed into a maturity model.

5.3.5.3 Reflection on Limitations of the Self-reported Information behaviour

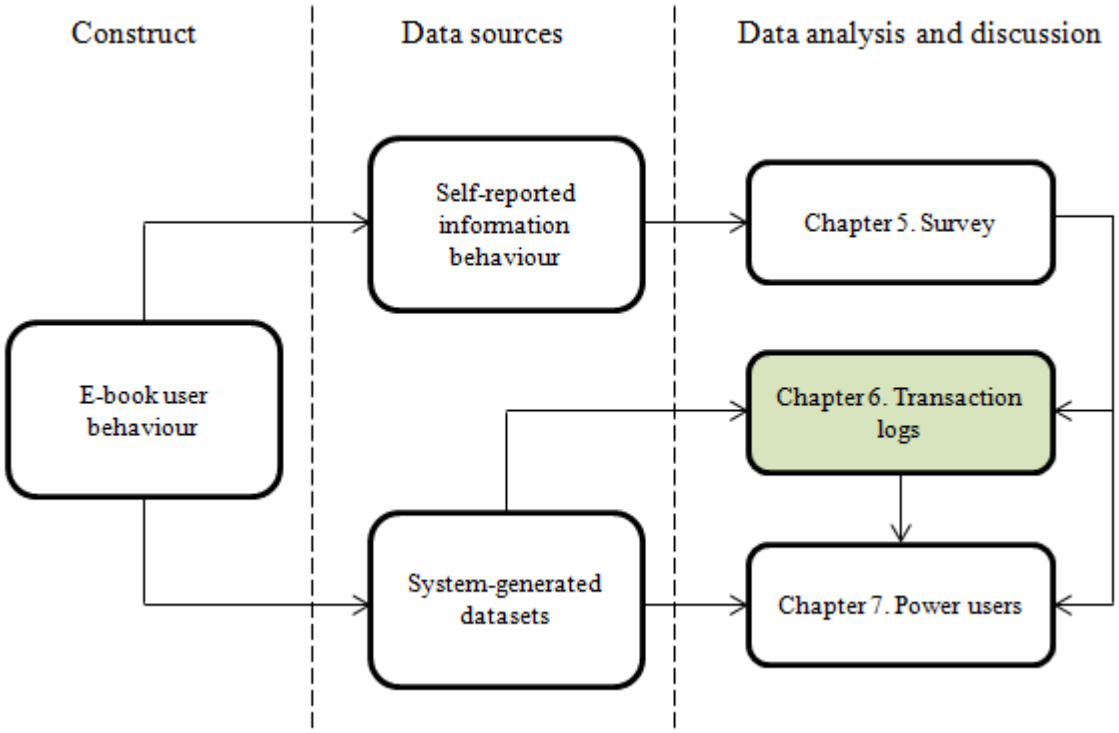
Finally, the researcher reflected on the nature and limitations of the research. Findings in this chapter are subject to limitations:

- Though efforts were made to include three purposefully selected cases/ARLs for a multiple independent, international case study (Section 4.4), the current study comprises a single case only, i.e. Edith Cowan University – a factor beyond the control of researcher. It was not possible to pursue the methodology of multiple independent case study;
- The non-probability sampling technique (convenience/voluntary) was used, which may not be the truly representative of the ECU population (Section 4.2.2.6). According to Tanner (2013b), assumptions of normality in regard to the distribution of data do not apply if a non-probability sample is selected;
- Survey data were collected against nominal and ordinal levels of measurement confining their analysis to descriptive and non-parametric statistical techniques (Allen & Bennett, 2010) (Section 4.3.2);

- The respondents' demographic distribution represented a bias owing to low faculty and general staff participation and much stronger student representation based on early career, young, on-campus, undergraduate, and Faculty of Health, Engineering and Science students (Section 5.1.2); and
- Self-reported information behaviour as measured by scales is subject to reliability of data issues arising from the observational, as opposed to experimental nature of such studies. The researcher has limited options for controlling response bias and accuracy. Participants may be influenced by considerations of perceived desirability of responses (so called Hawthorne effect), choose not to supply information or simply not fully understand their own behaviour.

For these reasons, in the research design process, it was decided to pursue a triangular design involving system-generated datasets of actual e-book use, as well as survey data. A full explanation of the design and precautions taken to improve robustness is described in Chapter Four. Importantly, as Nicholas et al. (2010) assert "[transaction log] data reflect what people actually do online not what they think they did, and not what they think they ought to say to a researcher" (p. 267). The next two Chapters present findings and interpretation from analysis of hard evidence of use found in transaction logs.

CHAPTER 6: DATA ANALYSIS AND DISCUSSION: SYSTEM-GENERATED DATASETS



Chapter Five reported the results of analysis of self-reported information behaviour. This chapter reports the analysis of system-generated transaction log datasets of e-book usage at the case study institution, Edith Cowan University (ECU). The ECU Library provides the University with access to e-book databases for two e-book aggregators/suppliers, Ebook Library (EBL) and Ebrary. Additionally, ECU Library provides access to 341 titles in MyiLibrary and 100 business e-books (i.e. 100 slots for swappable titles) in Safari, with 50 slots for technical books added in 2011 (K. Saunders, personal communication, March 5, 2013). The use of two e-book databases, EBL and Ebrary, are analysed here using the methods of log analysis.

Analysis and interpretation of the log data addresses the first two research questions that motivated the study in respect of system-generated datasets:

RQ1- What patterns of e-book use exist in academic and research libraries?
RQ2 - How can these patterns of e-book use be understood?

6.1 Ebook Library (EBL)

EBL is a private, commercial e-book aggregator/supplier owned by ProQuest on May 13, 2013 (EBL, 2013a). EBL acquires and aggregates e-books from leading publishers worldwide in a variety of disciplines and offer them on a single platform for use either online via their own interface or offline via Adobe Digital Editions. Main EBL customers include academic, corporate and research libraries. EBL also allows limited copy/paste, print, and download options. An EBL e-book can be printed (up to 20%) and copied (five percent) in online-read mode in accordance with DRM. An e-book can also be downloaded to a PC, laptop, and most of the mobile e-reader devices, which automatically expires after one (mostly new books) to seven (mostly old books) days.

The MARC records supplied by EBL do not usually have an edition statement. EBL records year of publication when the e-book was digitised, not when initially published in print format even if the same edition was digitised (L. Jahn, personal communication, August 22, 2013). A downloaded e-book can be copied or printed as per stated limits. An online e-book can also be experienced as audio, an accessibility feature. There are two main types of acquisition models for libraries, subject packages or title by title rental/purchase, and pay-per-use/view. Concurrent users may be fixed or unlimited. The ECU EBL e-book collection held nearly 350,000 titles at 19/10/2013 (EBL, 2013b). ECU purchased access to the full EBL database as per a pay-per-use model with unlimited concurrent users with effect from January 1, 2010.

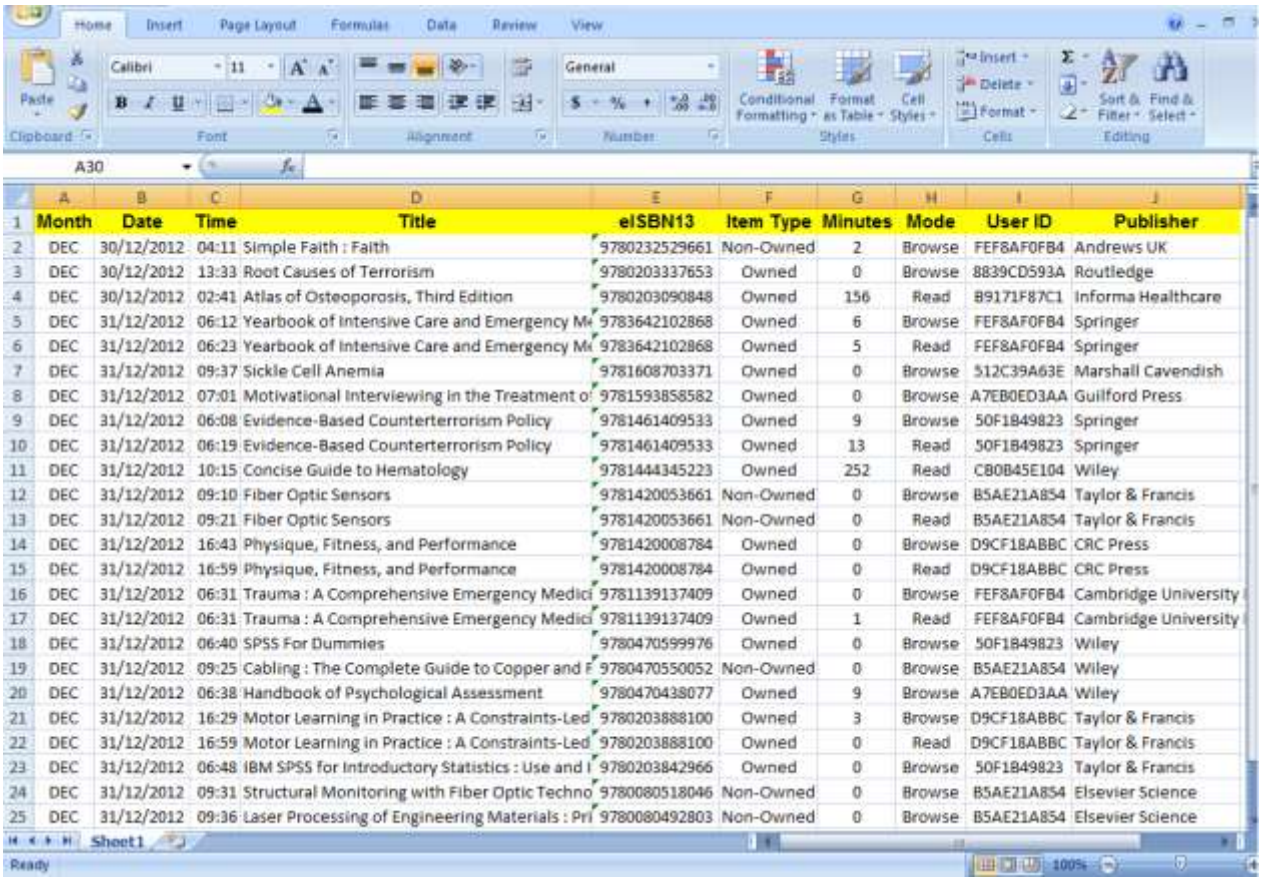
6.1.1 Target Datasets, Methodology and Tools

This study is longitudinal, involving three years' worth of EBL usage data, investigating information seeking behaviour by scholarly users of e-books employing statistical log analysis of the metadata datasets (logs) that describe e-book use.

This section compares three years (2010, 2011, and 2012) transaction logs for EBL e-book titles used by the ECU community. EBL generates different types of reports as transaction logs of e-book usage in spreadsheet (Excel) format. EBL records each and every e-book transaction as and when it happens in two different modes – *Browsing* and *Reading* – with the same variables. The difference between browsing and reading

modes is that browsing is a free-of-charge trial for the first five minutes for non-owned e-books (McLure & Hoseth, 2012) and ten minutes for owned e-books (D. Howard, personal communication, April 13, 2011) and reading (paid use) begins automatically thereafter. For owned e-books additional charging after ten minutes is a platform fee for service. These fees are less for owned e-books than for books that are not owned. McLure and Hoseth further explain that "Beyond browsing use includes short-term loans of unowned titles, and non-linear loan days and downloads of owned titles" (p. 140). Wells and Dumbell (2010) explain that the browse mode only occurs when a user first time accesses an EBL e-book. After certain minutes in browsing mode the usage switches automatically to a read-online mode. All subsequent usage will occur in reading mode whenever the same user accesses the same e-book, especially in case of non-owned e-books. Print, copy, and download provisions are available in reading mode only.

The study variables include Month of usage, Usage date, Time of usage, Title of e-book, standard number of e-book (eISBN13), owned or non-owned status of e-book (Item Type), Minutes of usage, browsing or reading (Mode), particular User ID (encrypted and anonymised by EBL), and Publisher of e-book. Two variables, Month (derived from usage date) and Mode, were added by the researcher. One variable, Day (derived from usage date), was added later by the researcher. The Mode variable was added to distinguish browsing and reading transactions when both were combined. Figure 6.1 presents a user view of an EBL transaction log file in Excel. Besides column headings, each row contains one record or transaction or view or use instance. Hence, number of transactions/views/records/use instances means number of rows.



Month	Date	Time	Title	eISBN13	Item Type	Minutes	Mode	User ID	Publisher
DEC	30/12/2012	04:11	Simple Faith : Faith	9780232529661	Non-Owned	2	Browse	FEF8AF0FB4	Andrews UK
DEC	30/12/2012	13:33	Root Causes of Terrorism	9780203337653	Owned	0	Browse	8839CD593A	Routledge
DEC	30/12/2012	02:41	Atlas of Osteoporosis, Third Edition	9780203090848	Owned	156	Read	B9171F87C1	Informa Healthcare
DEC	31/12/2012	06:12	Yearbook of Intensive Care and Emergency M	9783642102868	Owned	6	Browse	FEF8AF0FB4	Springer
DEC	31/12/2012	06:23	Yearbook of Intensive Care and Emergency M	9783642102868	Owned	5	Read	FEF8AF0FB4	Springer
DEC	31/12/2012	09:37	Sickle Cell Anemia	9781608703371	Owned	0	Browse	512C39A63E	Marshall Cavendish
DEC	31/12/2012	07:01	Motivational Interviewing in the Treatment o	9781593858582	Owned	0	Browse	A7EB0ED3AA	Guilford Press
DEC	31/12/2012	06:08	Evidence-Based Counterterrorism Policy	9781461409533	Owned	9	Browse	50F1B49823	Springer
DEC	31/12/2012	06:19	Evidence-Based Counterterrorism Policy	9781461409533	Owned	13	Read	50F1B49823	Springer
DEC	31/12/2012	10:15	Concise Guide to Hematology	9781444345223	Owned	252	Read	CB0B45E104	Wiley
DEC	31/12/2012	09:10	Fiber Optic Sensors	9781420053661	Non-Owned	0	Browse	B5AE21A854	Taylor & Francis
DEC	31/12/2012	09:21	Fiber Optic Sensors	9781420053661	Non-Owned	0	Read	B5AE21A854	Taylor & Francis
DEC	31/12/2012	16:43	Physique, Fitness, and Performance	9781420008784	Owned	0	Browse	D9CF18ABBC	CRC Press
DEC	31/12/2012	16:59	Physique, Fitness, and Performance	9781420008784	Owned	0	Read	D9CF18ABBC	CRC Press
DEC	31/12/2012	06:31	Trauma : A Comprehensive Emergency Medici	9781139137409	Owned	0	Browse	FEF8AF0FB4	Cambridge University
DEC	31/12/2012	06:31	Trauma : A Comprehensive Emergency Medici	9781139137409	Owned	1	Read	FEF8AF0FB4	Cambridge University
DEC	31/12/2012	06:40	SPSS For Dummies	9780470599976	Owned	0	Browse	50F1B49823	Wiley
DEC	31/12/2012	09:25	Cabling : The Complete Guide to Copper and F	9780470550052	Non-Owned	0	Browse	B5AE21A854	Wiley
DEC	31/12/2012	06:38	Handbook of Psychological Assessment	9780470438077	Owned	9	Browse	A7EB0ED3AA	Wiley
DEC	31/12/2012	16:29	Motor Learning in Practice : A Constraints-Led	9780203888100	Owned	3	Browse	D9CF18ABBC	Taylor & Francis
DEC	31/12/2012	16:59	Motor Learning in Practice : A Constraints-Led	9780203888100	Owned	0	Read	D9CF18ABBC	Taylor & Francis
DEC	31/12/2012	06:48	IBM SPSS for Introductory Statistics : Use and I	9780203842966	Owned	0	Browse	50F1B49823	Taylor & Francis
DEC	31/12/2012	09:31	Structural Monitoring with Fiber Optic Techno	9780080518046	Non-Owned	0	Browse	B5AE21A854	Elsevier Science
DEC	31/12/2012	09:36	Laser Processing of Engineering Materials : Pri	9780080492803	Non-Owned	0	Browse	B5AE21A854	Elsevier Science

Figure 6.1. EBL e-book transaction log file 2012 (Excel)

The data were first cleaned and made usable. In the preliminary analysis, data were imported into MS Access where SQL queries were used to mine the datasets. The Excel and IBM statistical tool SPSS were also used for analyses. Methods and techniques are explained in Chapters Three and Four.[79]

6.1.2 Assumptions Testing

The assumption that variables are normally distributed may be tested by means of various standard numeric and graphic procedures (Allen & Bennett, 2010). Four tests

[79] Vide Sections 3.6.1.1 and 3.7.1 and 4.3.1.

including a Kolmogorov-Smirnov (K-S) test were performed to check for normality of the three-year individual and combined dataset(s). All the numeric or numerically quantifiable/transformable variables, especially Minutes and Views, were found to be non-normally distributed, a phenomenon clearly seen from Skewness and Kurtosis in the descriptive statistics in Table 6.3. These normality test results suggest the use of non-parametric procedures for inferential statistics (Allen & Bennett).

6.1.3 Patterns of Use: Aggregate Trends 2010-2012

EBL e-book usage grew between 2010 and 2012 across all the variables except Total Minutes, Minutes in reading, and MinMax as shown in Table 6.1.

Table 6.1. Trends in EBL Use 2010-2012

Variable	**# 2010**	**# 2011**	**# 2012**	**Row Total**
ECU population*	25,943	25,734	25,404	77,081
EBL Collection (Titles)*	145,000	190,000	212,973	547,973
Total unique users who browsed*	8,482	9,353	11,690	29,525
Unique users who read from among browsing users*	5,347	5,962	8,303	19,612
Total unique titles browsed*	13,796	14,266	17,976	46,038
Unique titles read from among browsed titles*	7,308	7,891	10,026	25,225
Total transactions / Views	65,190	70,750	97,273	233,213
Browsing transactions / Views	46,206	48,939	66,911	162,056
Reading transactions / Views	18,984	21,811	30,362	71,157
Total Minutes (browsing and reading)	1,364,275	2,186,797	1,272,647	4,823,719
Minutes in browsing	99,543	118,841	160,352	378,736
Minutes in reading	1,264,732	2,067,956	1,112,295	4,444,983
Highest/maximum Minutes (MinMax) spent on reading one title by one user in one session	1,439	2,884	1,332	5,655
Searches run**	6,241	19,419	25,472	51,132
Sessions**	52,050	56,821	70,286	179,157

* Year-wise unique; ** Searches and sessions figures were calculated by EBL. All other figures were calculated by the researcher except ECU population and EBL collection (titles).

As shown in Table 6.1 a decrease in 2012 is observed in three variables (Total Minutes, Minutes in reading, and MinMax) based on minutes spent by users in browsing and/or reading, contrary to growth shown with other variables. Digital Rights Management (DRM) changes in policy explain the discrepancy. For example, in 2012 the loan period was reduced to a day, where previously it had been unlimited. The facility of downloading a title for offline use via Adobe Digital Edition (ADE) was initiated in 2012 and EBL has a separate method to record this offline usage. This change had the effect of reducing total Minutes, Minutes in reading, and MinMax as reading expanded to encompass offline as well as online reading. In the sections that follow, table data are analysed with accompanying interpretation, triangulated with findings from self-reported information behaviour where relevant.

6.1.4 ECU E-book User Population

Between 2010 and 2012 ECU's population in terms of cohorts adopted for this study is shown in Table 6.2 (Edith Cowan University, 2013).

Table 6.2. ECU Demographics 2010-2012

Year	**2010**	**2011**	**2012**
Faculty	762	771	752
Students	24,152	23,864	23,515
General staff	1,029	1,099	1,137
Total	**25,943**	**25,734**	**25,404**

The ECU EBL e-book user-base 2010-2012 as a proportion of the ECU population grew annually from 8,482 (N = 25,943; 32.69%) in 2010, to 9,353 (N = 25,734; 36.34%) in 2011, to 11,690 (N = 25,404; 40.02%) in 2012 of year-wise unique users. Figure 6.2 shows the proportion of e-book users in ECU's population.

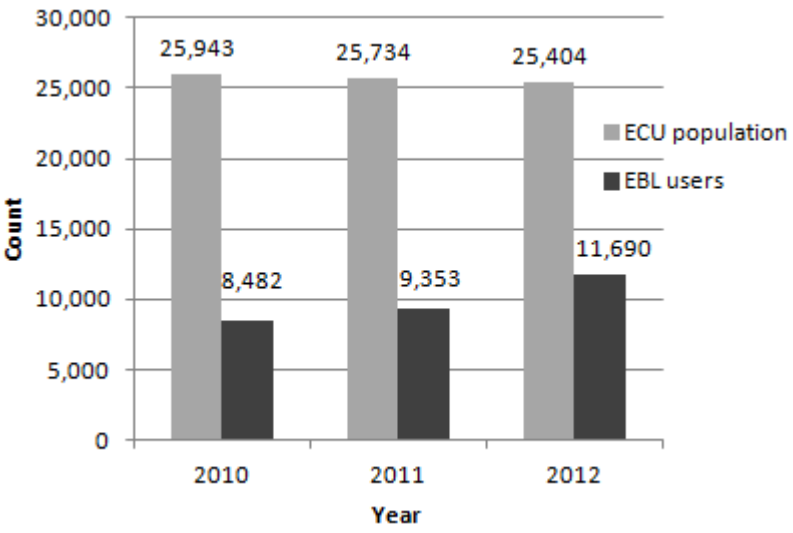


Figure 6.2. ECU population and EBL users 2010-2012

On *average* approximately 38.30% of the ECU population made use of EBL e-books between 2010 and 2012. In other words, on average, approximately 61.70% of ECU community never used any EBL e-book in three years. The repeating (duplicate/triplicate) users were 3,172 (2010-11), 2,270 (2010-12), 3,951 (2011-12), and 7,862 (2010-11-12). Findings from log analysis show a lower proportion of unique adopters (38.30%) compared with analysis of self-reported behaviour (67.62%) in Chapter Five (Finding 5.1), providing evidence of a bias to users contained in the convenience sample.

The pattern of year on year increase is consistent with other studies (e.g. Wells & Dumbell, 2010) and is consistent with growing user engagement with the format.

6.1.5 User Transactions/Views

Transactions are recorded in two modes of use, browsing and reading. As discussed, browsing is a free of cost trial use for the first five minutes (10 minutes for owned e-books) and reading (paid use in accordance with pay-per-use/view model) starts automatically thereafter. ECU pays per minute (multiple of one with round down) for all those titles used in either direct (online) or indirect (downloaded/offline) reading modes.

Based on combined data of three years (N=233,213) browsing transactions (69.49%) are more than twice of reading ones (30.51%) indicating that titles browsed are not necessarily read. While the analysis outcome is consistent with survey findings that e-books are preferred for fact finding, skim reading and unsuited to extended reading, since no data is available on query efficiency, the abandonment of titles for reasons of irrelevancy cannot be excluded as an explanation.

Each transaction forms one record of a particular title viewed by a particular user on a particular date spending particular minutes either in browsing or reading. Hence, a full-year usage report may consist of many repeated transactions of the same titles and users on different dates and times.

EBL transactions/views increased 8.53% (2010-11), 37.49% (2011-12), and 49.21% (2010-12) with a respective increase of 5,560, 26,523 and 32,083 views. Review of the frequency distribution shows that consistently across the surveyed years around one-third of all transactions were abandoned in less than one minute and more than one-half in less than three minutes.[80] Without data on query efficiency, definitive interpretation of this analysis outcome is not possible. Cumulative frequency data do however support the proposition of skim reading and unsuitability for extended reading (Findings 5.10.8 and 5.10.9) with only 15.1% of transactions over the three survey years meeting the standard of extended reading, if this standard is set at the lower threshold of ten minutes or more.

So what else can be said of the behaviour of users? Figure 6.3 shows the number of ECU e-book users in browsing and reading modes. Reading users are not separate but are from among browsing users, for example, 100 people started a race (browsing users) but 50 of them reached destination (reading users). The same example applies to browsed and read titles as well. On average, 66.42% of the browsing users entered the reading mode at least once. With regard to previous research, for example, McLure and

[80] Vide Table 6.5. Calculation is based on multiples of one minute with round down.

Hoseth (2012), based on 8-months' transaction analysis of EBL e-book usage at the Colorado State University (USA), also found 68.50% of the browsing users entered the reading mode at least once. Hence the data show that whilst user abandonment of titles is most typical, around two-thirds of users enter the reading mode at least once in each of the reported years. As discussed above, the pattern of use in reading mode is typically skim reading, consistent with quick fact finding (Finding 5.10.10).

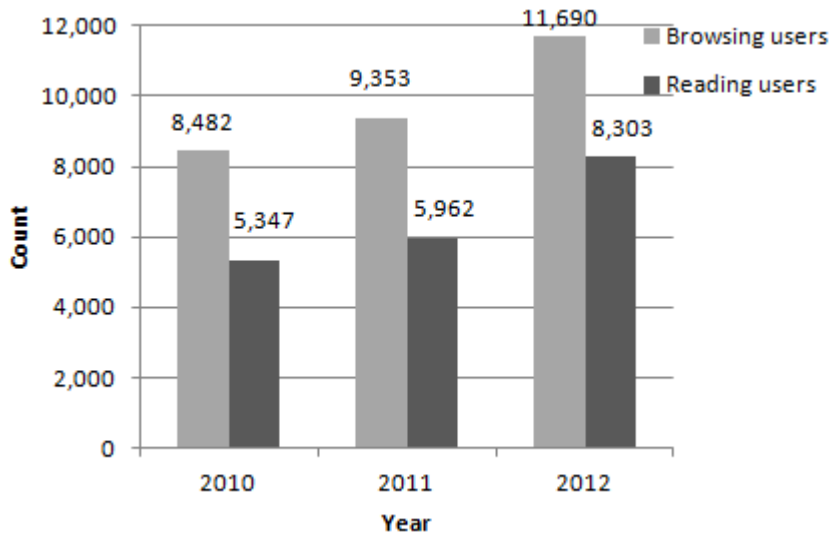


Figure 6.3. ECU e-book users in browsing and reading

A Kruskal-Wallis one-way ANOVA indicated a statistically significant difference (at $\alpha = 0.05$) in the year-wise distribution of user views/transactions with small effect size (Table 6.3).

Table 6.3. Distribution of Transactions/Views: ANOVA

Year	**2010**	**2011**	**2012**
Mean rank	14,275.47	14,319.47	15,471.60
H (adjusted for ties)	136.494		
df	2		
N	29,525		
p	.000		
Effect size η2	.005, small (Allen & Bennett, 2010)		

Further post-hoc tests filtered the groups by indicating the statistically significant differences between 2010-2012, and 2011-2012, whereas there was no significant difference for 2010-2011. A substantial increase in transactions by 44.81% and 36.72% (browsing), and 59.93% and 39.20% (reading) was recorded respectively between 2010-2012 and 2011-2012. The analysis is consistent with EBL's debut as a relatively new service in 2010-2011 and growing user engagement in 2012.

Although, there has been increase in both the browsing and reading transactions aligned with growth in user-base, the ratio between browsing and readings was consistent across the three years at approximately 70:30. Survey results help to explain the reasons of more browsing than reading. For example, rapid e-book browsing becomes possible when users experience discovery (Finding 5.10.2, p. 140), access (5.10.4, p. 141), searching (Finding 5.10.7, p. 141) and finding needed information easier (Finding 5.10.12, p. 142), especially via embedded links (Finding 5.10.13, p. 142), particularly using PC and laptop platforms (Finding 5.14, p. 154) where they feel no issues of on-screen reading (Finding 5.10.3, p. 141) for scanning (Finding 5.10.8, p. 141) quick facts (Finding 5.10.10, p. 142). Convenience (Finding 5.10.17, p. 143) is also a motivating and facilitating factor. Some of these factors lead to user satisfaction and continuance intention as well (vide Findings 5.15 and 5.18).

6.1.6 User Minutes spent on EBL E-book Use

The variable "Minutes" accounts for the minutes spent by users in browsing and reading e-books encompassing every instance/case (N=233,213). On average annually a user spent overall 163.38 minutes (12.83 in browsing, 150.55 in reading), 20.68 minutes per transaction/view (1.62 in browsing, 19.06 in reading) in each of the three years, 2010-2012. These average data are affected by outliers. More appropriate interpretation involves the constructs of median, mode, skew and kurtosis. Year-wise descriptive statistics of minutes is shown in Table 6.4.

Table 6.4. Descriptive Statistics of User Minutes

Statistic	Year 2010	Year 2011	Year 2012
Median	2	2	2
Mode	0	0	0
Skewness	9.150	7.390	7.171
Kurtosis	97.699	62.651	80.455
Max	1,439	2,884	1,332

Extreme variability is evident from the skewness and kurtosis values that describe lop-sided, lower values dominated distribution. The median (2 minutes) and mode (0 minute) are unchanged across three years. Although the transactions of minutes increased every year but the sum total of Minutes decreased in 2012 with the introduction of offline use of e-books via downloading or printouts.

However, the interquartile range is five minutes in 2010 and six minutes each in 2011 and 2012. Mode, median and skewness values show that most users only browse. The data are bi-modal, multi-peaked, positively skewed, leptokurtic, and asymmetrically distributed. Distribution also indicates some extraordinary or outlier instances on the consumption of minutes. Table 6.5 and Figure 6.4 show this variability. Outliers include so called ‘power users’, the subject of a specific investigation in Chapter Seven.

Table 6.5. Frequency of User Minutes Consumed at EBL 2010-2012

	Year 2010			**Year 2011**			**Year 2012**		
Transactions	Frequency	%	Cumu-lative %	Frequency	%	Cumu-lative %	Frequency	%	Cumu-lative %
0-minute	21,363	32.8	32.8	20,369	28.8	28.8	30,500	31.4	31.4
1-minute	9,207	14.1	46.9	9,867	13.9	42.7	12,873	13.2	44.6
2-minute	6,053	9.3	56.2	6,723	9.5	52.2	8,707	9.0	53.6
3-minute	4,953	7.6	63.8	5,438	7.7	59.9	7,197	7.4	61.0
4-minute	6,450	9.9	73.7	6,715	9.5	69.4	8,473	8.7	69.7
5-minute	1,965	3.0	76.7	2,261	3.2	72.6	3,107	3.2	72.9
6-minute	1,370	2.1	78.8	1,698	2.4	75.0	2,410	2.5	75.4
7-minute	1,244	1.9	80.7	1,605	2.3	77.3	2,302	2.4	77.8
8-minute	1,360	2.1	82.8	1,781	2.5	79.8	2,543	2.6	80.4
9-minute	2,170	3.3	86.1	2,935	4.1	83.9	4,127	4.2	84.6
10-minute+	9,055	13.9	100.0	11,358	16.1	100.0	15,034	15.4	100
Total	**65,190**	100		**70,750**	100		**97,273**	100	

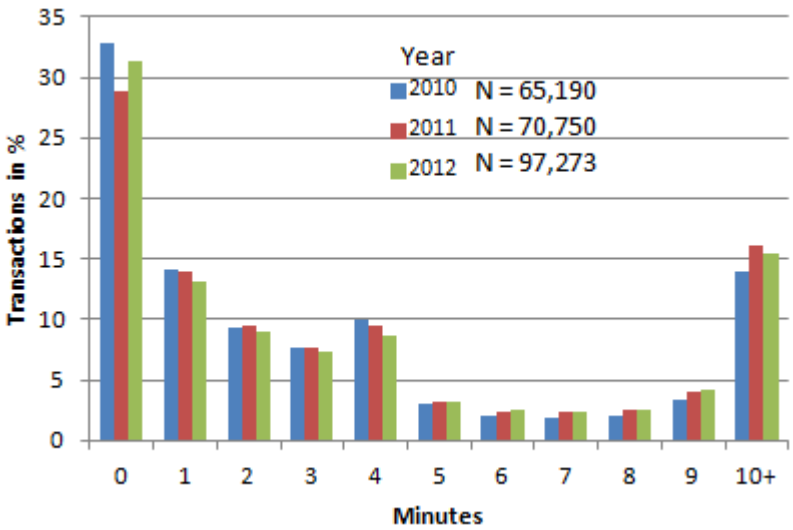


Figure 6.4. Frequency of Minutes 2010-2012

Around 85% of transactions/views by minutes are below 10 minutes, whereas 0-minute views are around 31%. As discussed in section 6.1.5, the data are consistent with skim (or reference) and quick, snippet fact extraction use of e-books (Nicholas, Rowlands, & Jamali, 2010; JISC, 2009) and supportive of Survey findings (5.10.8 and 5.10.10).

6.1.7 Maximum Minutes Spent (MinMax)

The variable 'Minutes Max' is the highest/maximum minutes spent by a user in viewing a title measured across a single transaction. Data in 2010 and 2011 are unreliable as a measure of extended reading with a single title since a machine may be inactive with a title running. Parameterisation includes a maximum of five minutes for un-owned and 10 minutes for owned e-books in browsing mode. A downloaded e-book for offline use with Adobe Digital Editions (software introduced in 2012) expires after one to seven days. No data are contained in EBL transaction logs describing this kind of use. From 2012, loan for titles in online reading mode expired after 24 hours, a measure taken to control inactivity. This explains the decrease in Minutes Max in 2012, compared with previous two years. Users did not appreciate this change in DRM preferring longer loan periods for online/offline use (vide Section R1 in Appendix R).

6.1.8 E-book Titles Used

Since EBL keeps on adding new titles to its database every month, mid-year figures of EBL title availability were obtained from EBL blog posts in 2010 and 2011 (Lily, 2010, 2011) and directly from the EBL website for 2012 (www.ecu.eblib.com.au) on 18th July, 2012, to provide a more reliable estimate of unique EBL titles used, compared with ECU population including new student enrolments of both the semesters in a year.

The number of unique EBL titles used at ECU increased 3.41%, 26.01%, and 30.30% (browsed) and 7.98%, 27.06%, and 37.19% (read) against 31.03%, 12.09%, and 46.88% increase in EBL collection (number of unique titles) between 2010-2011, 2011-2012, and 2010-2012, respectively (Table 6.1). Approximately less than 10% (46,038/547,973: 8.40%) of EBL unique e-books were browsed by 38.30% of the ECU community (29,525/77,081), making for a total of 1.56 titles per user (46,038/29,525), in each of these three years. When it comes to reading less than 5% of EBL titles were read (25,225/547,973: 4.60%) by a quarter of ECU population (19,612/77,081: 25.44%), making 1.29 titles per user (25,225/19,612), approximately (Figure 6.5).

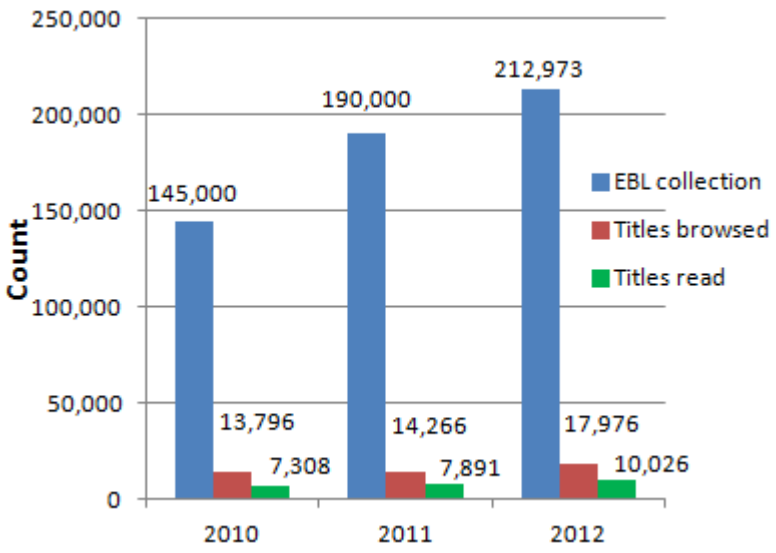


Figure 6.5. EBL collection and used titles comparison

Thirty-five percent (35%) and 22% of total, unique e-books used (browsed or read at least once) in 2010, also received usage in 2011 and 2012, respectively. Thirty-five percent of the titles used in 2011 and 2012 were common according to duplicate ISBNs in both the years. Out of 46,042 titles used in three years, 10,422 (22.64%) were used every year, suggesting the status of these titles as textbooks or embedded links. However, Bucknell (2010) claims that "past usage is not a good predictor of future usage" on the basis of e-book usage reports (p. 131).

Data on titles show that the majority (64.43%) of the browsing users entered the reading mode at least once with a browsed title. Similarly, 54.79% of the browsed titles were read by one or more users. Table 6.6 shows these statistics in which the majority of transactions/views, users, and titles fall in 1-9 minutes category.

Table 6.6. Minutes, Users, and Titles 2010-2012

Transaction category	Frequency	Sum of Minutes	Users*	Titles*
0 minute	72,232	0	3,620	8,991
1-9 minutes	125,534	448,379	9,609	19,321
10-29 minutes	12,977	224,522	4,659	5,660
30-59 minutes	7,248	305,810	2,691	3,120
60-99 minutes	4,898	382,539	1,888	2,007
100-249 minutes	6,277	971,231	3,072	3,131
250-499 minutes	2,224	762,528	1,749	1,638
500-999 minutes	1,022	714,857	1,102	1,019
1,000 minutes & above	801	1,013,853	1,135	1,155
Total	**233,213**	**4,823,719**	**29,525**	**46,042**

*Year-wise unique; browsing & reading combined.

Few of the users and titles accounted for most usage in terms of total views and sum of minutes in combined browsing and reading modes. On average only 15% of users consumed 83% of total minutes in each of three years, 2010-2012. Similarly, 20% of users made nearly 67% of all views/transactions. Ten percent of titles consumed 83% of total minutes and 20% of titles explained 68% of all views (Table 6.7). This is somewhat similar to the Twitter research where the top 10% of prolific twitter users accounted for 90% of tweets (Heil & Piskorski, 2012).

Table 6.7. ECU E-book User Behaviour

Use behaviour	2010	2011	2012
% of Minutes consumed by top 15% of users	86	88	75
% of Views by top 20% of users	68	67	65
% of Minutes consumed on top 10% of titles	86	85	78
% of Views on top 20% of titles	66	68	70

Figures rounded.

Tables S1, S2, and S3 (see Appendix S) list the most frequently used 10 EBL titles year-wise ranked according to sum of minutes consumed. These year-wise frequently used titles accounted for 8.47%, 7.41%, and 7.59% of total Minutes respectively for 2010, 2011, and 2012. These tables also show embedded/prescribed nature of some of the titles linked in units' outlines. These outlines were accessible through search function at the ECU website prior to 2012, for example, this researcher searched a particular e-book title and the results showed all those outlines in which that title was embedded.

6.1.9 Use of E-books and the ECU Academic Calendar

E-books are used throughout the year as evident from Figure 6.6 (see Table S4 in Appendix S for details). The tendency for e-book utilisation to follow the academic calendar is consistent across 2010-2012. Use is concentrated around the months when the semester is in session, the assignment/project submission dates and the coursework study. The month-wise e-book use as measured in transaction logs is consistent with findings from the survey of self-reported information behaviour.[81]

[81] Finding 5.5, p. 131.

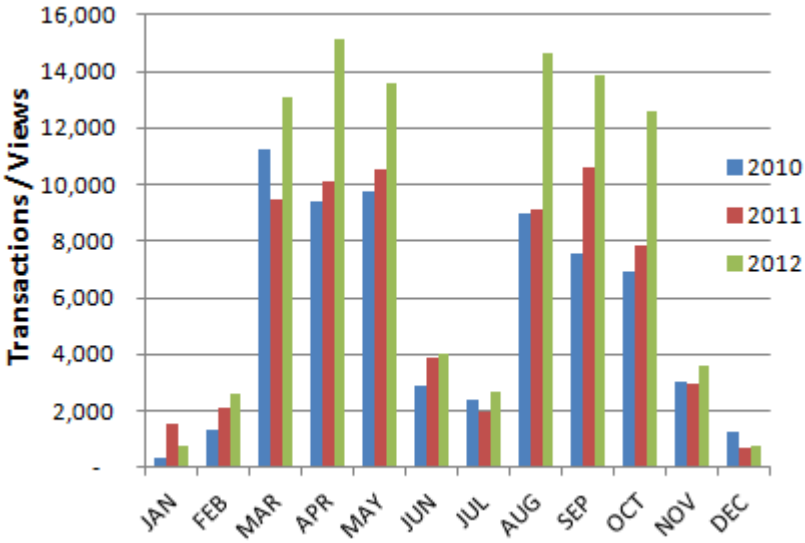


Figure 6.6. Month-wise e-book use at EBL

The months of March, April, and May in the first semester and August, September, and October in the second semester attract most use as measured by log transactions. Enthusiasm for e-books appears greatest at or near the assignment submission points in both the semesters (showing a tendency in the data to closely reflect academic cycles). These are the months when students study coursework, prepare and submit assignments. It appears that e-book utilisation for examination (June and November) is very low. The lowest use months, January, February, July (orientation months), and December, fall mostly during semester breaks and the e-books in these months seem only to be used by the research students and academic staff.

6.1.10 Daily Cycle of E-book Use

Monday is the most frequent day of the week for EBL e-book use, with Saturday, Sunday, and public holidays involving least use (see Figure S1 in Appendix S). Review of the daily cycle of e-book use also reveals that most use occurs within the same time zone. Only 10% of ECU students reside in a different time zone (not UTC+8) (D. Ward, personal communication, August 29, 2012). Hence, most of the peaked data of Time are distributed between 11 am and 3 pm (Figure 6.7). At this academic library, e-book use is concentrated in its geographic time zone around the 9-5pm working day.

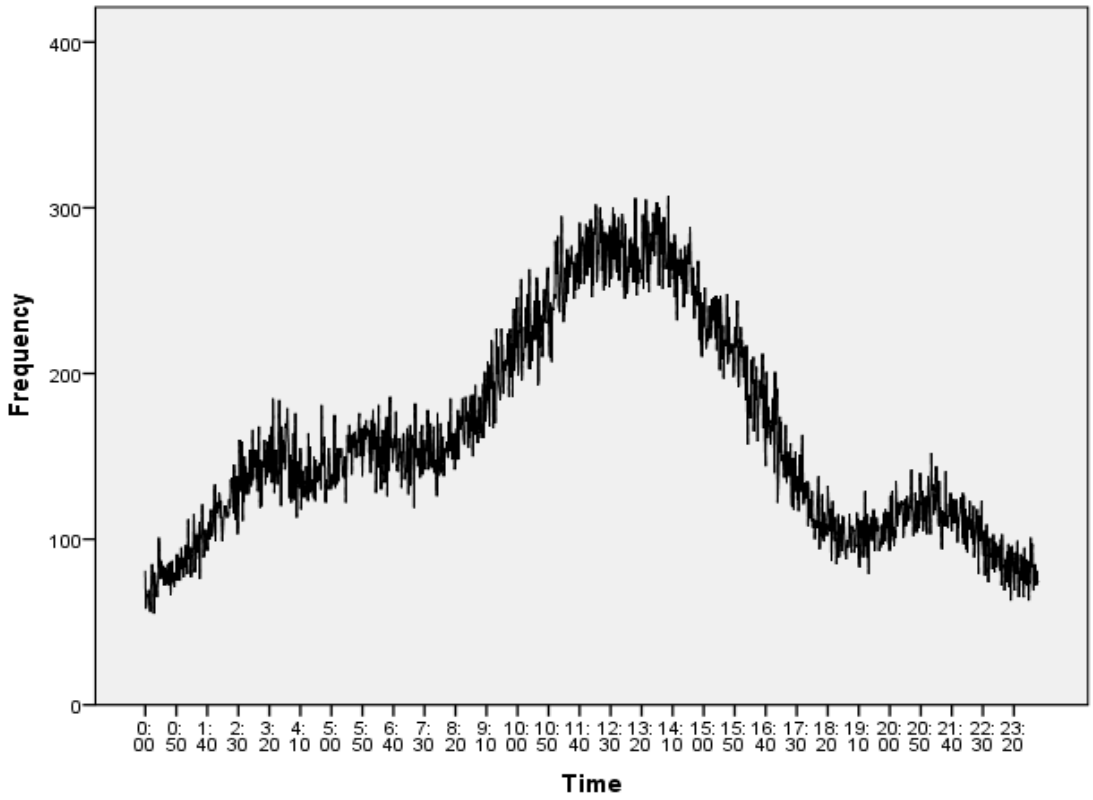


Figure 6.7. Time of EBL e-book use

6.1.11 User Sessions and Searches

As the ECU e-book user-base increased 2010-2012, the intensity of e-book usage and engagement also increased. User sessions with EBL e-books were up 35.04% and 23.70% in 2012, from 2010 and 2011. A session starts when a user opens a title and performs at least one view, copy, print, or download. It ends when the user closes the EBL window or logs/times out. Over the period 2010-2012, an ECU e-book user conducted on average 6.07 sessions (comprising browsing and reading of one or more titles) annually. Sessions averaged 26.92 minutes with 1.30 titles (including 0.26 unique titles) viewed per session annually. The variable, *views* or *transactions*, is a sum of browsed and read use instances for all users and titles including repeating ones. A small cohort (15%) of views/transactions and unique users accounted for around half of the sessions in three years, 2010-2012 (Table 6.8).

Table 6.8. EBL User Sessions, 2010-2012

Use behaviour	2010	2011	2012
% of Sessions conducted by top 15% of unique users	50.08	50.44	49.44
% of Sessions consumed by top 15% of views	48.11	49.06	47.68

There are two types of searches, regular and within a title. Regular searches are reported here which were conducted for e-books/titles directly on the EBL site[82] and the e-books were opened from those searches. On average a user ran 1.73 searches in each of three reported years. These searches conducted between 2010-2011 and 2010-2012 increased 211% and 308% respectively. This substantial increase in searches is indicative of the ECU community's increasing engagement with e-books over the data collection period. Comparatively, the increase in unique titles viewed was modest (3.44% and 30.30%) between 2010-2011 and 2010-2012, respectively. However, no data were collected that enabled meaningful reflection on query efficiency. It is important to mention that searches for e-books performed from the Library's interface were not available to researcher and, thus, not included in this study.

6.1.12 Item Type (Owned vs. Un-owned E-books)

Most frequently used titles are automatically purchased by ECU Library called 'owned' e-books in line with patron-driven, auto-purchase acquisition, but these are still offered via EBL server and interface (D. Howard, personal communication, April 13, 2011). EBL refers to this schema as a demand-driven acquisition model. McLure and Hoseth (2012) explain that "after four, 24-hour short-term loans the fifth use triggers a perpetual access purchase of the title, which includes 325 non-linear uses per year renewed annually at no cost" (p. 140). On average ECU Library has auto-

[82] The ECU-EBL interface can be accessed via the ECU databases, ECU search interface, and embedded links.

purchased/owned nearly one-fourth (23.33%) of the used e-books in each of three years, 2010-2012. Based on average of three years, 2010-2012, owned e-books accounted for 53% of transactions (browsing 67%, reading 33%), and 63.43% of minutes (8% in browsing and 92% in reading) annually. Seventy-five (75) and 70 percent of the owned e-books used (browsed or read) in 2010 also received usage respectively in 2011 and 2012. Seventy-four percent of the owned titles used in 2011 and 2012 were common.

Out of 10,735 unique titles (23.32% of used e-books) owned by ECU Library in three years (2010-2012), 4,927 (46%) have been used every year. The data are consistent with use of such titles as prescribed texts or embedded links. The number of year-wise unique users who used (only browsed or browsed and read) owned e-books were 5,867 (69%), 7,008 (75%), and 9,197 (79%) respectively for 2010, 2011, and 2012. The repeating/duplicate/triplicate users were 1,906 (2010-11), 1,363 (2010-12), 2,627 (2011-12), and 5,048 (2010-11-12). These were the users who used both owned and non-owned e-books but here they were filtered for owned e-books only. Hence, the majority of users used owned e-books repeatedly.

6.1.13 Relationship between Variables (Correlation)

Kendall's tau-b (bivariate, two-tailed, N = 29,525) at ($\alpha = 0.01$) indicated the presence of a strong positive correlation of titles browsed with titles read ($\tau = .65$, $p < .001$). This result shows that users whose engagement is greater as measured by titles browsed, are also more engaged in terms of converting browsing behaviour to reading behaviour. The result is consistent with culture of use and habituation/automaticity as explanations of user behaviour. Preference for the format as measured by titles browsed displays cross over effects with titles read. Similarly, more minutes are likely to be spent on reading, if more/maximum minutes (five for non-owned, 10 for owned e-books) are spent on browsing ($\tau = .48$, $p < .001$).

6.2 Ebrary Academic Complete

This section describes the use of Ebrary e-book titles at the Edith Cowan University, Western Australia. Ebrary (also known as 'ebrary'), a commercial web-based e-book aggregator/supplier owned by ProQuest in 2011, offers online subject packages (subscription), title by title purchase (perpetual archive), and short-term loan (rental) options to libraries for multiple/unlimited simultaneous users (Ebrary, 2013; ProQuest, n.d.; Schell, 2011). From 2012, Ebrary e-books can also be downloaded for a 7 to 14 days loan for offline use via Adobe Digital Editions software and Ebrary's app for smartphones and tablets. Utilising a different acquisition model, the recording of COUNTER-compliant usage statistics by Ebrary is not the same as that of EBL's pay-per-view model. Since the ECU Library has to pay for the whole database renewed annually as per the *subscription* acquisition model regardless of use/non-use, data capture is less comprehensive.

Ebrary acquires e-books on a variety of disciplines from different publishers and offer them on their single platform. The Ebrary website (http://site.Ebrary.com.ezproxy.ecu.edu.au/lib/ecu/home.action) was showing 84,829 e-book titles on 20 broad subject areas available to ECU community as at 15 September, 2013, listed in Table T1 (see Appendix T).

6.2.1 Target Datasets and Methodology

ECU Library subscribed to the Ebrary online e-book database from 2011 onwards. Ebrary usage statistics for the years, 2011 and 2012, were supplied by the ECU Library for analysis. Data were supplied in different report types and consisted of brief stats (pages viewed/copied/printed, unique documents, user sessions, and online turnaways), number of monthly searches conducted by users directly with Ebrary platform, and section requests listing unique titles with publishers and most standard numbers used month-wise. Section T.I in Appendix T presents a glossary of Ebrary terms used in usage reports.

E-book usage reports are automatically, system-generated log files in spreadsheet (Excel) format programmed and maintained by the e-book suppliers. These transaction

log files, especially section requests, were analysed statistically, describing the use of Ebrary e-book titles at the case study institution.

6.2.2 Patterns of Use: Aggregate Trends

ECU's annual report for 2012 reports its population (faculty, students, and general staff) as 25,734 and 25,404 respectively for 2011 and 2012 (Edith Cowan University, 2013). The Ebrary e-book title collection according to Ebrary press releases was over 70,000 and 75,000 respectively in the census months of June 2011 and 2012 (Ebrary, 2011, 2012b). Table 6.9 provides a summary of Ebrary e-book utilisation at ECU in two years, 2011 and 2012.

Table 6.9. Ebrary Overall Use Statistics 2011-2012

Parameter	**2011**	**2012**	**% change**
ECU population	25,734	25,404	-1.28
Ebrary collection (# of unique titles)	70,000	75,000	7.14
Collection by # of publishers	379	491	29.55
Unique titles used	10,769	15,975	48.34
User sessions	33,874	56,354	66.36
User searches	14,249	19,888	39.57
Section requests	557,711	804,926	44.33
Pages viewed	521,314	767,456	47.22
Pages copied	6,880	4,853	-29.46
Pages printed	29,517	32,617	10.50
Chapter/range downloads	N/A	2,475	N/A
Full title downloads	N/A	1,757	N/A
Wait queues/turnaways	N/A	N/A	N/A

As evidenced in Table 6.9 an increase is recorded in every variable of Ebrary usage except page copying with 29.46% decrease between 2011 and 2012 (see Section 6.2.5

for further explanation). Table T1 (see Appendix T) shows good coincidence between Ebrary subject areas and the teaching and learning programmes offered by ECU with the exceptions of military and naval science. According to Table 6.9 the used titles were respectively 0.42 and 0.63 per person in the reported years. Since Ebrary does not record user IDs the number of ECU e-book users on this platform cannot be determined.

6.2.3 Ebrary E-book Titles used

Ebrary collection (#unique titles) and the titles used increased 7.14% and 48.34% respectively between 2011 and 2012. The ECU community utilised approximately only 15.38% in 2011 and 21.3% in 2012 (average 18.44%) of unique e-books from the Ebrary database. Put differently, 81.56% of Ebrary e-books were never used at ECU in the reported years on average, conforming to "Trueswell's 20/80 rule" or "Juran's 'Vital Few' Principle, sometimes incorrectly referred to as the 'Pareto Principle'" (Eldredge, 1998, p. 496). Despite the free availability of many of Ebrary titles on Google books (Finding 5.7.8, and Appendix R7) other reasons of such a modest use in relation to survey findings are the same as those with EBL platform. Groves (2014) found through student citations that same e-book titles on Google were used more than those from library collections at the University of Sussex. From among 10,769 titles used in 2011, 2,341 (21.74%) were also used in 2012. In other words, 78% of the titles used in 2011 did not get usage again in 2012 suggesting that past usage may not be a good predictor of future usage (Bucknell, 2010). No definitive conclusion is possible about this behaviour. Changes in reading lists and assessments result in shifts of title use and collection utilisation by subject. However, no data are available about such changes. What is clear, however, is that engagement grew with an increase in titles used by 48.34%. Thus the pattern of increased engagement observed with EBL e-books is also observed with Ebrary e-books.

Ebrary data analysis also showed that the top 10% of the used titles accounted for 60% and 65% (average 62.50%) of usage (section requests) respectively in 2011 and 2012. The trend is even plainer when it comes to the top 20% of titles, where the figures are 77% and 80% respectively. The trend is consistent with some titles having the status of textbooks and/or embedded links. Section requests are calculated as sum of the number of pages viewed/copied/printed, pdf chapter/range and/or full-document downloads.

Most variables of Ebrary usage reports are not comprehensive, for example, a unique title used might comprise only a single page view of ten seconds. A page printed/copied might comprise only one sentence or one or fewer lines of a page. Ebrary log files yield fewer insights due to limitations of the nature and extent of data collection.

6.2.3.1 Subject-wise Usage

Tables T4 and T5 (see Appendix T) list most frequently used 20 titles year-wise. Based on section requests, 211 and 276 Ebrary titles with 400 or more section requests were selected respectively from 2011 and 2012 usage reports. These titles were assigned broader subjects using LCSH and descriptors from Google e-books. According to Tables T2 and T3 (see Appendix T), twenty-one (21) and 24 subjects accounted for 27.70% and 32.60% of usage (section requests) respectively in 2011 and 2012 with medicine & health, education, psychology, and social sciences being the most frequent. Most other subjects in both the years were same except environmental science in 2011 and agriculture, law, media, and physics in 2012. The usage percentage of these subjects would be much more if all the viewed titles are analysed subject-wise. However, the usage reports provided to researcher did not list subject headings, keywords or Dewey numbers.

6.2.3.2 Publisher Analysis

The e-books used in 2011 and 2012 respectively belonged to 379 and 491 publishers. The most frequent 20 publishers each were selected from both the years. These publishers accounted usage for more than 50% and 45% (average 47.50%) of titles and 59% and 46% (average 52.50%) of section requests respectively in 2011 and 2012 (see Tables T7 and T8 in Appendix T). In both the years, 12 publishers were same and 8 each were different. In a nutshell, 28 unique publishers made a lion's share in both the years in terms of number of titles and their section requests. McGraw-Hill, Routledge, Wiley, and Oxford University Press were the most frequent.

6.2.4 ECU Academic Cycle and User Section Requests

The use of e-books is linked with ECU academic cycles as evidenced in Figure 6.8 (see Table T6 in Appendix T for details). May in the first semester and September in the

second accounted for most usage followed by April, October, March, and August. These are the months when students prepare and submit their assignments, term papers, and projects. January, February, July, and December are the break months and hence captured comparatively very low usage. Less usage was also seen in the examination months, June and November. The pattern of use is similar to EBL.

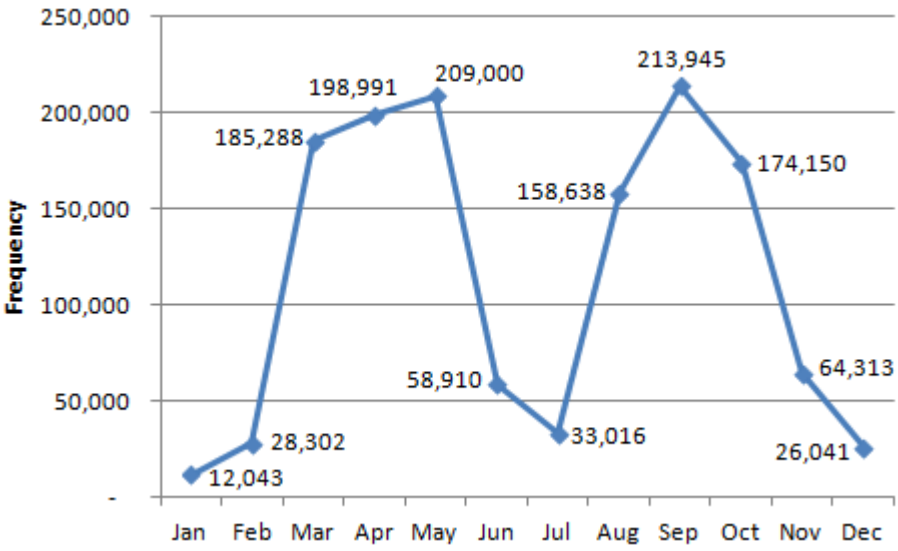


Figure 6.8. Month-wise user section requests, 2011-2012

6.2.5 Other Measures

Searches via the Ebrary interface/site increased 39.57% in 2012 relative to 2011, consistent with the increase in titles used (48.34%), section requests (44.33%), and sessions (66.36%). On average per session 3.37 titles were used, 14.28 pages were viewed, and 15.10 section requests were made in each of the reported years. The searches for e-books via the Library interface were unavailable to researcher and, thus, not included in this study.

The pages viewed in the two surveyed years averaged 1,288,770, with approximately forty-eight pages per unique title used (N = 26,744). Pages copied in the two reported years averaged 11,733, representing less than 1% of the pages viewed. Copying pages decreased 29.46% in 2012 owing to the introduction of chapter/range downloads and full title downloads, subject to a 7 to 14 days DRM loan expiration restriction (see

Section T.II in Appendix T for Ebrary's DRM details). Owing to complications of page copying, page printing increased 10.50% in 2012. In total 62,134 pages were printed in two years, 4.82% of the pages viewed. Chapters/ranges (2,475) and entire e-books (1,757) were downloaded in 2012 when new DRM loan options became available. Full titles downloaded were 11% of the titles used in 2012.

Findings on both the e-book platforms (EBL and Ebrary) show similar trends and patterns of use. Findings in this section are also consistent with Ebrary-based previous studies (e.g. Al, Soydal, & Tonta, 2010; Lamothe, 2010; Lannon & Mckinnon, 2013; Sprague & Hunter, 2008; Tucker, 2012).

6.3 Discussion and Summary of Analysis of System-generated Datasets

The analysis of system-generated datasets in this Chapter addressed the following research questions:

RQ1 & RQ2: What patterns of e-book use exist in the case study academic and research library and how can such patterns of use be understood?

6.3.1 ECU E-book User Community

Survey data showed that 67.62% of the sample respondents used ECU e-books (Finding 5.1), whereas DLA of EBL e-book data resulted in a lesser figure of 38.30% of users who browsed at least one e-book title (Section 6.1.4). Differences in adoption behaviour found using these two different research techniques can be understood in terms of the following factors:

- Self-reported behaviour captured *all* e-book sources and not just EBL users. Hence Ebrary (more than 80,000 titles), MyiLibrary (341 titles), and Safari (100 titles) (Chapter Six, introduction) are potentially represented in the reporting of self-behaviour;
- Latency. The survey was conducted in 2013 and hence included new 2013 users whereas DLA users were recorded 2010-2012;

- Self-reported behaviour was based on a convenience sample that involves some bias towards programmes that are known to involve over representation of e-book users relative to the ECU population;
- The so-called Hawthorne effect. The perceived social desirability of being an e-book user is likely to have inflated adoption outcomes with self-reported behaviour. Also a psychological feeling of hesitation among non-users of e-books for taking the survey cannot be excluded as an explanation of the larger adoption figure recorded in self-reported information behaviour.

Clearly, limitations of the nature and extent of the datasets available make a definitive assertion of the e-book user-base as a proportion of the population problematic. It is clear however that non-adoption ranges between one-third and two-thirds of potential users. The following discussion explores patterns of use in terms of this and other metrics of engagement.

6.3.2 Overall Use of E-books

DLA (Sections 6.1.8 and 6.2.3) showed that only a small fraction of e-books on average was used on both the e-book platforms, EBL, 2010-2012 (8.40%) and Ebrary, 2011-2012 (18.44%). Both analyses of system-generated datasets (this chapter) and self-reported information behaviour (Chapter Five) also pointed to many non-adopting users (see above).

Review of the Ebrary's collection list (see Table T1 in Appendix T) showed that programme subjects are well represented in e-book collections by discipline. Non-adoption therefore arises because:

- Academics choose not to engage students with e-book titles, preferring journals and p-books. The research did not have access to datasets enabling this problem to be investigated further. The key role played by academic referrers in adoption is widely reported in the literature (Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010; Rowlands et al., 2007).
- Students are resistant to the format. The survey of self-reported behaviour enables this to be understood, and reasons are briefly recounted below.

The major reasons of non-use explored in the survey (Table 5.4 and Finding 5.4) comprised lack of awareness (41 of 98 responses, 41.84%), preference for and use of physical books exclusively (36.73%), issues of findability in the library catalogue (31.63%), DRM limitations on e-books (24.49%), and unpleasant to use (21.43%), login problems (13.27%), cumbersome e-book interface (11.22%), and insufficient titles (10.20%). In their textual responses "no need" was the major reason reported by seven of non-user respondents. Survey analysis also showed that student need of e-books arose only when their physical counterparts were unavailable and this also owed to preference for physical books (Finding 5.11.2). The questionnaire item (3.2) being intended for all respondents showed that around 52% of users preferred physical books to e-books (Finding 5.11.1).

DLA also pointed the phenomenon of titles and users that are the subject of intensive engagement. Three years' DLA of EBL e-books showed that 4.60% of e-books were 'read' by a 25.44% of ECU community between 2010 and 2012 (Section 6.1.8). This pattern is consistent with these titles having the status of recommended/required texts and/or embedded links. DLA also supported the finding from Chapter Five that e-books are not preferred for longer/extended reading (Finding 5.10.9). From DLA, the ratio between browsing and reading transactions was consistent across the three years at approximately 70:30 (Section 6.1.5). Converting browsing users to reading users also depends on DRM that is acceptable to users (see Appendix T.II for Ebrary's DRM details). DRM concerns (Finding 5.10.6) were also frequently reported in respondents' open-ended comments (Appendix R1). Other related issues in open-ended comments concerned usability, platform/devices, size and quality of content, and format (see Appendix R).

6.3.3 Transactions and Minutes

Transactions and minutes were recorded in EBL logs only. As noted, browsing transactions (70%) were more than twice the reading transactions (30%) (Section 6.1.5). Similarly, Around 85% of transactions/views by minutes were below 10 minutes, whereas 0-minute views were around 31% (Section 6.1.6). Transaction/views involving sub-reading minutes (<10 mins) point towards skim (or reference) or quick, snippet fact extraction use of e-books (Borchert et al., 2009; Nicholas, Rowlands, & Jamali, 2010;

JISC, 2009) and abandonment of titles after browsing that do not satisfy an information need. Against survey items (3.14 and 3.17), the majority of respondents, 57% each, showed agreement respectively for typical skim reading (Finding 5.10.8) and most quick, fact finding information (Finding 5.10.10) use of e-books. Respondents also self-reported that e-books were not suitable for extended reading (Finding 5.10.9). Thus DLA provided triangular confirmation of the survey findings.

6.3.4 Types of E-book Users

Based on averages of three years' combined EBL data (N=233,213), minutes per transaction/view showed extreme variability. This was also evident from the skewness (9.755) and kurtosis (115.411) values. The median (2 minutes) and mode (0 minute) were unchanged across three years. Review of the frequency distribution showed that consistently across the surveyed years, one-third of all transactions were abandoned in less than one minute and one-half in less than three minutes.[83] The data were bi-modal, multi-peaked, leptokurtic, and asymmetrically distributed. If the pattern of use typically involves abandonment with or without browsing in three minutes or less, DLA also revealed intensive or highly engaged users.

DLA summary statistics supported findings from previous studies, namely, that a small cohort of users was responsible for most reading behaviour (Ahmad & Brogan, 2012; Al, Soydal, & Tonta, 2010; Lamothe, 2010; Lannon & Mckinnon, 2013; Sprague & Hunter, 2008; Tucker, 2012). On average only 15 and 20 percent of users respectively consumed 83% of total minutes and made nearly 67% of all views/transactions in each of three years, 2010-2012. Analysis suggests that e-book users consist of skim readers, fact finders, average and power users. Since the existing literature has mostly framed e-book use as superficial, the confirmation of highly engaged users presented the researchers with a new analysis opportunity, namely the 'power' user. Utilising the

[83] Vide Table 6.4 (p. 191) and Table 6.5 (p. 192). Table 6.5 calculation is based on multiples of one minute with round down.

work of Wilson (1999)[84] and Marchionini (2006),[85] an information behavioural profile of such a user is suggested and validated against log data using statistical methods in Chapter Seven.

6.3.5 Summary and Researcher Reflection

DLA of EBL transaction logs showed growing engagement with e-books at ECU between 2010 and 2012. However, looking collectively at EBL/DLA data, it is apparent that only 38.30% of the university population made use of EBL e-books in browsing mode and of these browsers 66.43% (overall 25.44%) entered into reading mode one or more times. A small cohort of titles (8.40%) was browsed and of these 54.79% (overall 4.60%) read in each of three reported years one or more times. Around a third (33.57%) of browsing users never entered the reading mode with any e-book title.

A similar pattern of growth was observed with Ebrary, subject to the limitation that log files did not describe browsers, users, and time spent, but only titles used. Increasing engagement of the ECU community was observed with more titles used between 2011 (10,769 titles) and 2012 (15,975 titles) - an increase of 48.34% in the number of titles used. Exploration of titles was disappointing, with only 18.44% of the Ebrary titles used in the two reported years on average. Furthermore, consistent with Zhang and Kudva (2014), survey findings revealed that e-book adoption may vary by individual demographic, contextual, and situational factors (Chapter Five).

In summary, DLA and other analysis showed increasing engagement with the e-book format year on year as measured by % increase in users and titles used. However, in aggregate terms non-adoption was also observed, with only 38% of the ECU population manifesting as adopters of EBL e-books as measured by DLA of EBL transaction logs. The result with DLA points to the weakness of the convenience sample in conveying

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[84] Vide Section 2.5.6.1 for details of Wilson's work on human information behaviour.

[85] Vide Section 2.7.3.1 for details on Marchionini's concept of exploratory search.

the true level of adoption – the whole population outcome shows an adoption rate of around half that of the outcome from self-reported behaviour with a convenience sample. Section (6.1.3) describes reasons for this difference. However, definitive explanation of the lower than expected adoption found in log files is elusive. The research could not control for academic referrer effects (embedded links and adoption or non-adoption of e-books by academics in subjects) and hence the role played by resistance to the format cannot be precisely determined. In other respects, results from DLA were consistent with outcomes from analysis of self-reported behaviour. For example, the Chapter Five findings that most use involved fact finding (5.10.10, p. 142) and skim reading (5.10.8, p. 141) was supported by EBL analysis. Around 85% of transactions/views by minutes were below 10 minutes, whereas 0-minute views comprised around 31% (Section 6.1.6).

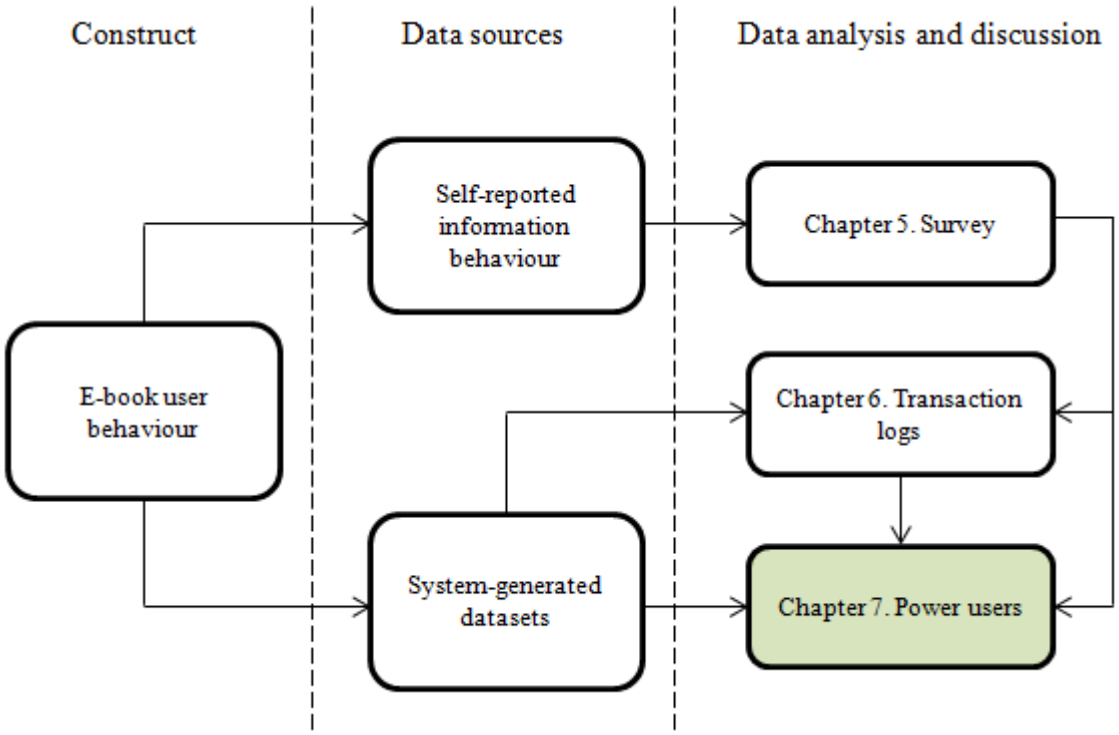
Year on year, DLA showed that more titles were being used (see sections 6.1.8 and 6.2.3) describing growth in explorations of the resource. However, as discussed, in terms of collections, only small percentages of collections were ever used. The contemporary literature showed similar findings, for example, only the 10% of Ebrary titles were used at the Hacettepe University, Turkey (Al, Soydal, & Tonta, 2010). Lannon and McKinnon (2013) revealed that a small number of titles accounted for a large percentage of usage annually, and 97% of the Ebrary e-books were never accessed at the McGill University, Canada. Groves (2014) found that merely 22.5% of students viewed 14% of the EBL e-books at the University of Sussex, UK. According to CIBER (2009b), a small number of titles of the MyiLibrary database accounted for most usage at the UK universities. McLure and Hoseth (2012) revealed that e-books received more use through browsing than sustained use or download, but relatively little use overall at the Colorado State University, USA. Culture of use is also consistent with the preference for format (Finding 5.11).

How can apparent underutilisation of the e-book titles be explained? Lamothe, (2013) argues that insight comes from comparing the number of searches with use metrics (e.g. number of viewings, titles browsed and titles read). Lots of searches with fewer unique titles used (EBL section 6.1.11) can be explained in terms of:

- Information retrieval and collection issues – for example, query efficiency and discovery tool efficiency in terms of precision and recall (Ahmad & Brogan, 2012), and title sufficiency to meet information needs (Shin, 2011);
- Culture of use – for example, where habit/automaticity operates with the results of searches for e-books as it does with a Google results list where most people do not go beyond the first page of a results list; and
- Immaturity of use – longevity of user experience (e.g. years in higher education), and programme context (undergraduate vs. postgraduate) involve different information behaviour. Fact finding and skim reading are typical of nascent use and there is much evidence of this from DLA. Nascent users are also more likely to be users of embedded links. The roles played by embedded courseware links and academic referrer adoption revealed in findings 5.10.13 and 5.12.5, is consistent with previous studies (e.g. Bierman, Ortega, & Rupp-Serrano, 2010; CIBER, 2009b; Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010; Nicholas et al., 2009b; Rowlands et al., 2007). Most of the collection would consequently remain unexplored if most reading behaviour entailed these factors and crossover effects (culture of use/automaticity) resulting in gaps in the volume of use and the number of users.

The study suggests that ARLs face the challenge not only of building engagement, but also shifting behaviour from nascent to mature use. The research-oriented literature and survey (self-reported information behaviour) suggest that one element of a successful response to this challenge is the capability of dynamically profiling user behaviour contained in log files and to offer individualised experience. The researcher chose next to explore the question of how user patterns of behaviour contained in log files might work for user profiling to offer individualised (personalised and/or customised) experience of e-books. The case of the intensive or ‘power user’ was adopted as a starting point, as a new vein of research and alternative to the discourse on nascent or immature use that pervades most of the research-oriented literature.

CHAPTER 7: DATA ANALYSIS AND DISCUSSION: POWER USERS: ADDRESSING THE GAP BETWEEN USER EXPECTATION AND EXPERIENCE



7.1 Introduction

The Summary and Researcher Reflection in Chapter Six outlined the rationale for another phase of the investigation concerning so called 'power users'. Findings from the DLA of the EBL platform and survey suggested a sophisticated e-book user group of *power users.* Specifically, DLA findings (Section 6.1.8) showed that a small cohort of users is responsible for most reading behaviour.

- In some instances, such users recorded outlier behaviour in terms of total minutes of more than five SD units.
- Indeed a few users accounted for most usage in terms of total views and sum of minutes in combined browsing and reading modes.
- On average only 15% of users consumed 83% of total minutes and 20% of users made nearly 67% of all views/transactions in each of three years, 2010-2012.

7.2 What is an E-book Power User?

The concepts of a power user and academic e-book power user were discussed in Chapter Two.[86]

With the benefit of Marchionini's (2006) concept of exploratory search[87] an intriguing picture emerges of what it is to be an e-book power user – i.e. a power user can be thought of as one who converts titles browsed to titles read more than most users, reads more unique titles and manifests engagement through exploratory searching and serendipitous discovery. For this analysis, with a working hypothesis of the power user as someone who manifests exploratory behaviour as well as intensive use, a reference group of power users was identified from the logs based on the criteria of one thousand (1,000) minutes spent in browsing and/or reading ten (10) or more unique titles in one year. Such thresholds may seem modest, but in an academic library context exploratory searching is often undertaken with journals, e-journals and Web-based information sources, i.e. with a variety of information source types.

However, the existing research has defined and scoped power user simplistically, for example, Borchert et al. (2009), Folb, Wessel, and Czechowski (2011), JISC (2009), Levine-Clark (2007), Nicholas et al., (2010), and Posigha (2012). Whereas, the LIS literature on information behaviour attributes exploratory search, serendipitous discovery and other advanced cognitive learning processes (Marchionini, 2006; White & Roth, 2009). Hence, the researcher identified a need to further investigate this category of users in the real time record of transaction log data. The researcher concluded that such research might be significant in personalisation and customisation of resources aimed at building better e-book delivery systems.

This chapter demonstrates how power user behaviour is different from other user behaviour, shows which variables determine such behaviour and creates a probabilistic

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[86] Vide Section 2.7 for details on power users and academic e-book power users.

[87] Vide Section 2.7.3.1 for details on Marchionini's concept of exploratory search.

model that can determine a power user based on these variables. The work is rational and significant in as much as profiles might be used to offer customised user interfaces to users- a classic approach to improving user experience with information systems. Survey finding (5.15.3, p. 156) revealed that customisation features rank as the third largest effect factor in terms of overall satisfaction, an endorsement of expectation and gratification theory relevance to understanding user acceptance of e-books. Specifically, users who found existing Library e-book customisation features inadequate to meet their needs were less likely to be satisfied overall.

Another survey finding (5.18.8, p. 161) also demonstrated the importance of functionality features of e-books including user customisation in predicting continuance intention with large effect size, an endorsement of performance expectancy and gratification theory to inform user acceptance and engagement of e-books. Specifically, users who used Library e-books due to functionality features (full-text searching, highlighting, bookmarking, annotating, downloadability, and user customisation) were more likely to express continuance intention.

Such findings reflect the broader discourse on the role of customisation and personalisation of e-books. For example, Abdullah and Gibb (2008a) citing Appleton assert that "... e-books need to be customised and targeted at a particular user group" (p. 596).

Analysis and interpretation of the power user log data partially addresses the first two of the research questions that motivated the study in respect of this cohort of users:

RQ1- What patterns of e-book use exist in academic and research libraries?
RQ2 - How can these patterns of e-book use be understood?

The remainder of the Chapter describes and explains patterns of use in respect of power users.

7.3 Identification of Academic E-book Power Users: Datasets and Methodology

Can academic e-book power users be reliably identified in system log data? A case study set of e-book user transaction log data generated by the Ebook Library (EBL)

platform was made available by the Edith Cowan University Library to assist with the study. Deep Log Analysis (DLA) was used to explore the data. With statistical methods, further investigation yielded insight into whether an equation for identifying academic e-book power users within log data could work at an appropriate confidence level. Identifying and isolating academic power e-book users in transaction logs for study presents some methodological challenges, for DLA targets large datasets requiring new skills and a commitment to learning new methods. Prior studies (e.g. Ahmad & Brogan, 2012; Ahmad, Brogan, & Johnstone, 2014; Al, Soydal, & Tonta, 2010; CIBER, 2009b; JISC, 2009; Nicholas et al., 2005, 2007, 2009a, 2010) have used this technique.

The sample data for the study consisted of computer-generated EBL transaction log files of e-books used over three years, (2010-2012), at ECU. The ECU Library purchased access to EBL e-book database in 2010. The 2010, 2011, and 2012 log files contained 65,190, 70,750, and 97,273 records respectively of transaction data, describing the behaviour of 8,482, 9,353, and 11,690 year-wise unique ECU e-book users. Table 7.1 shows such data with the variables of interest.

Features of these logs include the non-normality of data and over-representation of behaviour based on embedded links. Table 7.2 describes log variables and coding of power and non-power users based on the heuristics of 1000 minutes and 10 or more unique titles. The dependent variable is non-power user (NPU) or power user (PU) coded respectively with zero and one (NPU0_PU1).

Table 7.1. E-book Transaction Log Data Example

Date	eISBN13	Minutes	Mode	User ID
15/03/2010	9780470506561	2	Browsing	0544DAB895
15/03/2010	9780470498750	343	Reading	61F1B9AEED
15/03/2010	9780470510537	7	Browsing	0544DAB895
18/03/2010	9780080922652	3	Browsing	61F1B9AEED
21/03/2010	9780203894781	0	Browsing	B4313B6013
21/03/2010	9780203894781	1,439	Reading	B4313B6013
05/04/2013	9780470510537	1	Reading	0544DAB895
29/04/2010	9780470159149	1,343	Reading	FFB78D1AC0
17/05/2010	9780080494036	0	Browsing	8611A0541E
17/05/2010	9780470588185	4	Browsing	8611A0541E
17/05/2010	9780470588185	1110	Reading	8611A0541E
17/05/2010	9780470588185	0	Reading	8611A0541E
17/05/2010	9780511241321	0	Browsing	8611A0541E
17/05/2010	9780787987497	3	Browsing	8611A0541E
17/05/2010	9780814414798	4	Browsing	8611A0541E
17/05/2010	9781403948106	0	Browsing	8611A0541E
17/05/2010	9781848449503	1	Browsing	8611A0541E
18/05/2010	9780787987497	0	Browsing	8611A0541E
18/05/2010	9780787987497	101	Reading	8611A0541E
18/05/2010	9781847877499	4	Browsing	8611A0541E
26/05/2013	9780470159149	9	Browsing	7ADEB5BEB0
18/08/2010	9781410617675	1	Browsing	8611A0541E
29/08/2010	9780470498750	1	Browsing	7ADEB5BEB0
26/09/2010	9781615353293	0	Browsing	8611A0541E

Table 7.2. PU and NPU Data Subset Example (derived from Table 7.1)

NPU0_PU1	User ID	Views	Minutes Total	Minutes Browsing	Minutes Reading	Minutes Max	Sessions[88]	Titles Browsed	Titles Read	Unique Titles Viewed	Unique Titles Browsed	Unique Titles Read
0 (NPU)	0544DAB895	3	10	9	1	9	2	2	1	2	2	1
0 (NPU)	61F1B9AEED	2	346	3	343	343	2	1	1	2	1	1
0 (NPU)	7ADEB5BEB0	2	10	10	0	9	2	2	0	2	2	0
1 (PU)	8611A0541E	14	1,228	17	1,211	1,110	4	11	3	10	10	2
0 (NPU)	B4313B6013	2	1,439	0	1,439	1,439	1	1	1	1	1	1
0 (NPU)	FFB78D1AC0	1	1,343	0	1,343	1,343	1	0	1	1	0	1

[88] Since calculation of sessions as per EBL criteria (login counts) (L. Jahn, personal communication, September 11, 2013) or counting opened titles after at least one page turn each was not possible from the log data, my session counts is based on unique dates.

The independent variables are Minutes Total (sum of Minutes Browsing and Minutes Reading), Views (sum of Titles Browsed and Titles Read), Minutes Max, Sessions, and Unique Titles Viewed (Unique Titles browsed and/or read).

7.4 Results and Discussion

The Kolmogorov-Smirnov (K-S) test ($p < .001$), and other measures (e.g. inspection of skewness, kurtosis, histograms, boxplots) indicated the non-normal distribution of data across all variables based on all e-book users (PUs and NPUs). The heuristic of academic e-book power use adopted for the study yielded 517 PUs overall. In this study, an academic e-book PU is characterised as a person who spent 1,000 or more minutes in browsing and/or reading of 10 or more unique titles in one year.[89] Such a threshold was set to minimise the chance of inclusion of reading behaviour concentrated merely around embedded courseware links. When compared with the total ECU population (faculty, students, and staff) (Edith Cowan University, 2013) the e-book PUs are 152/25,943 (0.59%), 233/25,734 (0.91%), and 132/25,404 (0.52%) respectively for 2010, 2011, and 2012.

Based on the 2010 data, in contrast with the JISC (2009) study, ECU e-book PUs are most likely to be found in health sciences, business & management, media, engineering, computing, law, and education. Table 7.3 shows top twelve ECU power e-book users from EBL usage data of 2010.

[89] Application of the heuristic in 2010 = 152 power users or 1.79%; 2011 = 233 or 2.49%; 2012 = 132 or 1.13% of total e-book users.

Table 7.3. Top Twelve ECU Power E-book Users, 2010

Rank	Views	Minutes Total	Minutes Browsing	Minutes Reading	Minutes Max	Sessions	Titles Browsed	Titles Read	Unique Titles
1	651	28,112	960	27,152	1,437	107	455	196	198
2	233	8,143	328	7,815	1,343	52	145	88	111
3	65	7,838	91	7,747	1,351	23	40	25	21
4	55	7,289	79	7,210	1,381	21	37	18	30
5	81	7,220	98	7,122	1,381	26	46	35	31
6	62	6,772	135	6,637	1,425	25	35	27	18
7	62	6,607	101	6,506	1,379	16	37	25	23
8	120	6,211	209	6,002	1,439	40	80	40	45
9	235	6,035	250	5,785	1,161	39	162	73	120
10	38	5,860	35	5,825	1,437	16	21	17	11
11	107	5,375	153	5,222	1,376	34	74	33	55
12	237	5,309	509	4,800	1,425	36	175	62	109

Table 7.4 highlights the non-parametric nature of the data as seen by the Kolmogorov-Smirnov (K-S) test results and the multi-modal nature of variables.

Table 7.4. ECU PUs at EBL, 2010: Summary Statistics (N = 152)

Statistic	Views	Minutes Total	Minutes Max	Minutes Browsing	Minutes Reading	Sessions	Titles Browsed	Titles Read	Unique Titles viewed	Unique Titles read
Mean	68.55	2,615.08	836.63	104.16	2,510.92	20.07	46.63	21.91	31.42	14.79
Median	48.50	1,830.00	853.00	73.50	1,761.50	17.50	31.00	17.00	21.00	11.00
Mode	34	1,073[a]	1,437	50	1,087[a]	8[a]	25	9[a]	10	7
Std.Dev.	68.173	2,582.108	412.023	105.191	2,513.749	13.448	48.642	20.363	27.884	12.916
Range	637	27,097	1,328	956	26,418	103	444	194	188	101
Skewness	4.711	6.751	.009	4.343	6.622	2.333	4.578	4.700	2.560	3.030
Kurtosis	35.027	63.078	-1.501	29.570	61.226	10.835	32.755	35.351	9.277	14.720
p (K-S test)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Subsequent sections demonstrate significant differences in power user behaviour from non-power users, that they can be detected statistically by their patterns of system use, and develop a model that can dynamically determine, a priori, whether a user is a power user or not.

7.4.1 Difference between Power and Non-power Users

A Mann-Whitney *U* test was used to compare two independent, combined samples (PUs and NPUs) of 2010. This test was selected to see if the values between PUs and NPUs across the variables, *Views* (transactions), *Minutes Total*, *Minutes in Browsing*, *Minutes in Reading*, *Minutes Max* spent in browsing/reading a title, *Sessions* conducted, *Titles Browsed*, *Titles Read*, overall *Unique Titles* viewed (regardless of mode, browsing or reading), and *Unique Titles Read* are statistically, significantly different. The purposive sample of 152 PUs was compared with a randomly selected sample of 381 NPUs drawn from the 2010 dataset. The NPU population for 2010 was over 8,000. Hence, the NPU sample size was determined from Israel (2009) based on ±5% precision level where confidence level is 95% and P = 0.5 to mitigate type I and II errors.

The Mann-Whitney *U* test indicated that the values of PUs across all variables were significantly different than those of the NPUs as evidenced in Table 7.5.

Table 7.5. PUs (n=152) vs. NPUs (n=381) (N = 533)

Variable	***Mean Rank***	***U***	***z***	***Adjusted p, 1-tailed***	**Effect *r***	**Effect size *r****
Views	NPU = 192.90 PU = 452.75	722.00	-17.658	.000	-0.76	Large
Minutes total	NPU = 192.12 PU = 454.69	427.00	-17.779	.000	-0.77	Large
Minutes browsing	NPU = 194.78 PU = 448.02	1440.50	-17.163	.000	-0.74	Large
Minutes reading	NPU = 192.32 PU = 454.19	502.50	-17.969	.000	-0.78	Large
Minutes max	NPU = 196.34 PU = 444.12	2034.50	-16.781	.000	-0.73	Large
Sessions	NPU = 194.43 PU = 448.91	1305.00	-17.502	.000	-0.76	Large
Titles browsed	NPU = 193.16 PU = 452.09	823.00	-17.712	.000	-0.77	Large
Titles read	NPU = 193.16 PU = 452.10	821.50	-17.774	.000	-0.77	Large
Unique titles viewed	NPU = 193.89 PU = 450.26	1101.00	-17.641	.000	-0.76	Large
Unique titles read	NPU = 193.93 PU = 450.16	1115.00	-17.653	.000	-0.76	Large

* Effect *r* => .5 is considered large (Cohen, cited in Allen & Bennett, 2010, p. 241)

Thus PUs spend more minutes in browsing and reading, conduct more sessions, explore more unique titles and browse and read more titles than NPUs and these differences are significant. Hence a picture of the power user behaviour begins to emerge which is consistent with Marchionini (2006) and where classic behaviours identified with power users of print books are also found to be significant with e-books.

7.4.2 Relationship between Variables (Correlations)

Kendall's tau-b (one-tailed, N = 533) indicated the presence of a strong positive correlation of minutes total with minutes in reading ($\tau = .92$, $p < .001$), with minutes

max ($\tau = .89$, $p < .001$), with titles read ($\tau = .72$, $p < .001$), with minutes in browsing ($\tau = .70$, $p < .001$), with views ($\tau = .70$, $p < .001$), with unique titles read ($\tau = .70$, $p < .001$), with sessions ($\tau = .66$, $p < .001$), with titles browsed ($\tau = .65$, $p < .001$), and with unique titles viewed ($\tau = .61$, $p < .001$). Correlation testing results were consistent with the results from Mann-Whitney *U* testing.

7.4.3 A Model to Predict Power Users of E-books

The researchers recognised that the most useful outcome from DLA analysis of transaction data would come from autonomous, machine-based analysis of user behaviour leading to categorisation of a user as a power or non-power user and utilisation of the result to adjust the user experience of e-books via interface and accessible functionality. Binary Logistic Regression (BLR) was used to see what variables predict a PU and also to confirm a formula that might work with log data to dynamically distinguish a PU from an NPU.

7.4.3.1 Binary Logistic Regression (BLR) of the 2010 Dataset

The 2010 dataset was used as a base to develop a regression equation. BLR is non-sensitive to the conditions of data normality, levels of measurement, linearity and variance (R. B. Burns & R. A. Burns, 2008). As discussed, the PU/NPU subset comprised a purposive sample of 152 PUs and a random sample of 381 NPUs from 2010. Owing to the dichotomous and categorical nature of the dependent variable (PU/NPU), BLR was selected as the most appropriate regression method. The predictor or independent variables derived from the raw transaction logs were *Minutes Total, Views, Minutes Max, Minutes in Browsing, Minutes in Reading, Sessions, Titles Browsed, Titles Read, Unique Titles* viewed (browsed and/or read), *Unique Titles Browsed*, and *Unique Titles Read*. Two variables as a whole, *Minutes Total* and *Unique Titles* were not included in the analysis because these were used to derive the response/dependent variable, NPU/PU. However, Minutes Total was bifurcated as Minutes in Browsing and Minutes in Reading in the analysis. One of the bifurcations of Unique Titles was included in the analysis as Unique Titles Read. Hence, Unique Titles Browsed was excluded. Another variable, *Views* (transactions/accesses), was not

included in the analysis as a whole but was bifurcated into *Titles Browsed* and *Titles Read*.

The preliminary test showed that two variables, Minutes Max and Titles Read were not significantly contributing to the model hence they were excluded. Using SPSS-21 a BLR re-test of the model was statistically significant, indicating that the remaining five predictors as a set reliably distinguished between PUs and NPUs (chi square = 600.013, $p < .001$ with df = 5).

The non-significance ($p > .05$) on the Hosmer and Lemeshow (H-L) goodness-of-fit test, an alternative to chi-square, indicates well-fitting models (R. B. Burns & R. A. Burns, 2008). This desirable outcome of non-significance suggests that the model prediction does not significantly differ from the observed. In our case the H-L statistic (1.000) was not statistically significant, indicating good fitness of the model (Table 7.6).

Table 7.6. Hosmer and LemeshowTest

Step	Chi-Square	df	Sig.
1	0.190	8	1.000

The prediction success rate of the BLR model was 98.7% overall and for NPU and PU as well as shown in Table 7.7.

Table 7.7. BLR Classification Table

Observed		**Predicted** NPU0_PU1		Percentage
		NPU	PU	Correct
NPU0_PU1	NPU	376	5	98.7
	PU	2	150	98.7
Overall %				**98.7**

Nagelkerke's R-squared was 0.969, indicating a strong relationship between the grouping/predictors and the prediction. The Wald criterion demonstrated that the five

predictor variables, *minutes in browsing (p < .022), minutes in reading (p < .001), sessions (p < .048), titles browsed (p < .038),* and *unique titles read (p < .042),* made a significant contribution to prediction at *a = 0.05* level with one degree of freedom as evidenced in Table 7.8.

Table 7.8. BLR Variables in the Equation

IVs	B	S.E.	Wald	*p*	Exp(B)
Minutes in Browsing	.110	.048	5.367	.021	1.117
Minutes in Reading	.009	.002	13.437	.000	1.009
Sessions	-.398	.200	3.960	.047	.672
Titles Browsed	.170	.082	4.336	.037	1.186
Unique Titles Read	.417	.204	4.168	.041	1.517
Constant	-14.604	3.781	14.920	.000	.000

The logistic coefficients produced the following predictive equation:

$$\text{Probability of identifying a power user} = \frac{e^x}{1 + e^x}$$

Where **x =** {(0.110 x Minutes in Browsing) + (0.009 x Minutes in Reading) -- (0.398 x Sessions) + (0.170 x Titles Browsed) + (0.417 x Unique Titles Read) – 14.604}; and e is the base of the natural logarithm (approx. 2.72).

The above equation was applied to two of the randomly selected sample cases, one each from PU and NPU 2011 datasets. Table 7.9 describes the result.

Table 7.9. Application of Predictive Equation to Sample Cases

Sr	***Minutes total (not in equation)***	**Minutes browsing**	**Minutes reading**	**Sessions**	**Titles browsed**	***Unique titles viewed (not in equation)***	**Unique titles read**	**Application of equation**	**Result**
Case1	1,206	17	1189	8	8	5	3	$e^{-2.606}/1+e^{-2.606}$	0.07
Case2	1,379	54	1,325	12	17	12	4	$e^{3.043}/1+e^{3.043}$	0.95

Based on one year of data, both cases satisfied at least 1,000 Total Minutes (browsing and reading). The second criterion of unique titles viewed =>10 was satisfied by Case2 only. Therefore, according to criteria, Case2 was a power user and the Case1 a non-power user. The equation classified both cases correctly without knowing the criteria values. As the Table 7.9 showed the probability of being a power user for Case1 was 7%, and for Case2 95%.

7.4.3.2 Validity and Reliability Testing of the BLR Model

Two tests were conducted to test the validity and reliability of the BLR model. These were the Receiver Operating Characteristic (ROC) test and test of reliability/efficiency.

7.4.3.2.1 Receiver Operating Characteristic (ROC) analysis

Receiver Operating Characteristic (ROC) curve is a useful measure of goodness-of-fit to evaluate the performance of classifying binary subjects (IBM, 2013). ROC procedure assesses the predictive accuracy of a comparing model (Gonen, 2006). In this chapter ROC was used to evaluate the fit of the BLR model based on the simultaneous measurement of sensitivity (True positive) and specificity (True negative) for all possible cutoff points using state variables (NPU/PU) and the saved predicted probabilities of the BLR as test variable. The sensitivity and specificity pairs for each possible cutoff point and plot sensitivity were calculated with ROC curve analysis at asymptotic 99% significance level (Table 7.10).

Table 7.10. ROC Analysis Results

Statistic	**NPU**	**PU**
Area	.001	.999
Std. error	.001	.001
Asymptotic sig	.000	.000
Lower bound	.000	.998
Upper bound	.002	1.000

The area under the curve with 99% confidence interval, .999 (.998, 1.000) for PU and .001 (.000, .002) for NPU, is significantly different ($p < .001$) meaning that the BLR classifies both the groups (NPU/PU) significantly rejecting the null hypothesis of by chance.

7.4.3.2.2 Reliability and efficiency: 2011 and 2012 datasets

The 2011 and 2012 datasets were tested against the BLR equation using the same coding system and sampling. There were 233 and 132 PUs and 9,120 and 11,558 NPUs

respectively for 2011 and 2012. The misclassified cases as a result of the test were 15 and 2 out of 381 each with scores more than 0.49 for NPUs and 8 and 3 out of 233 and 132 with scores less than 0.51 for PUs respectively for 2011 and 2012 against the coding, 0 for NPU, and 1 for PU. Hence, the overall prediction success was 96.25% and 99.02% (96.06% and 99.47% for NPU, and 96.57% and 97.73% for PU) respectively for 2011 and 2012.

7.4.4 Comparison among PUs and between PUs and All Users

The sums of all the variables were compared among the ECU PUs and between PUs and all users for 2010, 2011, and 2012. Table 7.11 shows a comparative summary.

Table 7.11. ECU Comparative Summary: 2010 - 2012 (PUs & All Users at EBL)

Variable	**PUs 2010**	**PUs 2011**	**PUs 2012**	**Sum (PUs, 2010-12)**	**Sum (all users, 2010-12)**	**% share of PUs 2010-12**
Total number of users*	152	233	132	517	29,525	1.75
Total transactions /views	10,419	15,245	11,052	36,716	233,213	15.74
Total minutes in viewing (browsing & reading)	397,492	805,768	237,503	1,440,763	4,823,719	29.87
Total minutes in browsing	15,832	23,938	17,127	56,897	378,736	15.02
Total minutes in reading	381,660	781,830	220,376	1,383,866	4,444,983	31.13
Total minutes max (aggregate) in viewing one title	127,168	218,250	43,301	388,719	2,352,233	16.53
Total sessions**	3,050	4,594	3,411	11,055	106,362	10.39
Total titles browsed*	7,088	10,159	7,333	24,580	162,056	15.17
Total titles read*	3,331	5,086	3,719	12,136	71,157	17.06
Total unique titles viewed* (browsed and/or read)	4,776	6,934	4,633	16,343	46,042	35.50

* Year-wise unique; ** based on different criteria of counting as footnoted under Table 7.2.

As evidenced from Table 7.11 a very small group, power users (1.75% of all users), made up a considerable share of every aspect of e-book use across three years. These are the information literate users who discover, browse and read extensively in longer

sessions presumably beyond embedded courseware links. On average a PU spent 2,786.78 minutes in viewing 71.01 titles (47.54 titles browsed, 23.47 titles read, with a maximum 751.87 aggregate minutes on one title), 39.24 minutes per view, in 21.38 sessions in which there were 31.61 unique titles viewed in each of three years from 2010 to 2012. The sessions conducted, although lesser in number but longer in duration, average 130.33 minutes and 3.32 views per session, evidence that PU behaviour is exploratory and extensive, not merely concentrated around fact finding or skim or reference use of e-books or driven exclusively by embedded courseware links reflecting web type reading behaviours. From among the titles browsed approximately 50% were also read with a proportion, 66.49%, of unique titles. Number of PUs decreased in 2012 more from 2011 than 2010. Number of total minutes in reading and minutes max also substantially decreased in 2012. Explanations consistent with this change include both endogenous and exogenous factors. For example, growth in the incidence of courseware embedded links to e-books and changes to DRM, resulting in more offline use.

Lamothe (2013) argues that insight comes from comparing the number of searches conducted directly at the supplier site (via library's login authentication) with use metrics. Table 7.12 shows these figures across three years of data for all users.

Table 7.12. Comparison of Searches, Titles, and Sessions (based on Table 6.1)

Variable in Total #	**2010**	**2011**	**2012**	**% change (2010-2012)**	**% change (2011-2012)**
Searches run at EBL site by ECU users	6,241	19,419	25,472	308.14	31.17
Unique EBL titles browsed by ECU users	13,796	14,266	17,976	30.30	26.01
Unique EBL titles read after browsing by ECU users	7,308	7,891	10,026	37.19	27.06
Sessions conducted at EBL by ECU users	52,050	56,821	70,286	35.04	23.70

The table suggests the question of how such large increases in searches run, result in modest increases of activity levels as measured by unique titles browsed/read and sessions. Section 6.3.5 provides an explanation in terms of information retrieval and

collection issues, culture of use, and immaturity of use in terms of longevity of user experience.

7.4.5 Data Matching of Power Users

The encrypted and anonymised profiles of 78 out of 315 survey respondents, i.e. users who consented in the survey to use their e-book transaction log data, were decrypted with the assistance of ECU Library administration and then matched with overall and power users log data for each of the three years, 2010-2012. The data of 43 of 78 consenting survey respondents was found in e-book transaction logs of all users and only two of them were found to be power users, one in the 2010 dataset (a female, on-campus, undergraduate student, FEA, aged 25-33 with 3-5 years studying at ECU at the time of survey in 2013) and one in the 2012 dataset (a male, academic staff, FHES, aged 52-60 with 10+ years working at ECU at the time of survey). Owing to the insufficient nature of the data (only two users), further profiling of power users involving transaction log data matching with survey data was deemed inappropriate.

7.5 Summary and Researcher Reflection

In regard to research questions the patterns of academic power e-book user behaviour were explored by (a) using a criterion to distinguish a PU, (b) determining differences between PUs and NPUs by comparisons, and (c) devising and validating a predictive model for the probability of a PU.

DLA of EBL e-book transactions yielded a model of power user behaviour grounded in evidence contained in the logs. The model suggests a different approach for identifying and defining an academic e-book power user – one consistent with Marchionini's (2006) notion of exploratory searching encompassing activities such as learning and investigation, as well as fact finding. In these terms a power user is one who converts titles browsed to titles read and explores collections independently of embedded courseware links. Further this research demonstrated that a set of potential business rules can be derived that might provide the basis of machine-based user classification (Section 8.9). Such classification might be used to deliver individualised views and functionality to users of e-books, based on behavioural profiles.

But what to do with powers users, presuming they can be found and their information behaviour documented? User interface design in computing and information systems has evolved significantly, from text-only monochrome displays using keyboard input to touch-sensitive, multi-tasking tablet applications (apps) that respond to voice commands. Unfortunately, e-book systems have not kept pace with developments in user interface design. If power users of e-book systems have different requirements, then they might benefit from a changed interface and richer functionality. A first step in giving effect to the work done here would be to determine precisely who is a power user dynamically (i.e. as a user interacts with a system) and then to give such users the opportunity to customise and/or adopt a system personalised interface that better supports their needs. This is also part of the narrative of identifying and working with 'power users'.

However, by way of limitation, it is important to acknowledge that the proposed model/equation is based on the data of one case library only, namely ECU. Hence, its power has not been tested on any other dataset, enabling conclusions as to the generalisable character of the model and its usefulness. Taking the current result further in terms of a generalisable solution will necessarily involve calibration using more datasets from other participating libraries. In circumstances where the availability of even anonymised data cannot be assured for reasons of privacy, pushing this research forward with further datasets presents as a challenge to researchers interested in the field.

CHAPTER 8: DISCUSSION AND CONCLUSIONS

8.1 Overview

This study extensively investigated e-book user behaviour in an Australian case study Academic and Research Library (ARL) -- Edith Cowan University (ECU) Library, utilising e-book system-generated datasets and self-reported e-book information behaviour in a community of academics, students, and general staff. Data analysed consisted of three years of Ebook Library (EBL) transaction log data (2010-2012) and two years of Ebrary transaction log data (2011-2012) of e-book usage. Data describing self-reported e-book behaviour was captured in a survey.

This chapter:

- describes the contribution to knowledge made by this investigation;
- discusses key findings in the context of previous research on e-book adoption in ARLs;
- acknowledges limitations of the study; and
- proposes directions for further research.

8.2 Contribution to Knowledge

Expansively exploring e-book usage patterns in an Australian case study Academic and Research Library (ARL) through mixed methods, the study aimed to provide triangular confirmation of its findings. As a result, the work done by Borchert et al. (2009), Wells and Dumbell (2010), Ahmad and Brogan (2012) and Ahmad, Brogan, and Johnstone (2014) has been extended and refined. In summary, subject to its limitations, the research has contributed to knowledge by:

- Comprehensively operationalising e-book user behaviour inclusive of factors in perception, experience, information behaviour, attitude and technology acceptance (TAM, UTAUT, ECT, UGT, and IDT). Before the study, e-book user behaviour was often viewed simplistically in terms of factors such as sessions, session duration, and downloads;

- Expanding on works performed by Shin (2011), CIBER (2008), and Jamali, Nicholas, and Rowlands (2009) with a new validated model of e-book adoption grounded in the analysis of data of users' self-reported information behaviour. This model is described in Section 8.6 (Figure 8.7). The model builds upon best fit data analysis techniques inclusive of the interactional effect of different variables with moderate to large effect sizes.[90] Consequently, some factors found important in previous studies have been discarded and others elevated in importance;
- Applying Marchionini's (2006) notion of exploratory search to the analysis of information behaviour described in e-book transaction logs. This novel application of Marchionini's work resulted in the discovery of a predictive method for identifying and classifying e-book users on the basis of use behaviour, manifested in transaction log records (Section 8.5). The resulting equation was subsequently demonstrated to be an efficient predictor of cases. The discovery paves the way for creation of a set of potential business rules that provide the basis of machine-based user classification, a precursor to system-based individualisation of the e-book experience to user needs;
- Investigating exploratory search behaviour found in transaction logs typical of the 'power' e-book user.[91] As explained in Chapter Two, this work draws upon Marchionini's (2006) idea of higher level information behaviour that supports the activities of learning and investigation and is distinguishable from lower level behaviour that support skimming and fact finding. Before this research, intensive or power e-book use has mainly been measured simplistically in terms of title browsed over arbitrary time periods (e.g. JISC, 2009). This research was able to validate a model of power use (Section 8.5) encompassing exploratory

[90] Chapter Five.

[91] Chapter Seven.

and serendipitous behaviour as well as frequency or intensity as measured by minutes spent in browsing and reading unique titles;

- Subject to its limitations, the current study develops a notion of e-book information behaviour maturity grounded in self-reported information behaviour (Section 8.4). Findings in this research also extend current understanding of the impact of different factors on overall e-book user satisfaction (Section 8.6.9) and continuance intention (Section 8.6.10) for Library e-books through statistical inferences grounded in self-reported information behaviour.

These contributions are explored in the discussion that follows, beginning with a summary of key findings and conclusions drawn in connection with the research questions that motivated the study.

8.3 Patterns of E-book Use in the Case Study Academic and Research Library

RQ1. What patterns of e-book use exist in academic and research libraries; and
RQ2. How can these patterns of e-book use be understood?

In aggregate terms, analysis of the data revealed *low levels* of higher order cognitive behaviour in terms of Marchionini's (2006) model of search behaviour, *concentration* of browsing and reading activity in a small number of titles, some user *resistance* to the e-book format delivered over platforms in use and the so called power phenomenon, where relatively *few* users are responsible for most use. The analysis points to the significance and importance of the research, suggesting a gulf between popular perceptions of e-book acceptance fuelled by other agents and formats and the ARL user experience. The following sections contextualise important findings from each of the studies in terms of the research-oriented literature.

8.3.1 Key Findings from Self-reported Information Behaviour

8.3.1.1 Overall Status of E-book Use

The survey data analysis showed that slightly more than two thirds (67.62%) of respondents were ECU e-book users and slightly less than one third (31.43%) did not

use e-books. The limitations of the convenience sample were revealed with analysis of log data which did not triangulate with the survey analysis. It showed that approximately 62% of ECU population did not use any of EBL e-book titles in each of three years 2010-2012. In common with previous studies, the study did not demonstrate the idealised 100% adoption rate. Aggregate adoption outcomes are consistent with previous studies (e.g. Cumaoglu, Sacici, & Torun, 2013; Li et al., 2011; McLure & Hoseth, 2012; Nicholas et al., 2008).

8.3.1.2 Patterns of Non-use of ECU E-books

The self-reported factors of not using ECU e-books were explored (Figure 8.1) in which the major reasons approximated unawareness (42%), preference for hardcopy books (37%), issues with discovery (32%), certain limitations on e-books due to DRM (24%), and perceived unpleasantness (21%).[92] These factors are consistent with previous studies (e.g. Bratanek, 2013; Croft & Davis, 2009; Ebrary, 2012a; Shelburne, 2009; Taylor, 2013; Zhao & Abuizam, 2013).

Croft and Davis (2009) argue that whilst even more clients (especially students) are using e-books, effective promotion of e-books is still a challenge. Lonsdale and Armstrong (2010) observe that often libraries have "no formal promotion strategy for e-resources" (p. 185). Although little in evidence, they emphasise the value of academic commitment and promotion. Dinkelman and Stacy-Bates (2007) suggest various pathways for easy access to e-books. These, for example, include creating web pages focusing on e-books, preparing e-books' subject guides, publicising new e-books on library homepages, improving or enhancing the functionality of search mechanisms, eliminating ambiguity in the terminology used to describe electronic resources (e.g. e-books, e-texts, online resources, online reference resources, and databases). A direct link to e-books on library homepage like Google books is emphasised.

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[92] Table 5.4 and Finding 5.4, pp. 128-129.

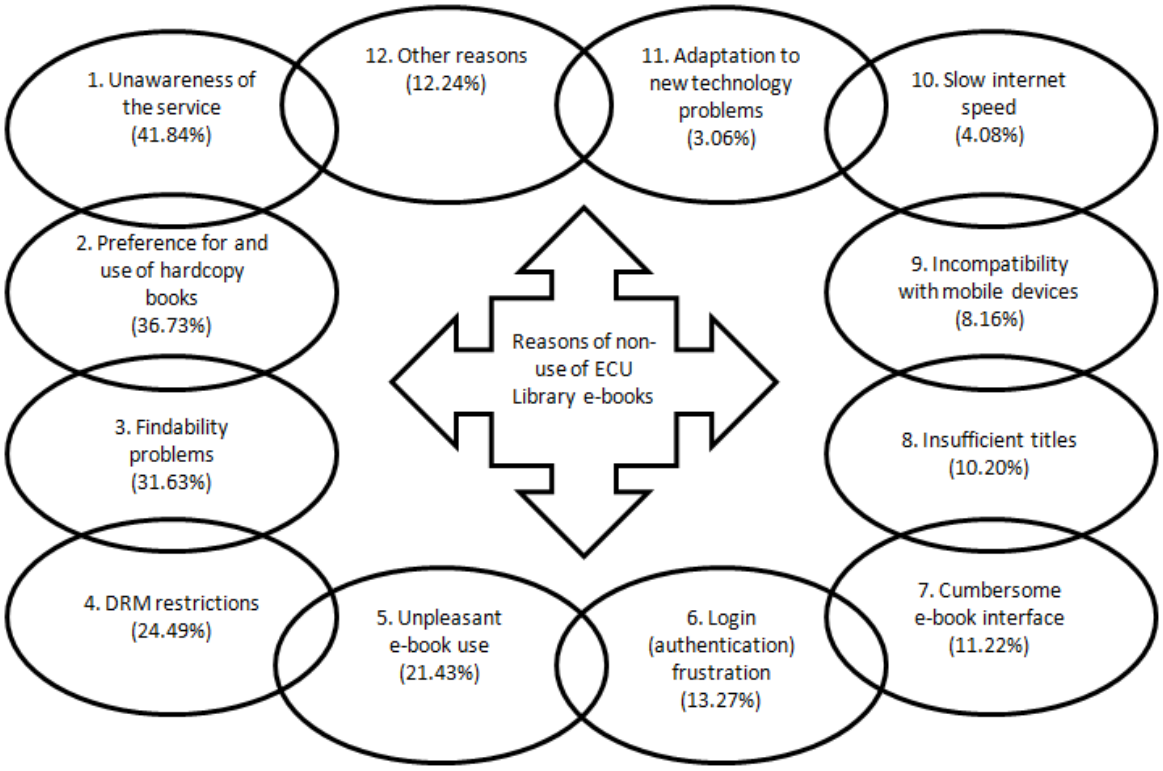

Figure 8.1. Factors of non-use of ECU e-books

Polanka (2011) suggests offering an OpenURL linking that can be run through local link resolvers such as SFX (ExLibris), 360 Link (Serials Solutions) or WebBridge (Innovative Interfaces). She claims that "the presence of OpenURL linking significantly increases the discoverability of e-books, not only through the library's OPAC but also through licensed databases, Google Scholar, and other web-based research tools" (p. 78).

The publishers and aggregators need to minimise the DRM restrictions in order to make e-books acceptable to a wider community. To make the e-book pleasant to use and a preferred format, Bennett and Landoni (2005) assert "... if e-books are to reach their full potential, they will have to offer more than simply an electronic version of the printed book" (p. 16). Their review of recommendations for e-books' wider acceptability and uptake include:

- Creating and raising awareness. Role players include publishers, suppliers and aggregators, librarians, and academics and stronger links among them;

- Promoting advantages of e-books for specific categories of users;
- Making e-books easier to find and purchase;
- Defining common benchmarks for research on and user-centred design of e-books inclusive of personalisation and customisation capability;
- E-books can follow paper books example in appearance and functionality based on intended readership, category, and purpose, for example, children's books, adult's scientific publications, novels, encyclopaedias, monographs, textbooks, and art books;
- E-books content (for whom and how), format (by purpose), purpose (by user profile), and use (optimum) should be based on user-centred approach;
- E-books as born original should be reviewed by reputable academics, academic journals, and publishers and booksellers to ensure quality;
- Value addition to e-books at the design stage in terms of screen resolution to minimise the problems of on-screen reading;
- Integration of e-books with other library resources and their interoperability; and
- Library's simple, clear and comprehensive e-book training for all users.

Williams (2011) argues that the EPUB e-book format is an open, standardised, and re-flowable format that allows reformat and repagination according to an agent's screen size and user settings, which matters especially in small screen-sized e-reader devices. According to Howard (2013), meeting the challenge of successful adoption of e-books particularly e-textbooks will require multiple stakeholders: learning management system support, IT, teaching and learning strategies, university policy, library, and bookshops. He further added that libraries can contribute on many fronts – licensing, technical requirements, content management, and embedding and integrating research and information literacy skills into the curriculum. This research also points to the need for holistic approaches to the problem of non-use.

8.3.1.3 Individualisation and Functionality

Sundar and Marathe (2010) highlight the importance of two individualisation features, *personalisation* and *customisation*, in system design of web-based services and digital media. Personalisation, based on observation of user behaviour, involves tailoring of

content by the system to individual needs and tastes, whereas customisation refers to the tailoring of content by the users themselves to their needs and tastes within the allowable limits provided by the system. Therefore, personalisation is automatic and may require little or no direct involvement of users. Contrarily, customisation requires users to configure a product or service to their requirements and specifications, for example, from display and format settings to a variety of functionality and control functions in case of e-books.

The survey of user attitude to e-books revealed that users who found Library e-book customisation features adequate to meet their needs were more likely to be *satisfied* e-book users. This relationship recorded the third largest effect size (Finding 5.15.3, p. 156). Another survey finding (5.18.8, p. 161) revealed that users who used Library e-books due to functionality features (full-text searching, highlighting, bookmarking, annotating, downloadability, and *user customisation*) were more likely to express *continuance intention*. The effect size was also large.

Discussion

These findings suggest the role that customisation and personalisation might play in improving user experience with e-books, i.e. increasing overall satisfaction and continuance intention. They are also consistent with findings from the literature on both e-book adoption and information systems more generally. For example, Abdullah and Gibb (2008a) citing Appleton assert that "... e-books need to be customised and targeted at a particular user group" (p. 596). Bennett and Landoni (2005) citing Wilson claim that "personalisation and user customisation will be the core of the next generation of e-books and e-readers" (p. 10). Huang and Hsieh (2012) also emphasise on the customisation capability to enrich user's experience and acceptance of e-books.

Findings on user customisation and personalisation endorse the expectation and gratification theory view of adoption behaviour. For example, Shin (2011), and Zhou (2011) argue that users compare their expectation and perceived performance of the product to form satisfaction. A user is satisfied if perceived performance equals or exceeds user expectation, and is dissatisfied, if not. Satisfied users reuse or form an

intention to reuse the product in future, whereas dissatisfied patrons do not (Bhattacherjee, 2001).

Outside the context of e-books, Sundar and Marathe (2010) argue that the requirements of power users and non-power users are different with regard to personalisation and customisation. They assert that non-power users are more impressed by the interface tailoring content for them without their active involvement. On the other hand, power users appreciate the ability to personally modify the interface. They further claim that "theoretical knowledge of the psychological appeal of customisation, however, is still in its nascent stages... insufficient attention has been paid to the process of customisation" (p. 299). They maintain that power users are likely to have strong self-efficacy and clear outcome expectations, both good predictors of technology use, as well as they are likely to be more frustrated if the interface poses restrictions. Therefore, customisation "(self-as-source) will motivate greater engagement with content, which is likely to result in positive attitudes given its guaranteed consonance with the user's interests" (p. 304).

Through its investigation of self-reported information behaviour and attitudes to e-books, the current study provides evidence that supports the need of personalisation and customisation to e-books.[93] Customisation can also offer tools for role-based tasks, for example, tools to facilitate (a) academics in writing curriculum and courseware, (2) graduate students in preparing assignments, (c) HDR students in research, and (d) staff in fun/recreation reading.[94] It is important to note, however, that information behaviour discrimination comprises only one pathway in customisation. Egan (2009) citing Siegersma argues the need of "customised delivery to flexible, full-colour screens; textbooks with audio and video components; touch screens for handwriting and margin note-taking and text highlighting" (p. 5), i.e. customisation according to agent characteristics.

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[93] Vide Sections 5.2.14; 5.3.5.1; and 8.5.

[94] Finding 5.6, p. 133.

8.3.2 Key Findings from DLA

The research also relied upon Deep Log Analysis (DLA) as a means of understanding e-book adoption behaviour (Chapters Six and Seven). Using three years' (EBL) and two years' (Ebrary) worth of authentic log data, this phase of the research moved the investigation from analysis of self-perception of behaviour to datasets describing and providing an actual record of transaction and interaction. Consistent with prior research, findings of EBL and Ebrary usage at ECU (Chapter Six) are summarised here.

8.3.2.1 EBook Library (EBL) Use 2010-2012

On average 38.30% of ECU population made use of EBL e-books in each of three years, 2010-2012. From the introduction of EBL platform in 2010, ECU user-base has been growing. An increase of 10.27% from 2010 to 2011, 24.99% from 2011 to 2012 and 37.82% from 2010 to 2012 in users was recorded. Growth aligns with increased awareness in ECU population[95] and higher activity levels arising from more embedded courseware links.[96] Viewing of EBL e-books (69.49% browsing; 30.51% reading) also grew, 8.53% (2010-11), 37.49% (2011-12), and 49.21% (2010-12) aligned with increase in EBL e-book titles. However, 33.58% of users only browsed and did not enter the reading mode. EBL e-book use increased gradually in every year, 2010-2012, across all the variables except Total Minutes, Minutes in Reading, and Minutes Max in 2012. Explanation of decrease in these three variables includes skim[97] or reference[98] use, DRM restrictions,[99] and preference for offline use of e-books via downloads or printouts. This is also evident from other metrics, for example, 30.97% of views could

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[95] Survey findings 5.10.1 (w = 1.04), p. 140; and 5.12.1 (φ = .40), p. 147. Survey was conducted in 2013.

[96] Survey findings: 5.10.13 (w = .69), p. 142; 5.12.5 (φ = .33 & .38), p. 148; and 5.18.10 (φ = .47), p. 162.

[97] Survey finding 5.10.8 (w = .99), p. 141.

[98] Survey finding 5.10.10 (w = .82), p. 142.

[99] Survey finding 5.10.6 (w = .65), p. 141.

not go beyond 0 (zero) minute; 53.83% of views remained between 1 (one) and 9 (nine) minutes; and only 15.20% of transactions could yield 10 or more minutes (Table 6.5, p. 192).

On average, less than 10 percent (8.40%) and less than five percent (4.60%) of EBL unique e-books were browsed and read by 38.30% and 25.44% of ECU community, respectively in each of three reported years. Ten percent of titles consumed 83% of total minutes and 20% of titles explained 68% of all views (Table 6.7, p. 196, and Table 6.8, p. 199). The result is consistent with embedded courseware links as an independent and controlling variable and how academic adoption of e-book texts fundamentally shapes behaviour.

Figure 8.2 presents a summary view of EBL use at ECU in three years, 2010-2012, across all the variables of interest (Section 6.1).

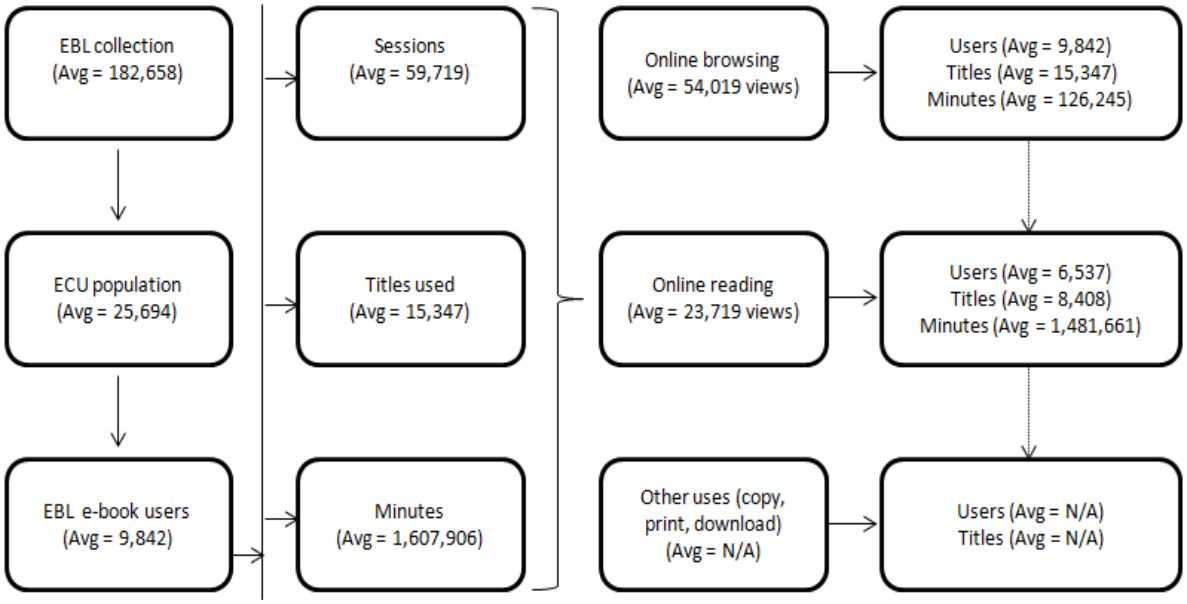

Figure 8.2. EBL e-books use at ECU 2010-2012

Less than half (45.21%) of the titles were abandoned after browsing, but the majority of users (66.43%) continued reading after browsing. On average, only 15% of users accounted for 83% of total minutes and almost half of the total sessions in each of three years, 2010-2012. Similarly, 20% of users made nearly 67% of all views/transactions. From these figures the idea of power use and users emerged and demanded further

research. ECU Library auto purchased less than a quarter (23.33%) of the used EBL e-books every year. Most usage was concentrated around those auto purchased e-books due to the likely reasons of being textbooks or having embedded links.

8.3.2.2 Ebrary Use 2011-2012

The ECU academic community utilised only 15.38% in 2011 and 21.3% in 2012 (average 18.44%) of e-books from the Ebrary database. Put differently, 84.62% and 78.7% (average 81.56%) of Ebrary e-books were never used at ECU in 2011 and 2012, respectively. Twenty-two percent (22%) of the used titles in 2011 received usage again in 2012. The top 20% of the used titles accounted for 77% and 80% (average 78.5%) of usage (section requests) in 2011 and 2012, respectively. The most frequent subject areas included health and medicine, social sciences, and education. This result also is consistent with embedded courseware links as an independent and controlling variable and how academic adoption of e-book texts fundamentally shapes behaviour.

Like EBL the use of Ebrary e-books is linked with ECU academic calendar; May in the first semester and September in the second accounted for most usage followed by April, October, March, and August.[100] These are the months when students study and prepare and submit their assignments, term papers, and projects.[101] Low and lowest usage was observed in exam months, June and November, and during semester breaks, respectively.

An increase in 2012 from 2011 was recorded in different use metrics, for example, searches (39.57%), titles used (48.34%), section requests (44.33%), and sessions (66.36%). On average per session 3.37 titles were used, 14.28 pages viewed, and 15.10 section requests made in each of two years, 2011 and 2012. Not the entire e-book but only 48 pages per unique title used were viewed in each of two reported years on

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[100] Sections 6.1.9 and 6.2.4.

[101] In comparison with survey finding 5.5, p. 131.

average. Pages copied in two years were merely 0.91% of the pages viewed. Page copying decreased 29.46% in 2012. Explanation of this decrease includes copy restrictions (maximum 30% of pages) and complications of copying page by page, one page at a time, by selecting the desired text. Contrarily, page printing increased 10.50% in 2012. Pages printed in two years were 4.82% of the pages viewed. Page printing is much easier than page copying owing to option of range selection. Full titles downloaded were 11% of the total titles used in 2012.

Figure 8.3 presents a summary view of Ebrary use at ECU in two years, 2011-2012, across all the variables of interest (Section 6.2).

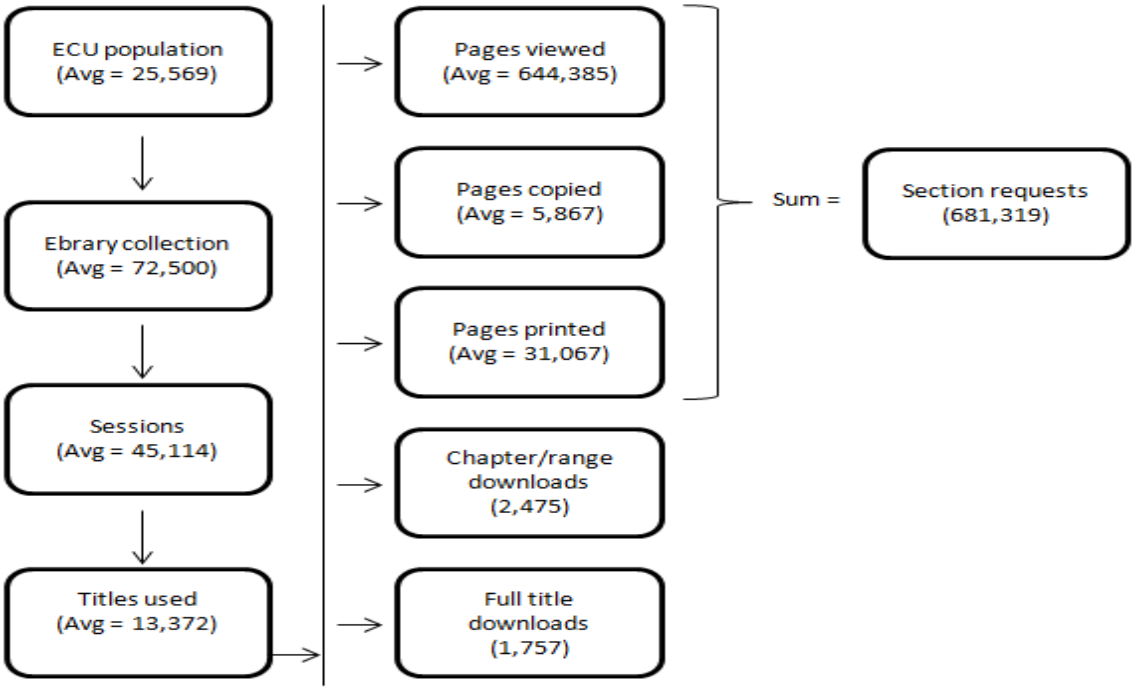

Figure 8.3. Ebrary e-books use at ECU 2011-2012

8.4 Modelling E-book User Information Behaviour Maturity

Analysis and interpretation of data on self-reported behaviour also leads to a notion of e-book user maturity based on user behavioural traits and conditions that facilitate growth in reader maturity mostly around demographic factors.

Despite a rich pool of research on information seeking behaviours the area of e-book user nascent and mature behaviours is yet to attract researchers' attention. Survey data analysis showed a significant difference between early career or nascent behaviour (NB) and experienced or mature behaviour (MB). The paragraph to follow compares both nascent and mature behaviours with mapping to particular findings numbered in parenthesis. An NB starts with an unawareness of the resource (5.2.3; 5.4.1) and types of resources (5.10.20) available to them, initiates using e-textbooks (5.10.13) following peer influence, tutor recommendation, and embedded courseware links (5.8.1; 5.10.13; 5.12.5), as well as using traditional discovery ways (5.8.2) with less information literacy skills (5.4.3), focussed around accomplishing a given task (5.6.4) conveniently (5.10.17) without going deep into the resource (5.10.8; 5.10.10; 5.12.4).

Contrarily, an MB exhibits good awareness of the resources (5.12.1; 5.12.6) and information literacy skills (5.10.4; 5.10.7; 5.10.12; 5.13.2;) by seeking out multiple discovery pathways (5.8.3-5) and sources (5.3), adapts to varied tasks (5.6.1; 5.6.3; 5.6.5), adjusts to platforms/agents (5.13.5; 5.14; 5.16.2) with knowing e-book functionality features (5.10.18) and differences between types of resources (5.13.9), and after exploration (5.2.1; 5.2.4) feels satisfied with collection sufficiency (5.12.3; 5.15.1) but unsatisfied with the restrictions (5.12.2).

Data analysis also showed that most NB is associated with early career undergraduate students with less than a year in tertiary education and most MB is associated with experienced graduate students with three or more years in tertiary education. Catalano (2013) supports that "graduate students use libraries in diverse ways depending on the discipline studied" (p. 243). She also notes differences in information seeking behaviour of master's and doctoral students.

Figure 8.4 models both nascent and mature behaviours with contributing factors mapping to particular survey findings numbered in parenthesis.

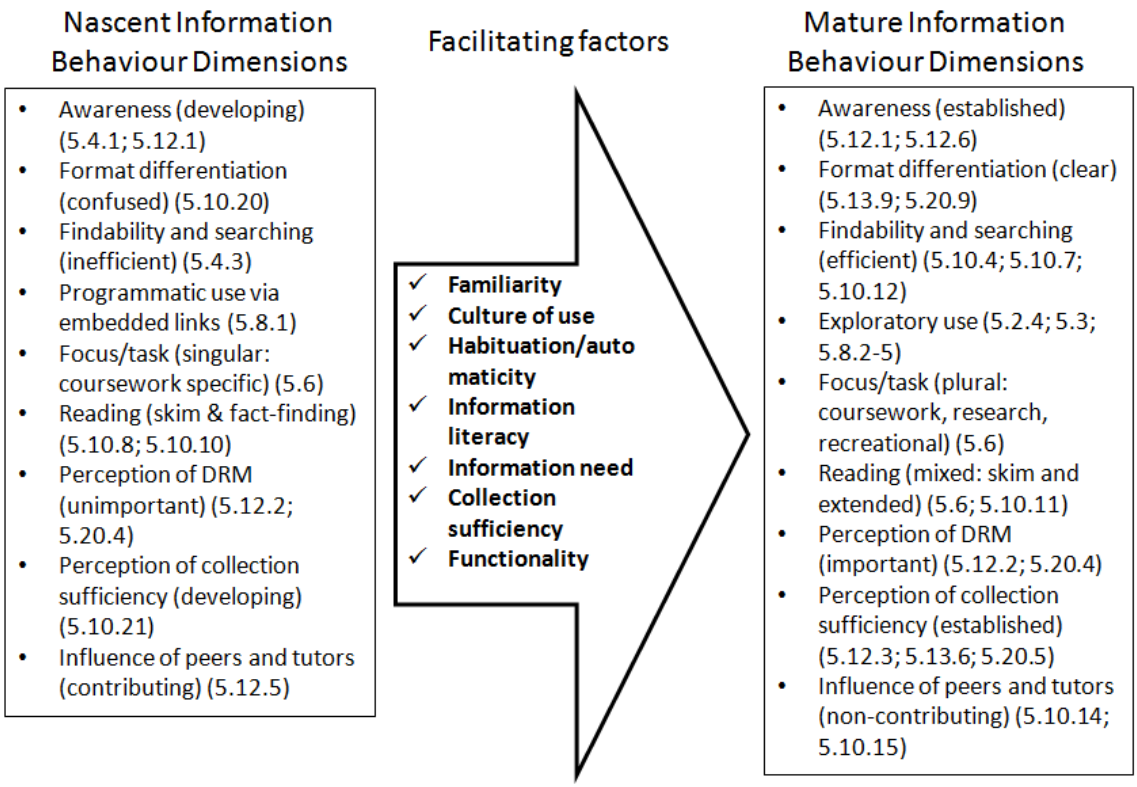

Figure 8.4. E-book user information behaviour maturity model

Converting a nascent behaviour to mature behaviour has the following implications.

- Launching awareness campaigns for the availability of library resources to users including promotion of e-books (Lonsdale & Armstrong, 2010; Vasileiou & Rowley, 2011);
- Inculcating differences between resources and advantages of each including e-books (Hernon et al., 2007; Lin et al., 2010);
- Strengthening information literacy programmes as how to find, explore, evaluate, use, and extract knowledge from each resource (Mahmood, 2013) including e-books (Groves, 2014);
- Minimising DRM restrictions including loan periods on e-books to make them more usable and beneficial for the users (Jamali, Nicholas, & Rowlands, 2009; McLure & Hoseth, 2012);

- Enriching and enhancing e-book collection (titles) capability to satisfy user information needs (Armstrong & Lonsdale, 2009; Link, Tosaka, & Weng, 2012);
- Assigning in-depth tasks (assignments, projects, term papers, and study) to students based on multiple e-book titles and sources, neither merely based on embedded courseware links nor on fact finding or scanning of information;
- Enhancing e-book functionality features (Huthwaite et al., 2011) especially user personalisation and customisation (Huang & Hsieh, 2012); and
- Familiarising users with latest technological innovations (e.g. tablets, e-book readers, and smartphones and apps) with hands-on training and tools (Bennett & Landoni, 2005). Library lending service of these devices is suggested (Savova & Garsia, 2012) with pre-loaded subject and recreational e-book content, where possible.

8.5 Towards Intelligent Systems: Modelling Power Users in Transaction Log Files

DLA findings (Tables 6.7 and 6.8) demonstrated that a minority of users accounted for most e-book usage in terms of total views, minutes, and sessions. Thus the findings support the notion of the 'power' or intensive user in e-book utilisation, as suggested in previous studies (e.g. Ahmad & Brogan, 2012; Ahmad, Brogan, & Johnstone, 2014; JISC, 2009). Sundar and Marathe (2010) found that "power users rated content quality higher when it had a customizable interface, whereas non-power users preferred personalized content" (p. 298).

Given the apparent importance of individualisation (i.e. customisation and personalisation)[102] of e-books to users, the researcher reflected on how power users might be profiled from log data enabling the e-book experience to be customised and/or personalised. Thus evolved the idea of a further study that would attempt to understand

[102] Vide Section 2.7.3.2 on customisation and personalisation.

how profiling of users might be undertaken dynamically within an e-book delivery system, paving the way for intelligent e-book systems capable of delivering customised and personalised user experiences.

The paragraphs that follow describe outcomes from this research that revise and/or add to the body of knowledge in relation to building better e-book systems in terms of Expectations and Gratification Theory (EGT) through information behaviour profiling.

- **Definition and concept of a Power User (PU)**: To begin with, the researcher reviewed how the Power User (PU) might be usefully defined. The existing research oriented publication often defines the power user simplistically. For example, "someone who had looked at five or more e-books within the four weeks" leading into a user survey (JISC, 2009, p. 24). Other academic e-book researchers simply view such e-book users as, for example, highest users (Levine-Clark, 2007), heaviest users (Folb, Wessel, & Czechowski, 2011; Nicholas et al., 2010; Posigha, 2012), most enthusiastic users (Posigha), satisfied users (netizens), and efficient users (utilitarians) (Borchert et al., 2009, p. 12).

Such a simplistic view fails to account for the LIS literature on information behaviour which attributes exploratory search, serendipitous discovery and other attributes to 'advanced behaviour' (Marchionini, 2006; O'Brien & Toms, 2008; White & Roth, 2009). Consequently, the research offered an alternative heuristic encompassing conversion of titles browsed to title read and unique titles as well as time spent in browsing and reading.

- **Refinement in the idea/concept of Power User**: If a model of the power user based on the wider discourse of advanced behaviour were to be adopted, might the data be used to validate such a model? Figure 8.5 includes statistically analysed variables representing parameters of PU behaviour that were not captured in a concept of preceded literature and Figure 8.6 shows the results from validation testing of such a model.

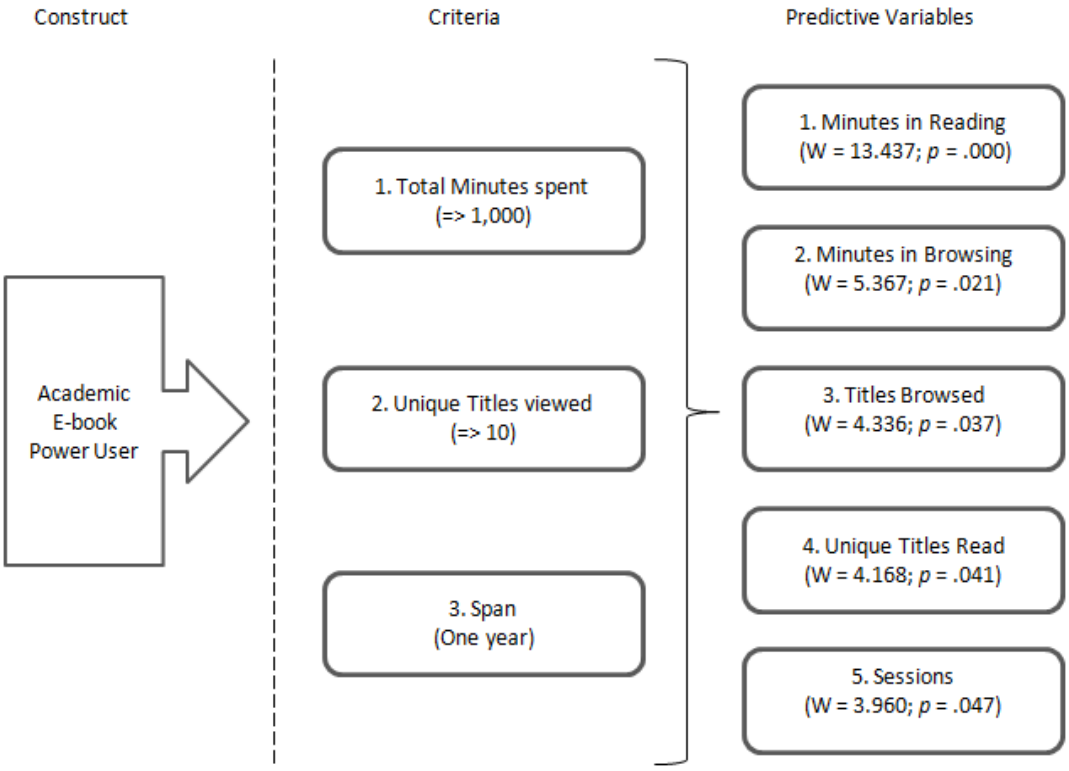

Figure 8.5. Academic e-book power user: Predictive variables

Power use is more appropriately considered as encompassing exploratory behaviour describing advanced cognitive processes in information behaviour (e.g. investigative searching involving multiple iterations and activities such as analysis, synthesis evaluation, and serendipitous browsing with an objective of learning) (Marchionini, 2006; White & Roth, 2009). The researcher explored whether a method could be established and with what variables to categorise PUs. The outcome from this research was another discovery- that an equation could reliably predict power use based on three years' worth of EBL transaction log data of e-book usage at ECU. The predictive equation was as follows:

$$\text{Probability of identifying a power user} = \frac{e^{x}}{1 + e^{x}}$$

Where **x =** {(0.110 x Minutes in Browsing) + (0.009 x Minutes in Reading) -- (0.398 x Sessions) + (0.170 x Titles Browsed) + (0.417 x Unique Titles Read) – 14.604}; and e is

the base of the natural logarithm (approx. 2.72) (see Section 7.4.3.1 and Table 7.9 for an explanation of the application of the above predictive equation to two sample cases).

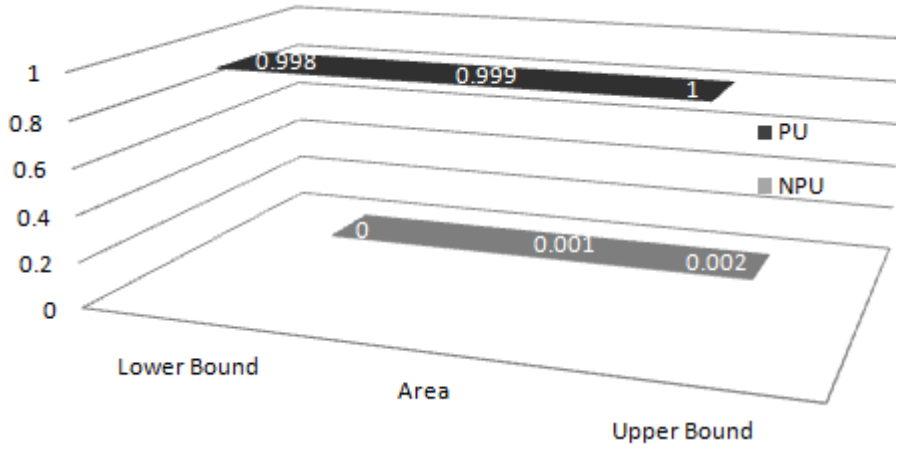

Figure 8.6. ROC validation of the PU model

This research has made an original contribution to knowledge by demonstrating that:

- concepts of higher level cognitive behaviours in searching and learning can be applied to the understanding of user types described in log data;
- it is feasible mathematically to identify a PU on the basis of transaction log records;
- models created in this way can be successfully validated against the data. However, the work done describes the need for calibration involving more datasets; and
- models can be used to predict (categorise) users providing in real time the basis of discriminating between users in terms of user customisation and personalisation of e-books.

A set of business rules will also be required that defines the nature of the individualised experience to be offered to users based on machine-based classification outcomes. The goal of user-centric design for e-books should be to deliver individualised views and functionality to users of e-books, based on behavioural profiles. According to Sundar and Marathe (2010), customised offerings can be gratifying especially in the web environment which is known for its issues of information explosion and overload. They

further argue that customisation may range from simple font or colour change to more advanced modifications. This study has also demonstrated the contributing role of e-book customisation capability to user satisfaction (Finding 5.15.3, p. 156) and continuance intention (Finding 5.18.8, p. 161) with large effect sizes.

8.6 Revised Theoretical Model of E-book Adoption and Role of Intervening and Control variables

RQ3. Are use and behaviour consistent with the major models of technology adoption?
RQ4. What intervening or control variables significantly affect use and behaviour?

Based on critical review of the literature (Chapter Two), the researcher formulated a baseline model of e-book technology adoption (Figure 2.7, p. 68) consistent with major technology adoption and information behaviour frameworks. This work scoped factors in technology adoption and information behaviour that might be found significant in empirical study of adoption outcomes in a quasi-experimental context.

Keeping in view a generic model of variables (Figures 4.2 and 4.3) and after empirical fieldwork (analysis of self-reported information behaviour) the baseline model (Figure 2.7) can be revised. The revised/evolved e-book adoption model for ARLs is based on more than 100 statistically significant findings from this research with medium to large effect sizes[103] (Figure 8.7). Description of the model is arranged node-wise. Footnote mapping to Chapter Five (analysis of self-reported information behaviour) is given for every finding in the model description.

[103] Effect size Phi (φ) in case of Pearson chi-square crosstabulation; Cohen's *w* in case of chi-square test for goodness of fit; effect size => .3 and < .5 is medium, and => .5 is large (Allen & Bennett, 2010, pp. 228 & 236).

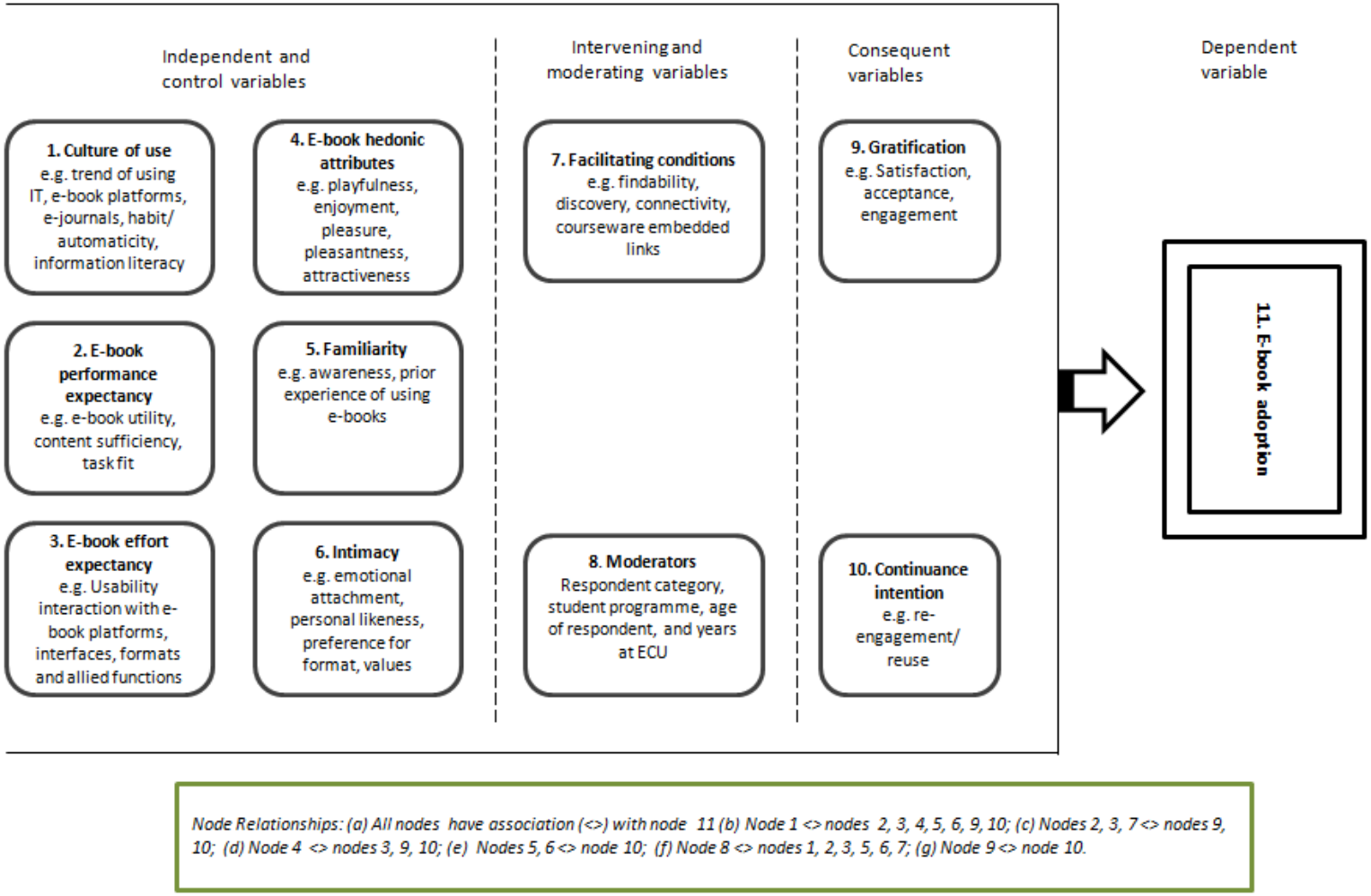

Figure 8.7. Evolved e-book adoption model for ARLs

8.6.1 Node One: Culture of Use

In the ICT domain, 'culture of use' (also referred to as e-culture) means "attitudes and practices in a digital ecosystem, both individually and collectively" ("eCulture," 2014, para. 1). In this research, such attitudes and practices include the embracing or rejection of fashions and trends in technology adoption (e.g. social media), platform tastes and preferences (e.g. tablet or desktop), resource tastes and preferences (e.g. e-journal vs. e-book; online vs. print), the role of habit/automaticity in the use of technology, and user information literacy. Chapter Five findings suggest that culture of use is related to e-book adoption across the dimensions of *habit/automaticity, preference for online resources and platforms,* and self-acquired *information literacy.* Particular findings with effect sizes concern:

(i) *Role of E-book readers (such as the Kindle or iPad)*

Results showed that users who experience e-books on the platforms other than e-book readers typically skim read Library e-books, while frequent users of e-book readers are much less likely to skim read (φ = .51).[104] *The result suggests that habituation in reading habits can grow from platform characteristics and shape information behaviour.* The peer reviewed literature supports this view. For example, Browne and Coe (2012) claim that e-book readers, typically used for leisure/fictional reading, promote line by line/linear reading. Habituation means that these readers bring this behaviour to library e-books. The finding is an endorsement of automaticity/habituation and culture of use.

(ii) *Role of E-journals*

Non-users of e-journals are likely to be non-users of e-books as well (φ = .35).[105] Such an association suggests a *cultural preference for print as opposed to online, works*

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[104] Finding 5.13.8, p. 151.

[105] Finding 5.20.9, p.165.

across both formats. Users who are receptive to or seek out e-journals are efficient at connecting with e-books and hence are more likely to be satisfied with e-book collections (φ = .37).[106]

The finding of significant association between node 1 (culture of use) and node 3 (effort expectancy) also points to the importance of culture of use and usability in technology adoption, for example, users who find e-journals usable in terms of window size, are not likely to be troubled by this with e-books (φ = .38)[107] and users find searching an e-book on desktop PC with a large display easy (φ = .42).[108] Laptop and desktop PC are the preferred e-book use platforms in this study.[109]

(iii) *Role of Information literacy*

Findings also show that the information literacy (format discrimination) and platform dimension of culture of use are related to the familiarity dimension of awareness. Specifically, frequent users of IT (desktop PC) are more likely to demonstrate awareness of ECU Library's resources of all kinds including e-books (φ = .42).[110] Where culture of use describes resource tastes and preferences (such as frequent use of e-journals), users are more successful at differentiating e-books and e-journals (φ = .39).[111]

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[106] Finding 5.13.6, p. 151 in connection with 5.13.2 (φ = .37), p. 150.

[107] Finding 5.13.4, p. 151.

[108] Finding 5.13.5, p. 151.

[109] Finding 5.14, p. 154.

[110] Finding 5.13.1, p. 150.

[111] Finding 5.13.9, p. 152.

8.6.2 Node Two: E-book Performance Expectancy

Perceived performance expectancy (Venkatesh et al., 2003) is user expectation of utility/performance. Operationalisation in the survey included the dimensions of *e-book collection sufficiency* (Lamothe, 2013; Shin, 2011), *purpose or task fit* (D'Ambra & Wilson, 2013), *convenience* (CIBER, 2008), *functionality* (Huthwaite et al., 2011), and *copy/print/download provisions* (Armstrong & Lonsdale, 2009). Chapter Five findings suggest that perceived performance expectancy or utility is related to e-book adoption across the operationalised dimensions. Particular findings that point to this perspective include:

(i) *User resistance to Digital Rights Management (DRM)*

In common with previous studies (e.g. Jamali, Nicholas, & Rowlands, 2009; McLure & Hoseth, 2012), this study found that DRM restrictions (copy, print, download limits) are frustrating to users (w = .65)[112] (further endorsement provided by crosstabulation, φ = .40),[113] resulting in some disaffection with the format. While e-book collections are meeting most users' needs (φ = .49),[114] nonetheless many users are undecided (w = .80)[115] (consistent with, e.g. Brahme & Gabriel, 2012; Letchumanan & Tarmizi, 2011a).

(ii) *Convenience, functionality and fact finding*

Library e-books are being used owing to convenience[116] (w = .90)[117] (consistent with almost all previous studies, e.g. Huang, 2013; Rowlands et al., 2007) and functionality

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[112] Finding 5.10.6, p. 141, and Appendix R1.

[113] Finding 5.20.4, p. 164.

[114] Finding 5.20.5, p. 164.

[115] Finding 5.10.21, p. 144, and Appendix R5.

[116] Item # 3.25 of survey, Appendix C.

features[118] (w = .57)[119] (in common with, e.g. CIBER, 2008; Jamali, Nicholas, & Rowlands, 2009) mostly for quick fact finding (w = .82)[120] (consistent with, e.g. JISC, 2009; Nicholas, Rowlands, & Jamali, 2010; Rajan, Jasimudeen, & Mathew, 2012). Matters concerning usability are discussed in Node Three.

8.6.3 Node Three: E-book Effort Expectancy and Usability

Perceived effort expectancy (Venkatesh et al., 2003) describes a usability perspective on e-book adoption. Operationalisation in the survey included self-assessed perception of effort required to *find/search/read e-books*. Perceived effort expectancy is grounded in perceived usability and is likely to affect e-book adopter behaviour. Particular findings of *Chapter Five* concerning effort expectancy and usability include:

(i) Impact of viewing agent and e-book form factors

Data analysis of self-reported behaviour showed that users were more satisfied with desktop PC (w = .75) and laptop (w = .68) as Library e-book platforms.[121] At this point in time, smartphones, tablets and e-book readers do not provide a satisfying viewing experience with library e-books yielding ambivalent (neutral) responses.[122]

Difficulties with on-screen reading of e-books is a usability issue also reported in previous studies (e.g. Borchert et al., 2009; CIBER, 2008; JISC, 2009; Li et al., 2011; Shelburne, 2009). Effort is not only an agent form factor issue. According to Browne and Coe (2012), current academic/non-fiction e-books are less successful for linear

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[117] Finding 5.10.17, p. 143.

[118] Item # 3.26 of survey, Appendix C.

[119] Finding 5.10.18, p. 143.

[120] Finding 5.10.10, p. 142.

[121] Finding 5.14, p. 154.

[122] Ibid.

reading where complex formatting (e.g. tables, figures, and sidebars) may make navigation through the work difficult. Chong, Lim, and Ling (2009) citing Chowdhury argue that interface design has an impact on usability (p. 213). They further argue that unsatisfactory e-book design is a barrier to student uptake of e-books and three design areas, navigation design, page layout, and content design, need improvement. Hence the form/genre of the e-book itself can also impact on usability with adverse impact on viewing effort.

Since in this study, laptops and desktops were most widely used, respondents in this study did not find e-books hard to read on their screens (w = .63).[123] Users agreed that the Library e-book text window was not too small (w = .73)[124] (further endorsed by crosstabulation, φ = .34).[125] The analysis also showed that the laptop and desktop PC agents, as the preferred e-book use platform, were well suited to the typical user requirements of skim reading (w = .99)[126] and fact finding (w = .99)[127] in the book body (i.e. outside the Table of Contents (TOC)) pages (w = .81).[128]

(ii) E-book searching user cost burden

Usability in terms of searching e-books for information was rated highly recording a large effect size (w = .86).[129] A similar survey item on the ease of finding information in

[123] Finding 5.10.3, p. 141.

[124] Finding 5.10.5, p. 141.

[125] Finding 5.20.3, p. 164.

[126] Finding 5.10.8, p. 141.

[127] Finding 5.10.10, p. 142.

[128] Finding 5.10.11, p. 142.

[129] Finding 5.10.7, p. 141.

e-books recorded a similar (large) effect size (w = .67)[130] (further endorsed by crosstabulation, φ = .32).[131]

(iii) Extended reading as a pathway to knowledge acquisition and learning

Marchionini (2006) suggested that advanced information behaviour supports the cognitive requirements of knowledge acquisition and learning. Users self-reported that Library e-books are not suitable for longer reading (w = .59),[132] posing obstacles to knowledge acquisition and learning. Unsuitability of e-books for longer reading brings about their use for quick, fact finding information (φ = .48),[133] and skim reading and quick, fact finding use of e-books are moderately, positively correlated as well.[134] JISC (2009) explains e-book use preference for skim reading and, fact finding in terms of DRM limitations, difficulties of screen reading especially for longer duration, and slow Internet speeds.

8.6.4 Node Four: E-book Hedonic Attributes

According to Venkatesh (2000) perceived enjoyment reduces/overcomes the feeling of effort/time being spent, i.e. cost burden. Perceived hedonic feeling or perceived enjoyment (Lee, 2010; Lin, Wu, & Tsai, 2005; Venkatesh, 2000; Zhou, 2011) derives from the ECT and UGT frameworks (Shin, 2011). Operationalisation in the survey included the dimensions of *pleasantness* and *attractiveness* perceived by the e-book users. Particular findings from Chapter Five that point to users' affective attitude toward e-book hedonic attributes in acceptance intention include:

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[130] Finding 5.10.12, p. 142.

[131] Finding 5.20.8, p.164.

[132] Finding 5.10.9, p. 142.

[133] Finding 5.10.10, p. 142.

[134] Finding 5.10.8, p. 141.

(i) Role of attractiveness as a hedonic attribute

Some support for the role of hedonic attributes could be found in attractiveness, where a crosstabulation showed that users of Library e-books also found e-book formats attractive (φ = .30),[135] with a moderate effect size. This finding adds to the literature since there is a paucity of literature that addresses hedonic factors in this way. For example, Armstrong and Lonsdale (2009) visualise current e-book interfaces as poor-looking and old-fashioned, but provide no specific guidance to aesthetic reaction. According to JISC (2009) e-book platforms and interfaces are not ideal. Ayris (2009) viewed current developments in digital delivery and dissemination as "new wine in old bottles" (p. 53).

(ii) Culture of use and hedonic attributes

Findings also show that culture of use (Node One) is shaped by hedonic attributes. Specifically, prolific users of e-journals were more likely to find Library e-book formats attractive (φ = .35).[136] The effect size is moderate and the association is consistent with the similarity of the formats, endorsing the idea of hedonic attributes as important in shaping acceptance.

8.6.5 Node Five: Familiarity

According to Shin (2011), citing Komiak and Benbasat, familiarity is "one's understanding of technologies, often based on previous interactions, experience and learning of the what, who, how and when of what is happening" (p. 266). Shin argues that familiarity plays a significant role in e-book adoption. Prior studies (e.g. Cumaoglu, Sacici, & Torun 2013; Letchumanan & Tarmizi, 2011a) also assert the importance of familiarity in successful e-book adoption. Operationalisation of familiarity in the survey

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[135] Finding 5.20.6, p. 164.

[136] Finding 5.13.7, p. 151.

included the dimensions of *awareness* of the ECU e-book provision, *prior personal experience* of using e-books and *differentiability* for different resource types. Chapter Five findings suggest that familiarity is related to e-book adoption across all of the operationalised dimensions. Particular findings that point to users' familiarity concern:

(i) Role of awareness

Lack of awareness was a major obstacle in successful e-book adoption reported by the majority of previous studies (e.g. Abdullah & Gibb, 2008a; Ashcroft, 2011; Croft & Davis, 2010; Milliot, 2007). Contrarily, there is good awareness of ECU Library e-books in the sample with a large effect size (w = 1.04).[137] The finding is consistent with the work of other researchers. For example, Borchert et al (2009) show a high level of awareness of e-books among staff and students at the Griffith University and the University of Southern Queensland.

(ii) Role of prior use of e-books and e-journals

Prior use of e-books (item 3.24 of survey, Appendix C) demonstrated large effect size (w = .77) and awareness of Library e-books (item 3.1 of survey) was found to be significantly associated with prior use of e-books with a medium effect size (φ = .48).[138] The finding is consistent with the work of Woody, Daniel, and Baker (2010). The sample largely differentiated e-books and e-journals (w = .71).[139] Consistent with culture of use and familiarity, users of other resources (e-journals, φ = .39)[140] and users

[137] Finding 5.10.1, p. 140.

[138] Finding 5.10.16, p. 143.

[139] Finding 5.10.20, p. 144.

[140] Finding 5.13.9, p. 152.

with prior experience of using e-books (φ = .44)[141] were successful in differentiating different resource types (e-books and e-journals).

8.6.6 Node Six: Intimacy

MacWilliam (2013) and Shin (2011) argue that intimacy plays a role in e-book adoption. Their definition is narrow encompassing emotional feeling or attachment (MacWilliam), i.e. "the feeling for paper books" (Shin, p. 266). Shin further argues that emotional factors represent human cultural and emotional values and these emotions are missing in digital media domain. Operationalisation of intimacy in the survey included the dimensions of *emotional attachment*, *personal likeness*, *preference for format*, and *values*. Particular findings relevant to intimacy include:

(i) Feeling for paper books

Consistent with previous studies (e.g. Bratanek, 2013; MacWilliam, 2013; McLure & Hoseth, 2012; Smyth & Carlin, 2012; Taylor, 2013), this study found preference for hardcopy books to e-books overall (*w* = .39)[142] (including when both physical and e-book were available (*w* = .44)).[143] Further this study found a pattern of use where users preferred e-books, only when there was no physical counterpart (*w* = .88).[144] Overall, around 52% of survey respondents preferred physical books to e-books and around 22% were undecided. Students prefer hardcopy books with medium effect size (w = .39).[145] Free-text comments illustrate perceptions and attitudes that explain what is observed in the test result, for example, in the thematic analysis of open-ended

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[141] Finding 5.10.20, p. 144.

[142] Finding 5.11.2, p. 146, and Appendix R3.

[143] Ibid.

[144] Ibid.

[145] Section 5.2.9.1, pp. 144-146.

comments, verisimilitude, intimacy, and preference for hardcopy ranked third by volume of the response.[146]

Because physical books are full of tradition and history and humans have been using them for centuries and emotional feelings of possession, sight (entity/tangibility/beauty), touch/embrace, and smell are all associated with paper books (Burritt, 2010; MacWilliam, 2013; Shin, 2011). Chong, Lim, and Ling (2009) argue that users' experiences with paper books form their expectations from e-books. Even sensory feeling of hearing associated only with audio version of e-books is not preferred (w = .61).[147]

8.6.7 Node Seven: Facilitating Conditions

Facilitating conditions describe organisational and technical infrastructure to support use of the system (Venkatesh et al., 2003). Operationalisation of facilitating conditions included the dimensions that facilitate use of e-books, for example, *discovery, findability, and courseware embedded links*. Particular findings that point toward the importance of facilitating conditions include:

(i) E-book discovery

No large-scale discovery issues with e-book titles were observed as the respondents largely experienced Library interface for finding e-books easy to use (w = .84),[148] a finding further endorsed by crosstabulation (φ = .36).[149]

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[146] Table 5.14, p. 166, and Appendix R3.

[147] Finding 5.10.19, p. 143.

[148] Finding 5.10.2, p. 140.

[149] Finding 5.20.1, p. 164.

ECU Library e-book use is positively associated with e-book access methods,[150] namely Library catalogue (φ = .40), Library's OneSearch (φ = .39), bookseller websites (φ = .36), and Library databases (φ = .32).

Consistent with culture of use, users of Library e-journals found the Library interface for finding e-books easy to use (φ = .37).[151] Library e-journals are routinely used by students and academics. In the Library One Search interface, e-journals appear in results lists and e-books are signposted as a format in the results list. More broadly this medium strength association suggests that users comfortable with the discovery interface for journal searching find this an efficient interface for accessing e-books as well.

(ii) E-book connectivity

Similarly, respondents largely did not face the proposition of problems in accessing e-books over the Internet (*w* = .65),[152] further endorsed by crosstabulation (φ = .33).[153] This finding suggests that issues with accessing e-books (e.g. Asunka, 2013; CIBER, 2008; Huthwaite et al., 2011; Letchumanan & Tarmizi, 2011a), connectivity and authentication (e.g. Bierman, Ortega, & Rupp-Serrano, 2010; JISC, 2009) have been resolved in the minds of users (e.g. Camacho & Spackman, 2010) participating in this study.

Consistent with culture of use, users of e-journals were less likely to experience access problems of Library e-books over the Internet (φ = .37).[154] The result suggests that if a

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[150] Finding 5.7.2, p. 136.

[151] Finding 5.13.2. p. 149.

[152] Finding 5.10.4, p. 141.

[153] Finding 5.20.2, p. 164.

[154] Finding 5.13.3, p. 150.

user experiences connectivity issues with other formats (e.g. online journals) the user is likely to have this experience with e-books as well.

(iii) Embedded courseware links

Consistent with Bierman, Ortega, and Rupp-Serrano (2010), respondents typically used courseware embedded links to access e-books (w = .69).[155] Another finding suggests that undergraduate student use of e-books is more likely to be influenced by embedded courseware links.[156]

Following courseware embedded links to e-books is the easiest way to connect with this resource since it requires very modest information literacy. There are two basic types of embedded links:- suggested (optional to use) and compulsory (vide items 5b.1 and 5b.2 of the survey instrument at Appendix C). Compulsory-to-use e-books lead to forced adoption (Walton, 2012) and the survey respondents (students) of this study did not endorse this type of adoption (vide Appendix R10). Alas, further examination of the nature of courseware embedded links and the types of linked e-books in three years of transaction logs, 2010-2012, was not possible (vide Section 6.1.8 and Appendix S) because the researcher had no dataset enabling titles to be tabulated against programmes of study or sufficient number of de-anonymised users.

8.6.8 Node Eight: Moderators

Patterns of use encompass demographic effects. Moderating variables that impact upon ECU e-book adoption include respondent category, student programme, age, gender, and years at ECU (Figure 8.8).

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[155] Finding 5.10.13, p. 142.

[156] Finding 5.12.5, p. 148.

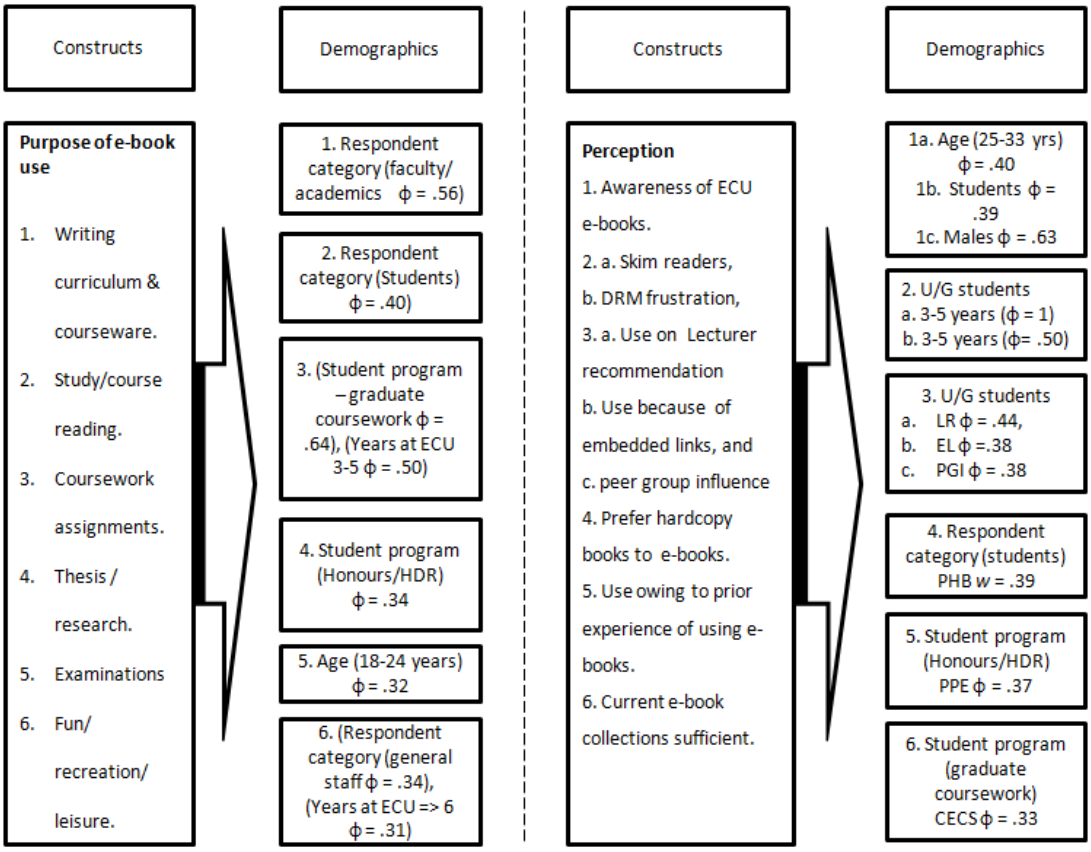

Figure 8.8. Effects of demography and segmentation on e-book usage pattern

As Figure 8.8 shows:

- Perceived relevance or usefulness of e-book content (purpose of use or task fit) is likely shaped by role (academics <> writing curriculum and courseware;[157] students <> study or course reading;[158] general staff <> fun/recreation/leisure);[159] student level/program of study (graduate coursework <> assignments;[160] honours/HDR <>

[157] Finding 5.6.2, p. 133.

[158] Finding 5.6.4, p. 133.

[159] Finding 5.6.1, p. 133.

[160] Finding 5.6.3, p. 133.

thesis/research)[161], age (18-24 years <> exams)[162] and experience or years at ECU (3-5 years <> assignments;[163] six+ years <> leisure);[164]

- *Awareness* is greatest among male students in 25-33 years age cohort;[165]
- Undergraduate use of e-books is more influenced by lecturer recommendation, peer group use, and embedded courseware links;[166]
- Skim use of e-books,[167] and frustration with DRM restrictions[168] is more likely attributed to senior undergraduate students in 3-5 years at ECU;
- Preference for hardcopy books is more likely significant with students,[169] the largest community (approximately 93%) in ECU population;[170]
- Familiarity (Shin, 2011) or prior experience of using e-books is likely greater with honours/HDR students;[171] and
- E-book collection sufficiency is more likely visualised by graduate (coursework) students[172] linked with coursework assignments.[173]

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[161] Finding 5.6.5, p. 133.

[162] Finding 5.6.4, p. 133.

[163] Finding 5.6.3, p. 133.

[164] Finding 5.6.1, p. 133.

[165] Finding 5.12.1, p. 147.

[166] Finding 5.12.5, p. 148.

[167] Finding 5.12.4, p. 148.

[168] Finding 5.12.2, p. 147.

[169] Finding 5.11.2, p. 146.

[170] Table 4.1, p. 105.

[171] Finding 5.12.6, p. 148.

[172] Finding 5.12.3, p. 147.

[173] Finding 5.6.3, p. 133.

8.6.9 Node Nine: Gratification Overall with ECU Library E-books

Consistent with ECT and UGT frameworks, a unified view (Figure 8.9) of the factors contributing to overall satisfaction with ECU Library e-books is described in this section.

In common with previous studies (e.g. Croft & Davis, 2010; Li et al, 2011; Zhao & Abuizam, 2013) ECU respondents were largely satisfied overall with ECU Library e-books (w = .93).[174] There were nine factors[175] that provided a path to satisfaction. Particular findings comprise:

I. perceived sufficiency of e-book collections, a utility perspective;
II. perceived easy-to-use Library interface for finding e-books, a facilitating condition provided by the ECU Library and is linked with perceived ease of use;
III. perceived adequacy of e-book customisation features, a utilitarian perspective;
IV. perceived attractiveness of the e-book formats, a hedonic attribute;
V. perceived convenience of use, an aspect of usefulness linked with effort expectancy;
VI. perceived pleasantness of using e-books, a hedonic attribute;
VII. perceived accessibility of e-books over the Internet, a facilitating condition provided by the ECU Library and is linked with perceived effort expectancy;
VIII. perceived findability of information in e-books, an ease of use and effort expectancy perspective; and
IX. perceived satisfaction with e-book use platform (laptop), an aspect of culture of use.

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[174] Section 5.2.11, p. 154.

[175] Findings 5.15 (1-8), pp. 155-156 and 5.16.2 (p. 158).

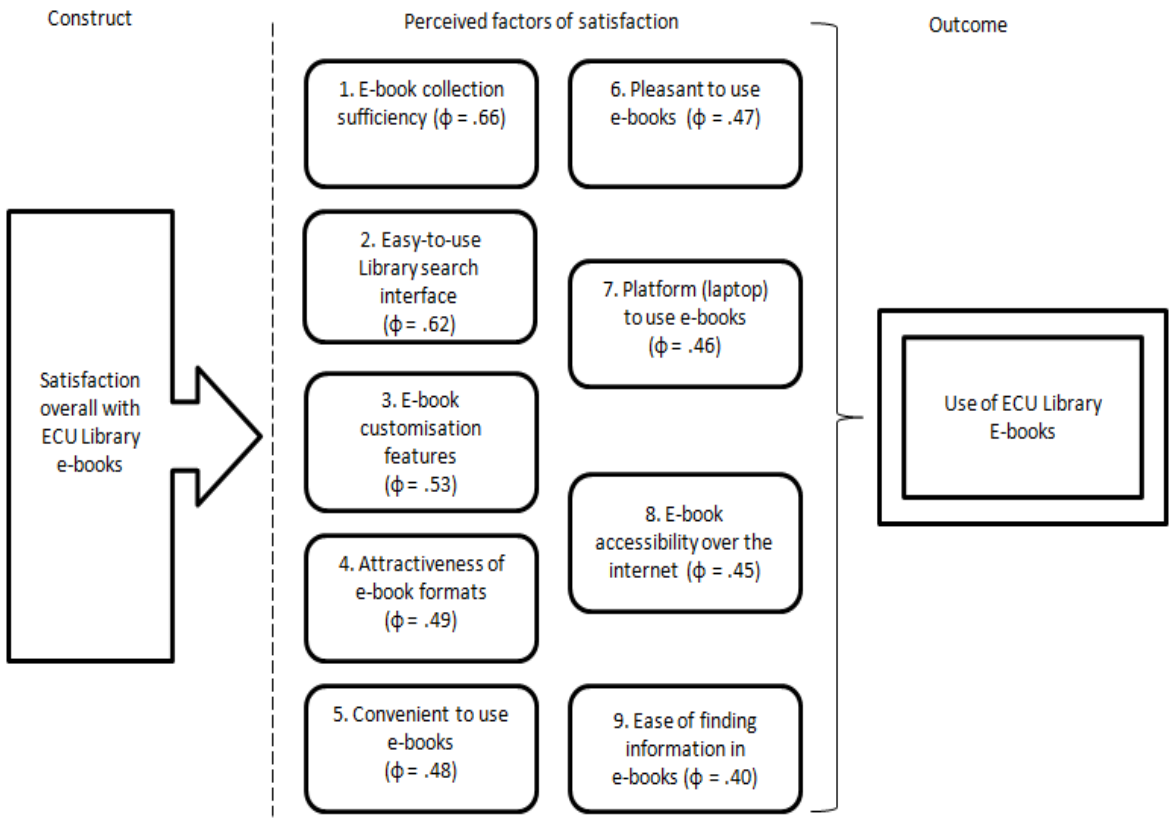

Figure 8.9. Sources of gratification with ECU e-books

8.6.10 Node Ten: Continuance Intention for using ECU Library E-books

Consistent with ECT and UGT frameworks a unified view of the factors contributing to post-adoption behaviour in terms of continuance intention for using ECU Library e-books is described in this section.

In common with previous studies (e.g. Shin, 2011; Zhao & Abuizam, 2013), ECU respondents expressed continuance intention for using ECU Library e-books. There were 15 particular factors[176] that provided a path to continuance intention (Figure 8.10).

Figure 8.11 presents a unified view of satisfaction and continuance intention.

[176] Findings 5.17 (p. 159); 5.18 (1-13), pp. 161-162; and 5.19.2 (p. 163).

Particular findings that point to technology adoption frameworks of continuance comprise:

I. perceived convenience of use, a utilitarian perspective linked with ease of use;

II. perceived pleasantness of using e-books, a hedonic attribute;

III. perceived attractiveness of the e-book formats, a hedonic attribute;

IV. perceived effort expectancy in finding information in e-books, a usability perspective;

V. perceived prior experience of using e-books, a familiarity perspective. Consistent with Shin (2011), familiarity does not provide a path to satisfaction and continuance intention related with familiarity is more driven by habituation/automaticity;

VI. perceived satisfaction overall with ECU Library e-books, an ECT and UGT perspective;

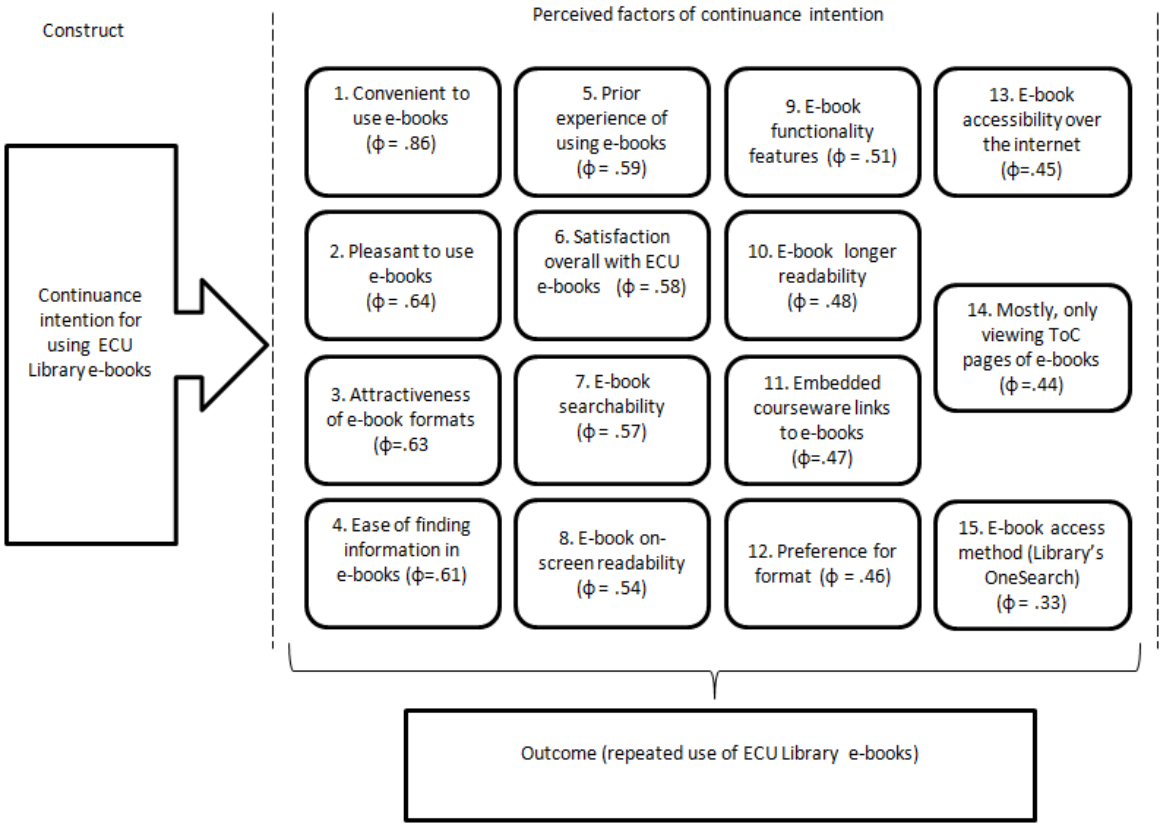

Figure 8.10. Sources of continuance with ECU e-books

VII. perceived effort expectancy in searching needed information in e-books, a usability perspective;

VIII. perceived effort expectancy for e-books' on-screen reading, a usability perspective;

IX. perceived e-book functionality features, a utility perspective;

X. perceived suitability of e-books for longer reading, an effort expectancy perspective;

XI. perceived accessibility of e-books via courseware embedded links, a facilitating condition;

XII. perceived preference for book format, an intimacy perspective linked with culture of use. Consistent with Shin (2011), intimacy does not provide a path to satisfaction and continuance intention related with intimacy is more driven by habituation/automaticity;

XIII. perceived accessibility of e-books over the Internet, a facilitating condition provided by the ECU Library and is linked with perceived effort expectancy;

XIV. perceived use of e-books (mostly only viewing TOC pages), a usability perspective linked with task fit; and

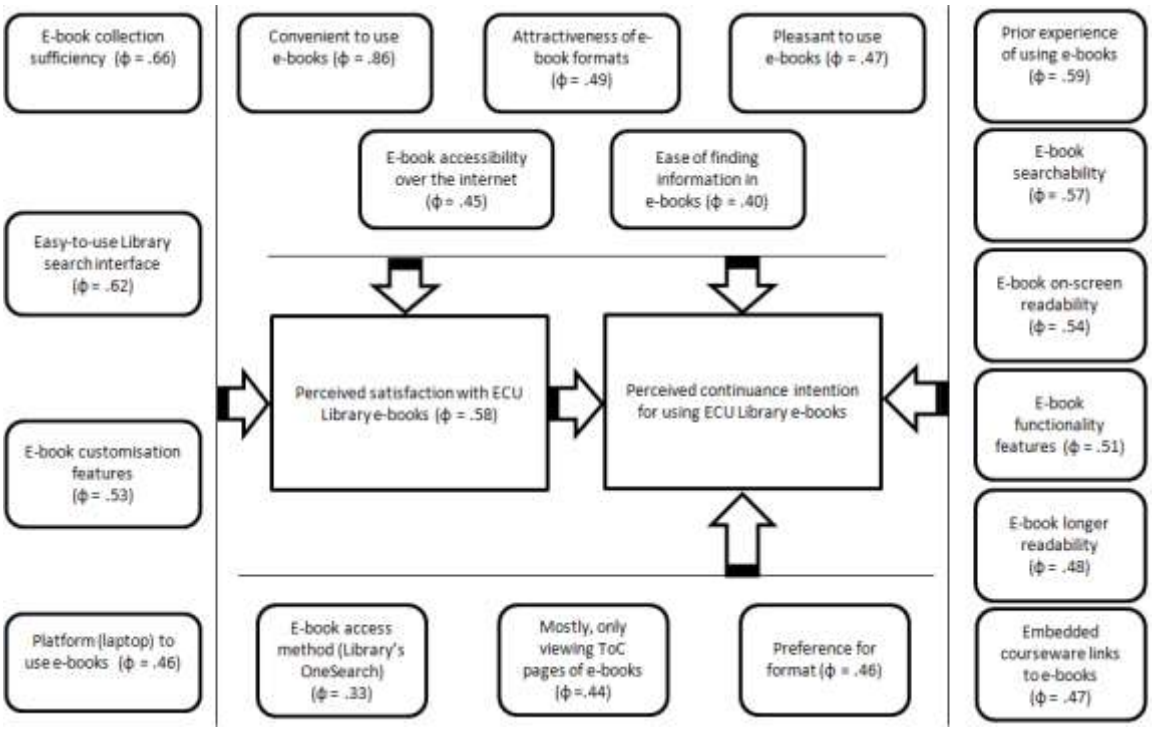

Figure 8.11. Unified factors of gratification and continuance with ECU e-books

XV. perceived accessibility of e-books via Library's OneSearch, a facilitating condition provided by the ECU Library and is linked with perceived effort expectancy.

8.6.11 Summary

The node analysis shows that the evolved model (Figure 8.7) is consistent with major technology adoption and information behaviour frameworks and allied works in the context of e-book adoption in ARLs across all the constructs except two, *forced adoption* and *UTAUT's social influence*, which were thus excluded from the model. Statistical tests for forced adoption were not significant. Furthermore, respondents' textual, open-ended comments also did not endorse forced adoption (Section 5.2.15 and Appendix R10).

Social influence was operationalised in the survey in the dimensions of influence of peers (use of system by co-workers in UTAUT) and recommendation of lecturer/tutor (Content Complete and OnlyConnect Consultancy, 2009; JISC, 2009; Lin et al., 2010).

Social influence in this study does not affect ECU e-book adoption, for users largely disagreed that they used Library e-books because of (i) peer group use (w = .85),[177] and (ii) lecturer/tutor recommendation (w = .54).[178] Venkatesh et al's (2003) study from which the construct was drawn also found that social influence was not significant in voluntary settings. Further, they found that social influence is only important in mandatory settings in the early years of individual's experience and was found to be significant only when tested against demographic variables. This study also found that social influence was only significant against a demographic variables (i.e. undergraduate students, which is an early years' stage of university education as well).[179]

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[177] Finding 5.10.14, p. 143.

[178] Finding 5.10.15, p. 143.

[179] Finding 5.12.5, p. 148.

8.7 Issues and Implications: Further Discussion

The evolved model of e-book adoption also functions as a guide to non-adoption. Section 8.3.1.2 summarises the evidence of non-adoption. The survey data analysis showed that slightly less than one third of participants (31.43%) did not use e-books. Keeping in view the limitations of the survey sample, the most reliable estimate of use versus non-use came from DLA which showed that approximately 62% of ECU population did not use any of EBL e-book titles in each of three years 2010-2012.

Figure 8.1 described reasons for non-use of ECU Library e-books that emerged from the self-reported data analysis, encompassing issues of familiarity, usability, and culture of use. Fieldwork by Cassidy et al. (2011) and other authors (such as Allard, 2009; Godwin, 2009; Gross & Leslie, 2010; Han & Liu, 2010; Harinarayana & Raju, 2010; Joint, 2009, 2010; Li, Wong, & Chan, 2010; Nesta & Mi, 2011; Oguz & Holt, 2011; Saeed, Yang, & Sinnappan, 2009; Zheng & Wang, 2009), have all pointed to the importance of culture of use. This study adds to this literature. Importantly the grounded nature of the evolved model suggests where effort is best invested as measured by significance and effect size, to promote technology acceptance.

How platforms and interfaces can be adjusted to improve user acceptance is not a green field, but populated with examples that point the way forward. Industry experience and findings from this research point to the desirability of reader education, wider agent/medium compatibility (culture of use), and interface innovation in building wider e-book acceptance in ARLs.

For example, the success of the Amazon's Kindle, a device which "looks and reads like real paper" points to the importance of verisimilitude and also usability; compared with LCD technology, e-ink screens offer 50% better contrast (Amazon, 2010, para. 5). Goodwyn (2014) argues that e-book readers (such as Kindle) reproduce the look of a traditional book with black print on a white surface/screen. While some studies (e.g. Zimerman, 2011) highlight the features of other e-book readers including Apple's iPad as well. Furthermore, Lai and Chang (2011) argue that the advantages of using dedicated e-book readers include "convenience (the ability to use it anywhere and anytime), compatibility (approximating the book experience), and media richness

(hyperlinking) ... stand-alone capability (no computer required), fast downloading, thin cases, large storage capacity, and access by either wired or wireless Internet" (p. 559).

MacWilliam (2013) claims that "the user experience rests not just in the e-book but on the device that the e-book is read" (p. 1). He further explains that a variety of e-reader devices has given rise to diverse levels of design and interactivity, for example, e-book, enhanced e-book and e-book app. He concludes that "publishers can affect the e-book contents and further enhance the reader's experience" and in this regard, they need to think innovatively and use a human-centred approach to design for more engaging experiences. The use of e-book readers also provides additional elements of playfulness (a hedonic attribute) and curiosity which is likely to motivate users to use e-books. Results showed that users who experience e-books on EBL and Ebrary type platforms with desktop and laptop agents typically skim read Library e-books, while frequent users of e-book readers are much less likely to skim read (φ = .51).[180] *This result suggests that habituation in reading habits can grow from platform characteristics and shape information behaviour*. Implications therefore of failure to address issues with platforms and interfaces may be seen to extend beyond rejection and acceptance, but also to information behaviour where existing interfaces promote shallow involvement with e-book content. This study has forged new knowledge of the connection between e-book experience on other platforms and how this shapes use of e-books in an academic library context.

A key tactic in interface innovation is individualisation, comprising personalisation and customisation (Section 8.3.1.3). This study has demonstrated the feasibility of log analytics as a data-informed method for individualisation of user e-book experience. The research developed a predictive equation with high efficiency in classifying e-book users in terms of power use and validated it against the transaction log data. As

[180] Finding 5.13.8, p. 151.

indicated in Sections 8.2 and 8.5, the original contribution made in this area has demonstrated that:

- Concepts of higher level cognitive behaviours in searching and learning can be applied to the understanding of user types described in log data;
- It is feasible mathematically, dynamically to identify a PU on the basis of transaction log records;
- Models created in this way can be successfully validated against the data. However, the work done describes the need for calibration; and
- Validated models can be used to predict (categorise) users providing in real time the basis of discriminating between users in terms of user customisation and personalisation of e-books.

Carrying this work forward involves machine-based learning. The nature of the research agenda is discussed in Section 8.9.

8.8 Limitations

The methods and techniques of this research included:

- Case study;
- A survey of self-reported information behaviour based on a convenience sample;
- Deep log analysis of e-book transaction data created by the EBL and Ebrary platforms.

Limitations of these methods and techniques are discussed in the conclusions to data analysis and briefly recounted here.

This study was initially conceived as a multiple independent, international case study involving three participating libraries (two from Australia and one from Pakistan). ECU Library from Australia was the only library to respond favourably to the researcher's invitation to participate in the study - a factor beyond the researcher's control (Sections 4.2 and 4.4).

The survey of self-reported information behaviour was based on a convenience/voluntary sample. The sample represented a bias and showed low faculty and general staff participation and much stronger student participation based on new/fresh, young, on-campus, undergraduate, and Faculty of Health, Engineering and Science (FHES) and Faculty of Education and Arts (FEA) students. The non-probability sample and categorical measurement of survey data confined the data analysis opportunities to descriptive and non-parametric statistical procedures (Sections 4.3.2, and 5.1.2 and 5.3.5.3).

The e-book platforms, EBL and Ebrary, were different in terms of usage reports and hence provided fewer opportunities for their usage comparison. Non-normal distribution of system-generated datasets confined the data analysis opportunities to descriptive and non-parametric procedures as well. Compared to EBL, Ebrary log files yielded fewer insights due to limitations of the nature and extent of data collection (Sections 3.6.1.1; 4.3.1; 6.2.2; and 6.2.3).

Further, the main focus of this study was on the (a) attitude, behaviour, and perceptions of e-book users and non-users grounded in their self-reported information behaviour, and (b) e-book adoption outcomes grounded in system-generated datasets. To achieve the purpose this study was conducted in an end-user perspective and in an ARL context. Peer reviewed literature shows that ARLs are the major stakeholders of e-book consumption as well as the primary target audience of e-book suppliers. Therefore, other types of libraries (e.g. public, special, and national) were not included in this study. Similarly, feedback from other stakeholders, e.g. library management, e-book suppliers, and publishers, was not sought.

Keeping in view the scope and purpose of this study, certain e-book areas were briefly discussed but not primarily focused. These areas entailed e-book design (e.g. interface, layouts, styles and formats), information literacy, e-book use medium (i.e. e-reading machines and devices), and other resources (e.g. print books, and print/electronic journals). Each of these areas might postulate a primary-focused, full-fledged study.

8.9 Future Research

There are a number of directions that might underpin future research in e-book acceptance and use. These directions are discussed below. Directions encompass research techniques that are established in LIS (e.g. data matching, key logging, and query analysis) or derive from the field of computer science.

Where users consent, comprehensive e-book user profiling, i.e. matching of users' survey data with transaction log data where user IDs are recorded (e.g. EBL platform), may provide deeper insights. This technique was contemplated in this research, but insufficient users consented to data matching to enable the analysis to proceed. Again with the consent of users, library deployment of e-book readers equipped with key logger software might also inform new directions. Key logger software records all instances of user inputs. Analysis of user search queries for e-books via library interfaces or suppliers site might inform decisions regarding the need for information literacy programmes. Analysis of output/results in response to user search queries may be helpful to evaluate the efficiency of discovery tool in terms of precision and recall. Use of video and voice recording cameras to document e-book user expression and behaviour and interaction with e-books and interfaces and platforms with think-aloud protocols might also be useful, particularly in the area of interface design.

Machine Learning (ML), a type of artificial intelligence identified with the field of computer science, might also be used for predictions and the application of business rules. ML enables computers to learn from data inputs beyond explicit instructions programmed to make decisions and predictions. Such algorithms automatically change and grow themselves when the new datasets are introduced to them. Given the work done with the BLR model, a static model, a supervised ML technique might be used to create a dynamic solution to the problem of user classification. Figure 8.12 provides a holistic view of the supervised ML process.

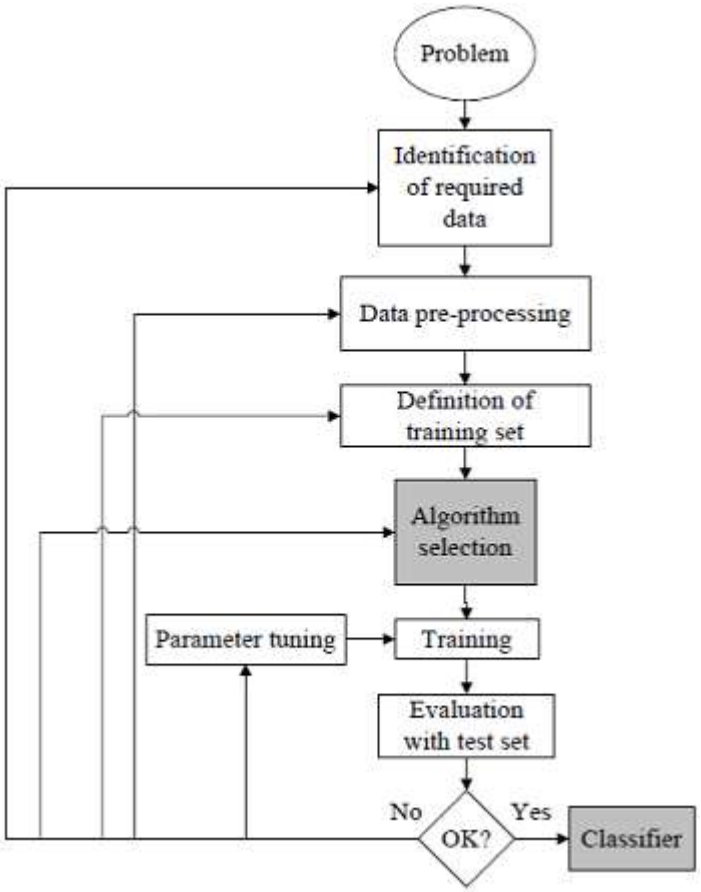

Figure 8.12. Supervised ML process (adopted from Kotsiantis, 2007, p. 250)

Applying this technique to the problem of classifying users the following steps are suggested. First, at the planning phase system-generated datasets are cleaned and combined (browsing and reading) into one dataset with some recoding into new variables, for example, mode (browsing or reading), and item type (owned or un-owned). The combined, raw dataset is categorised into a number of user variables with particular user ID, for example, user category (PU or NPU), views, minutes total, minutes in browsing, minutes in reading, minutes max, sessions, titles browsed, titles read, unique titles viewed, unique titles browsed, and unique titles read, using specific techniques (e.g. SQL in MS Access and/or advanced functions in MS Excel).

The dataset is now ready for ML training module. Before input the dataset is randomly bifurcated, for example, 90% for training and 10% for testing – a simple technique having one set each.

The ML model can be used with any identical datasets for calibration and may be useful in terms of:

- producing a more dynamic, efficient, and robust outcomes;
- classifying and predicting power and non-power users for individualisation decisions, i.e. personalisation and customisation;
- determining predictive variables of the classification;
- determining a better criterion for the classification decision with greater efficiency and fewer limitations;
- setting up business rules;
- dissolving problem cases more efficiently;
- devising a maturity model of e-book user information behaviour;
- unfolding new directions in e-book user information behaviour;
- extending insights into patterns of e-book use;
- making decisions based on confirmation rather than speculation on e-book transaction log data; and
- guiding towards discovery and/or innovative design of future generation e-books and their interfaces based on pattern recognition of the desired features.

In summary, there are many directions arising from this research describing fruitful multi-disciplinary research possibilities going forward. The researcher is pleased to have contributed to the foundations of such a journey.

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Appendix A: Definitions of Terms

The definitions of different terms used in the context of this study are given underneath in alphabetic order.

Academic and research library (ARL): Academic library is a library or library system in a postsecondary educational institution. A university library is a "library or library system established, administered, and funded by a university to meet the information, research, and curriculum needs of its students, faculty, and staff... Large university libraries with comprehensive collections are considered research libraries" (Reitz, 2014e, university library, para. 1). College libraries have also been reviewed in this study with regard to e-book adoption.

Agent: An e-book use medium or *platform* such as *e-book reader* and laptop.

Aggregator: see Supplier.

Antecedent variable "precedes the focal independent variable and helps to explain its origins. Antecedent and consequent variables extend the focal relationship beyond its original boundaries and elaborate the relationship by giving it external moorings (place or line)" (Aneshensel, 2002, p. 182).

Consequent variables "extend the causal process to examine the subsequent impact of dependent variable. Antecedent and consequent variables extend the focal relationship beyond its original boundaries and elaborate the relationship by giving it external moorings (place or line)" (Aneshensel, 2002, p. xv & 182).

Control Variables: "Eliminating alternative explanations for the empirical association between the focal independent and dependent variables; this ruling-out function involves the analysis of control variables to eliminate spuriousness and additional independent variables to remove redundancy; also confounder" (Aneshensel, 2002, p. xiv).

Counting Online Use of Networked Electronic Resources (COUNTER): Project COUNTER, launched in 2002, is a UK-based international initiative serving librarians, publishers, and intermediaries. This collaboration sets the standards that facilitate the

recording and reporting of online use statistics in a consistent, credible, and compatible way. COUNTER-standardized data are: number of successful requests by month and title, number of successful section requests by month and title, number of turnaways by month and title, number of turnaways by month and service, number of searches and sessions by month and title, and total number of searches and sessions by month and service (Crosetto, 2011, pp. 127-128; Project COUNTER, n.d.).

Culture of use: (1) A common prevailing trend within a defined community, (2) broadly refers to e-culture of use or culture of using digital resources that encompasses trend of using IT, e-journals, e-book use platforms, social media, apps, habit/automaticity, and e-information literacy.

Dependent variable is the change or difference in behaviour due to independent variable, also effect or criterion variable or post-test (Gay, 2000).

E-book reader: A separate hardware device to read e-books such as Kindle and Kobo.

EBook Library (EBL) is an *aggregator/supplier* of web-based collection of e-books of different publishers on a variety of subjects at one *platform*/point of use (Ebooks Corporation, 2005).

Ebrary is an *aggregator/supplier* of web-based collection of e-resources (mainly e-books) of different publishers on a variety of subjects at one *platform*/point of use (Ebrary, 2011).

Focal relationship is the "single relationship at the centre of one's theory; the one key cause-and-effect relationship indispensable to the integrity of the entire theoretical model" (Aneshensel, 2002, pp. xiv-xv).

Format refers to the digital makeup of e-books. This may be pdf, html, EPUB or other.

Independent variables are factors believed to make a difference in the behaviour of dependent variables. In research design, these are often the cause or experimental or treatment variable (Gay, 2000).

Information need is “a gap in a person’s knowledge that, when experienced at the conscious level as a question, gives rise to a search for an answer” (Reitz, 2011c, information need).

Interface: “A program that controls a display for the user (usually on a computer monitor) and that allows the user to interact with the system” (WordWeb, ‘interface’).

Intervening variables “represent causal mechanisms and processes that connect the focal independent variable to the dependent variable and form the interior of the focal relationship” (Aneshensel, 2002, p. xv & 182).

Library: The standalone word “Library” with capital ‘L’ within sentences denotes ECU Library, where not particularly mentioned.

Platform: (1) The e-book system provided by the supplier such as EBL and Ebrary (JISC, 2009; CIBER, 2009b), (2) E-book use medium or *agent* such as *e-book reader* and laptop.

Supplier: The company or vendor that provides access to electronic books of different publishers on a variety of subjects at one point of use, namely, EBook Library (EBL), and Ebrary.

Appendix B: Covering Letter for Survey

E-Book Adoption in Academic and Research Libraries

Thank you for agreeing to participate in this research project.

Project aims:

In recent years the use of electronic books (e-books) has grown in. academic and research libraries. Web-based e-book delivery involving desktop, netbook and iPad user agents is expanding rapidly. This study aims to explore e-book adoption outcomes by examining usage patterns of e-books by academics and students in the case study institution - Edith Cowan University. Using deep web log analysis of factual usage datasets and survey methods, the research investigates patterns of e-book user behaviour.

Your participation:

By completing the survey, you will be assisting in enriching discourse on what constitutes successful e-book adoption and what libraries and suppliers/ publishers can do to maximise user acceptance of a format that in some instances already accounts for half of the acquisitions budget of some libraries. This survey will also contribute to a better understanding of how exploratory behaviour in e-book utilisation can be encouraged, mimicking behaviour with traditional formats. It is anticipated that the results will be communicated via conference presentations and journal articles. Your participation in the survey is voluntary. A summary of findings will be provided to individual participants on request.

Research protocol:

No name identified data are to be published as a consequence of this project. Data gathered will be kept in secure storage for a maximum of five years then destroyed. No third party access to data will be permitted. No data will be used for purposes other than those described here.

To provide the fullest understanding of participant behaviour and use of e-books, limited data matching of survey responses to ECU Library e-book transaction log data is proposed. Please include your email address and ECU ID in the space provided at the end of the survey, if you are prepared to participate in this phase of the project.

Who should complete the survey?

The survey is intended to be completed by the students, academic/faculty, and non-academic staff.

Can I decline to answer some questions?

The usefulness of any survey is affected by nil responses, therefore, you are encouraged to answer all questions, but you are in no way required to do so.

How long will the survey take?

The estimated completion time is 15 minutes.

Consent:

By participating in the survey you are indicating that you have read the aims and research protocols for E-Book Adoption in Academic and Research Libraries and consent to the use of data supplied for research purposes.

About the Principal Researcher:

The Principal Researcher, Pervaiz Ahmad, is a PhD student in Information Science, in the School of Computer and Security Science, Edith Cowan University, Perth, WA. Pervaiz is on study leave from his substantive position as Assistant Professor in

Library and Information Science at the Allama Iqbal Open University, Islamabad, Pakistan. Any questions about the research may be directed to Pervaiz Ahmad on phone or by email.

For further information about the researcher and this research you may also contact my principal Supervisor, Dr Mark Brogan, School of Computer and Security Science, Edith Cowan University on 08 6304 6300 or by email: m.brogan@ecu.edu.au.

If you have any concerns or complaints about the research project and wish to talk to an independent person, you may contact:

Research Ethics Officer
Edith Cowan University
270 Joondalup Drive
JOONDALUP WA 6027
Phone: (08) 6304 2170
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Thank you for taking the time to contribute.

Yours sincerely,
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Appendix C: Survey for ECU Academics, Students, and General Staff

E-Book Adoption in Academic and Research Libraries

There are two prizes through a random draw for the complete and valid responses (details at the end of survey).

Part 1. Use of E-Books (For all respondents)

This section describes your use of e-books. Please check the button that best describes your use.

	Yes (1)	No (2)	Don't know (3)
1.1. I use ECU Library e-books			
1.2. I use e-books sourced from other providers			

Part 2. Non-use of ECU Library E-books (for Non users only)

Statements in this section are ONLY for survey respondents who are NOT current library e-book users, i.e. you answered NO to Item 1.1 -- I use e-books from my ECU Library. Statements are aimed at exploring practical reasons for why you are not currently using this service. Check all boxes that apply. Use the text field for any additional explanation not covered by check box items.

- ❑ 2.1. Unaware of the service
- ❑ 2.2. Don't know how to find them in the library catalogue
- ❑ 2.3. Insufficient titles
- ❑ 2.4. Cumbersome interface
- ❑ 2.5. Unpleasant to use
- ❑ 2.6. Incompatibility with my mobile agent (e.g. iPad, Kindle e-book reader, smart phone)
- ❑ 2.7. Incompatibility with my browser
- ❑ 2.8. Login (authentication) is frustrating
- ❑ 2.9. Prefer and use hard copy books exclusively
- ❑ 2.10. My computer is too old
- ❑ 2.11. My Internet connection is too slow
- ❑ 2.12. I don't adapt well to new technology
- ❑ 2.13 Limitations on access, copying, printing and download frustrate me
- ❑ 2.14. Other (please specify in the textbox provided below) _____

Part 3. Awareness and Perception of ECU Library E-books (For ALL respondents)

Responses in this section describe your awareness and perception of ECU Library e-books. Decide if you agree or disagree with each of the statements. *If you are not a current ECU Library e-book user, you can skip statements that do not apply to you.*

	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
3.1. The ECU Library has e-books in its collection	❍	❍	❍	❍	❍
3.2. I prefer hard copy books to e-books	❍	❍	❍	❍	❍
3.3. The Library interface for Finding e-books is easy to use	❍	❍	❍	❍	❍
3.4. Library e-books are hard to read on my screen	❍	❍	❍	❍	❍
3.5. I have experienced problems accessing Library e-books over the Internet	❍	❍	❍	❍	❍
3.6. Existing Library e-book customisation features are inadequate to meet my needs	❍	❍	❍	❍	❍
3.7. The Library e-book text window is too small	❍	❍	❍	❍	❍
3.8. Library e-book access, copy and print limits are frustrating	❍	❍	❍	❍	❍
3.9. I prefer multimedia elements in e-books	❍	❍	❍	❍	❍
3.10. Searching e-books for the information I need is easy	❍	❍	❍	❍	❍

Part 3. continues .....

	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
3.11. I prefer Library e-books to physical books when both are available	❍	❍	❍	❍	❍
3.12. Current Library e-book collections satisfy my needs	❍	❍	❍	❍	❍
3.13. Library e-book formats are attractive	❍	❍	❍	❍	❍
3.14. Typically, I skim read Library e-books	❍	❍	❍	❍	❍
3.15. I use Library e-books when their physical counterparts are not available	❍	❍	❍	❍	❍
3.16. Library e-books are suitable for longer reading	❍	❍	❍	❍	❍
3.17. Mostly I use Library e-books for quick fact finding	❍	❍	❍	❍	❍
3.18. Mostly, I only view Table of contents (TOC) pages of Library e-books	❍	❍	❍	❍	❍
3.19. Using Library e-books is a pleasant experience	❍	❍	❍	❍	❍
3.20. Finding information in e-books is difficult	❍	❍	❍	❍	❍

Part 3 continues .....

	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
3.21. Typically, I use unit's/subject's embedded links to access e-books	❍	❍	❍	❍	❍
3.22. I use Library e-books because my friend or peer group use e-books	❍	❍	❍	❍	❍
3.23. I use Library e-books on the recommendation of my lecturer/tutor	❍	❍	❍	❍	❍
3.24. I use Library e-books because I have prior personal experience of using e-books	❍	❍	❍	❍	❍
3.25. I use Library e-books due to convenience (anywhere, always accessibility without subject to physical book lending rules)	❍	❍	❍	❍	❍
3.26. I use Library e-books due to functionality features (full-text searching, highlighting, bookmarking, annotating, downloadability, user customisation)	❍	❍	❍	❍	❍
3.27. I prefer audio version of Library e-books, where available	❍	❍	❍	❍	❍
3.28. I am satisfied overall with my University Library's e-books	❍	❍	❍	❍	❍
3.29. I intend to continue using e-books	❍	❍	❍	❍	❍
3.30. E-books and e-journals are different	❍	❍	❍	❍	❍

Part 4a. Frequency of Using Electronic Resources and Platforms (For ALL respondents)

Responses in this section describe how often you make use of various kinds of online resources and platforms for online work of all kinds. Please select a button that describes your frequency of use.

	1 - Never (1)	2 (2)	3 (3)	4 (4)	5 - Often (One or more times a day) (5)
4a.1. Desktop PC	❍	❍	❍	❍	❍
4a.2. Laptop, netbook	❍	❍	❍	❍	❍
4a.3. Tablet (other than iPad)	❍	❍	❍	❍	❍
4a.4. iPad	❍	❍	❍	❍	❍
4a.5. Smartphone	❍	❍	❍	❍	❍
4a.6. E-book reader	❍	❍	❍	❍	❍
4a.7. Online games	❍	❍	❍	❍	❍
4a.8. Social media (e.g. Facebook, Twitter, Youtube)	❍	❍	❍	❍	❍
4a.9. Library E-journals	❍	❍	❍	❍	❍

Part 4b: Satisfaction with E-Book Platforms (For ANY e-book user; If "Yes" to either Q1.1 or Q1.2 is selected)

E-books, including ECU Library e-books, can be read using a variety of user agents or platforms. For each agent used (if any), rate your overall satisfaction with e-books by selecting the relevant box.

	Very Unsatisfied (1)	Unsatisfied (2)	Neutral (3)	Satisfied (4)	Very Satisfied (5)
4b.1. Desktop PC	❍	❍	❍	❍	❍
4b.2.Laptop, netbook	❍	❍	❍	❍	❍
4b.3. Tablet (other than iPad)	❍	❍	❍	❍	❍
4b.4. iPad	❍	❍	❍	❍	❍
4b.5. Smartphone	❍	❍	❍	❍	❍
4b.6. Kindle	❍	❍	❍	❍	❍
4b.7. Kobo	❍	❍	❍	❍	❍
4b.8. E-book reader (other)	❍	❍	❍	❍	❍

Part 5. Purpose of E-book Use and Access methods (For ANY e-book user; If "Yes" to either Q1.1 or Q1.2 is selected)

Q.5a. Which of the following describes my e-book use? (Please check all that apply)

- ❑ 5a.1. General knowledge
- ❑ 5a.2. Fun/recreation
- ❑ 5a.3. Writing curriculum and courseware
- ❑ 5a.4. Assignments (Coursework)
- ❑ 5a.5. Study (Course reading)
- ❑ 5a.6. Exams
- ❑ 5a.7. Thesis/Research
- ❑ 5a.8. Other (please specify in the textbox provided below) _____

Q.5b. I use the following access methods to access e-books (please check all that apply)

- ❑ 5b.1. Embedded links via unit's/subject's suggested reading(s)
- ❑ 5b.2. Embedded links via unit's/subject's compulsory reading(s)
- ❑ 5b.3. Library catalogue
- ❑ 5b.4. Library's metasearch interface (e.g.OneSearch)
- ❑ 5b.5. Library databases
- ❑ 5b.6. Publisher websites (e.g. John Wiley & Sons, Springer, Cambridge University Press)
- ❑ 5b.7. Supplier websites (e.g. EBook Library, Ebrary, MyiLibrary, Safari)
- ❑ 5b.8. Bookseller websites (e.g. Amazon)
- ❑ 5b.9. iTunes Store
- ❑ 5b.10. Google e-books
- ❑ 5b.11. Other e-book websites
- ❑ 5b.12. Preloaded with e-reader devices
- ❑ 5b.13. Google Scholar
- ❑ 5b.14. Google search engine
- ❑ 5b.15. Other search engines
- ❑ 5b.16. Other (please specify in the textbox provided below) _____

Part 6. Comments or suggestions, if any, in the textbox provided below (For ALL respondents)

Part 7: Demographics (For ALL respondents)

Please select the relevant choice.

Q.7.1. Respondent category

- ❍ Academic/Faculty (includes sessional and casual as well as contract and continuing academic staff) (1)
- ❍ Student (2)
- ❍ General/Professional (Non-academic) staff (3)

Q.7.1.1. Mode of study (If "Student" to Q7.1 is selected)

- ❍ On-campus (1)
- ❍ Off-campus (2)
- ❍ Both (mixed mode) (3)

Q.7.1.2. Program of study (If "Student" to Q7.1 is selected)

- ❍ Undergraduate/Bachelors (1)
- ❍ Graduate/Postgraduate/Masters (coursework) (2)
- ❍ Honours/Research degree/Higher degree by research (HDR) (3)
- ❍ Other (please specify in the textbox provided below) _____

Q.7.2. Discipline/subject/major field of study/work

(Please write in the textbox provided below) _____

Coded as under:

- ❍ Faculty of Health, Engineering and Science (FHES) (1)
- ❍ Faculty of Education and Arts (FEA) (2)
- ❍ Faculty of Business and Law (FBL) (3)
- ❍ Other (Services) (4)

Q.7.3. Gender

- ❍ Male (1)
- ❍ Female (2)

Q.7.4. Age

- ❍ 18-24 (1)
- ❍ 25-33 (2)
- ❍ 34-42 (3)
- ❍ 43-51 (4)
- ❍ 52-60 (5)
- ❍ 61 or older (6)

Q7.5. Number of year(s) studying/working at ECU

- ❍ Less than a year (1)
- ❍ 1 to 2 years (2)
- ❍ 3 to 5 years (3)
- ❍ 6 to 9 years (4)
- ❍ 10 or more years (5)

Participant Consent

Q.8.1. Do you grant permission to use your Ebook Library (EBL) transaction log data, if any, for anonymised research as part of this study?

❍ No

❍ Yes (Please write your ECU ID in the textbox provided below) _____

Q.8.2. Do you want to be included in a prize draw for one of the two $50 cash prizes if your responses are complete and valid?

❍ No

❍ Yes (please write your name and email address) _____

Q.8.3. Do you want the summary of results of this survey to be emailed to you after data analysis?

❍ No

❍ Yes (please write your email address in the textbox provided below) _____

----------END----------

Appendix D: Abstracts of Papers Published during Study

1). Ahmad, P. & Brogan, M. (2012). Scholarly use of e-books in a virtual academic environment: A case study. *Australian Academic and Research Libraries, 43*(3), 189-213.

Abstract: From a fledgling technology with no proven business models, electronic books (e-books) have grown in importance usurping traditional formats as an acquisitions budget line in many academic library contexts. Business models include purchase, subscription, and pay per use. In academic and research libraries, web based e-book delivery is the dominant platform involving desktop, Netbook and iPad user agents. E-books are the hot property of today's academic library, forming the new wave in information services along with web scale discovery and institutional repositories.

This paper reports the results of a preliminary analysis of transactional e-log data describing academic and student use of Ebook Library (EBL) titles at Edith Cowan University (ECU) Library, Perth, Western Australia. The data mined and analysed encompassing Semesters One and Two of the 2010 academic year. Analysis includes descriptive statistics and other metrics describing e-book usage patterns and user behaviour. The paper compares usage patterns observed with earlier studies and reports on the phenomenon of the 'power user'.

2). Ahmad, P., Brogan, M., & Johnstone, M. N. (2014). The e-book power user in academic and research libraries: Deep log analysis and user customisation. *Australian Academic & Research Libraries, 45*(1), 35-47.

Abstract: In the literature on e-book adoption in academic and research libraries, user acceptance is seldom rigorously examined. As take-up of e-books has grown to achieve mass adoption, what industry analysts Gartner describe as the 'plateau of productivity,' the question of user acceptance may seem less relevant. However, if attention is switched from downloads, to information behaviour, expectations and gratification, the picture of acceptance is more nuanced, with some studies pointing towards user disaffection.

This paper reports on the information behaviour of another category of e-book users, i.e. apparently satisfied or intensive users. The paper is based on data analysis and interpretation of data found in transaction logs generated by the EBL e-book platform in a case study academic and research library. The paper forms part of a broader investigation of technology acceptance and options for improving the user experience of e-books within an academic library context. Three years worth of e-books transaction logs were mined for evidence of ‘power user’ behaviour. The paper demonstrates how power user behaviour is different from other user behaviour, shows which variables determine such behaviour and creates a probabilistic model that can determine a power user based on these variables. The paper also describes how this model was validated against the log data.

Appendix E: Analysis of Sample Demographics and Attributes (Thesis Section 5.1)

E.I. Survey Response Rate and Respondents by Occupation

The ECU community comprises academics/faculty, students, and general staff. Of 315 usable responses, 24 respondents did not attribute a respondent category (academic, student, staff) reducing the pool of responses usable for cluster attribution. In total 291 respondents self-attributed to a respondent category. Overall and cluster-wise response rate according to sample size[181] is described in Table E1.

Table E1. Survey Response Rate

Cluster	Sample size	Response size	% Response rate
Academics	261	26	9.96
General staff	296	33	11.15
Students	393	232	59.03
Undeclared	--	24	--
Total	**950**	**315**	**33.16**

The response rate was approximately 33%, a figure derived from the actual responses (315) divided by the three clusters' collective sample size (academics 261, students 393, and general staff 296 = 950).

In regards to response rate (cluster-wise and overall), the current study approximated or bettered the response rate of prior studies, for example, 1.97% (Smyth & Carlin, 2012), 3% (Shelburne, 2009), 5% (Anuradha & Usha, 2006), 10% (Brown, 2013). Catalano (2013, p. 246) concluded that a 30% response rate is acceptable for online accessed/e-mailed surveys.

[181] Vide Section 4.2.2.7 for an explanation of the sample size.

Although the convenience and self-selection nature of the sample used for the survey was less robust than random sampling, the technique used is similar to prior studies (e.g. Abdullah & Gibb, 2008a; Cumaoglu, Sacici, & Torun 2013; Roesnita & Zainab, 2005; Walton, 2012, 2014). Since this online survey was dependent on respondent self-selection voluntarily, there was no central control over the return of sample profile demographically (similar to Abdullah & Gibb, 2008a). Indeed there may be no practical alternative to convenience sampling. Catalano (2013) concluded that "most studies, both quantitative and qualitative, use convenience sampling, which is often unavoidable in library information behaviour research" (p. 246).

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that distribution of cluster responses as described in Table E1 is statistically significantly different (n = 291, df = 2, chi-square = 282.08, p <.001, w = .98) with large effect.[182] Implications of the response bias/skew are discussed in Section 5.1.2.

E.II. Mode of Student Study

At ECU students can enrol as On-campus students, Off-campus (online) students or both (Mixed mode). At 70.43% of respondents, the response is biased toward on-campus students (Table E2), demonstrating the difficulty of engaging online students with a study of this kind via email invitation. No statistical information for these three modes of student study is available in the ECU annual reports.

[182] According to Allen and Bennett (2010, p. 228) effect size Cohen's $w < .3$ = small/weak, $\geq .3 < .5$ = medium/moderate, $\geq .5$ = large/strong.

Table E2. Mode of Student Study (r = 230)

Mode	**Frequency**	**Percent**
On-campus	162	70.43
Off-campus	29	12.61
Both (mixed mode)	39	16.96
Total	**230**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that frequency distribution for student modes of study is statistically significantly different (n = 230, df = 2, chi-square = 143.12, p <.001, *w* = .79) with large effect. Implications of the response bias/skew are discussed in Section 5.1.2.

E.III. Programme of Student Study

Of 227 students who responded to this item, 137 (60.35%) were undergraduates (Table E3).

Table E3. Programme/Level of Student Study (r = 227)

Programme	**Frequency**	**Percent**
Undergraduate	137	60.35
Graduate (coursework)	62	27.31
Honours and HDR	28	12.34
Total	**227**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that student programmes of study are statistically significantly different (n = 227, df = 2, chi-square = 82.21, p <.001, *w* = .60) with large effect. Thus a picture emerges of the response as weighted toward undergraduate, On-campus students. Implications of the response bias are discussed in Section 5.1.2.

E.IV. Major Field of Study/Work

Participants were asked to describe their discipline of study or work. Responses were mapped to three ECU faculties and non-teaching departments (Table E4). Respondents from Faculty of Health, Engineering and Science comprised more than half (52.70%) of all respondents.

Table E4. Major Field of Study/Work (r [315 – 42] =273)

Field	**Frequency**	**Percent**
Faculty of Health, Engineering and Science (FHES)	166	52.70
Faculty of Education and Arts (FEA)	69	21.90
Faculty of Business and Law (FBL)	12	3.81
Other (non-teaching) departments	26	8.25
Missing responses	42	13.33
Total	**315**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that respondents' major fields of study/work are statistically significantly different (n = 273, df = 3, chi-square = 212.52, p <.001, *w* = .88) with large effect size. Implications of the response bias/skew are discussed in Section 5.1.2.

E.V. Gender

By gender, the response is approximately equally divided (Table E5). In the ECU population, 61.84% of students are female (Edith Cowan University, 2013).

Table E5. Gender (r [315 – 27] =288)

Gender	**Frequency**	**Percent**
Female	147	46.67
Male	141	44.76
Missing responses	27	8.57
Total	**315**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that gender distribution is not statistically significantly different (n = 288, df = 1, chi-square = .13, p = .72).

E.VI. Age

Of the six age group categories, young (undergraduate consistent with Table E3) respondents in the 18-24 years age group were more common (36.83%) than other groups (Table E6).

Table E6. Age (r [315 – 28] =287)

Age group	**Frequency**	**Percent**
18-24 years	116	36.83
25-33 years	53	16.83
34-42 years	63	20.00
43-51 years	31	9.84
52-60 years	18	5.71
61 years or older	6	1.90
Missing responses	28	8.89
Total	**315**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that respondents' age groups are statistically significantly different (n = 287, df = 5, chi-square = 163.63, p

<.001, *w* = .76) with large effect. Implications of the response bias/skew are discussed in Section 5.1.2.

E.VII. Number of year(s) studying/working at ECU

Consistent with Tables E3 and E6, new comers to ECU comprised 31.75% of respondents with 51.75% of respondents having spent 2 years or less in ECU programmes (Table E7).

Table E7. Span at ECU (r [315 – 27] =288)

Year(s)	**Frequency**	**Percent**
Less than a year	100	31.75
1-2 years	63	20.00
3-5 years	80	25.40
6-9 years	19	6.03
10 or more years	26	8.25
Missing responses	27	8.57
Total	**315**	**100**

A chi-square test for goodness of fit (with $\alpha = 0.05$) indicated that respondents' spans at ECU were statistically significantly different (n = 288, df = 4, chi-square = 83.63, p <.001, *w* = .54) with large effect. Implications of the response bias/skew are discussed in Section 5.1.2.

Appendix F: Demographics in ECU E-book Use: Crosstabs (Thesis Section 5.2.2)

Table 5.2: Contingency Tables

Note: In Q1.1 (I use ECU Library e-books) three "don't know" responses were excluded from the analysis due to insufficient sample.

Q1.1_I Use ECU Ebooks * Q03_Program

Crosstab

			Q03_Program			Total
			UNDERGRAD	GRADUATE COURSEWORK	HONORS/ HDR	
Q1.1_I Use ECU Ebooks	YES	Count	86	52	16	154
		Expected Count	93.1	41.8	19.2	154.0
	NO	Count	50	9	12	71
		Expected Count	42.9	19.2	8.8	71.0
Total		Count	136	61	28	225
		Expected Count	136.0	61.0	28.0	225.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.337[a]	2	.003
Likelihood Ratio	12.381	2	.002
Fisher's Exact Test	12.078		
Linear-by-Linear Association	.632[c]	1	.427
N of Valid Cases	225		

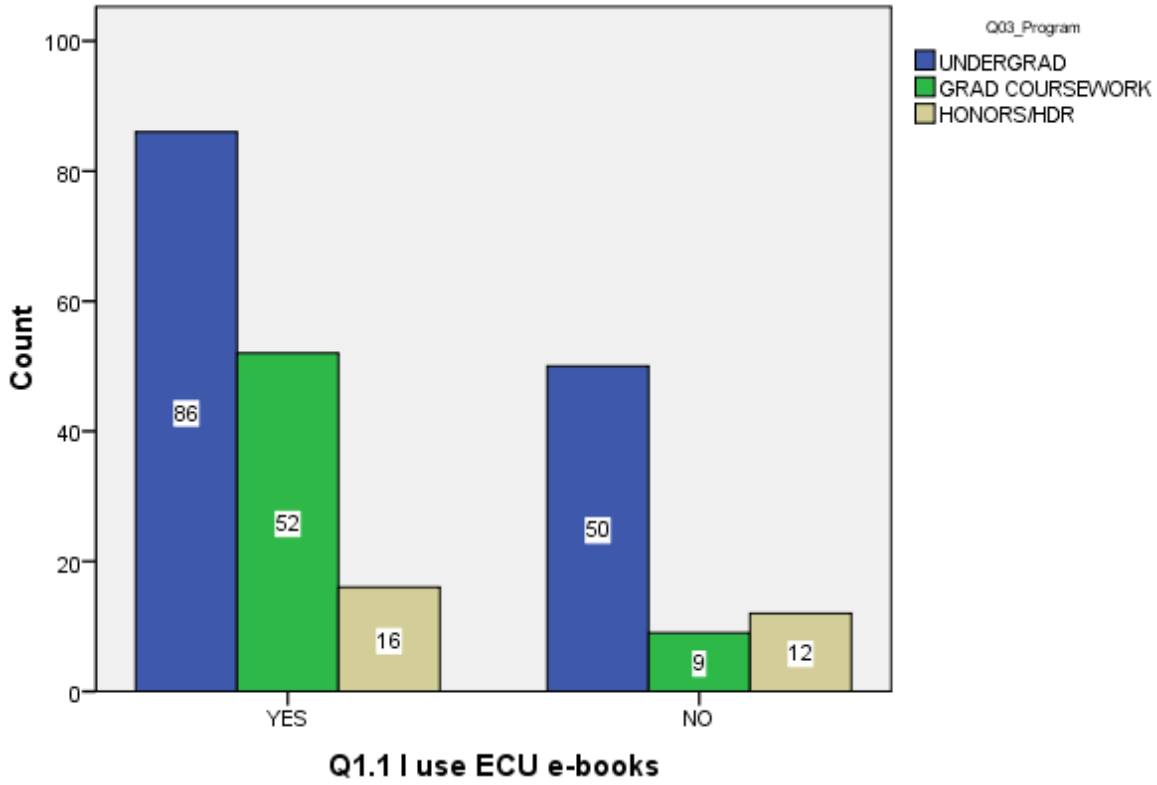
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.84.

b. Based on 100000 sampled tables with starting seed 79654295.

c. The standardized statistic is -.795.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.224	.003
	Cramer's V	.224	.003
N of Valid Cases		225	



Q1_1_Use ECU_Ebooks * Q05_Gender

			Q05_Gender		Total
			MALE	FEMALE	
Q1.1_I Use ECU Ebooks	YES	Count	82	112	194
		Expected Count	94.3	99.7	194.0
	NO	Count	57	35	92
		Expected Count	44.7	47.3	92.0
Total		Count	139	147	286
		Expected Count	139.0	147.0	286.0

When gender controlled for respondent category.

Q01_Respondent Category				Q05_Gender		Total
				MALE	FEMALE	
STUDENT	Q1.1_I use ECU e-books	YES	Count	61	89	150
			Expected Count	74.7	75.3	150.0
		NO	Count	46	19	65
			Expected Count	32.3	32.7	65.0
	Total		Count	107	108	215
			Expected Count	107.0	108.0	215.0

Q1.1_I Use ECU Ebooks * Q06_Age Crosstabulation (last two age categories excluded due to insufficient sample)

			Q06_Age				Total
			18-24	25-33	34-42	43-51	
Q1.1_I Use ECU Ebooks	YES	Count	71	40	44	27	182
		Expected Count	80.2	37.0	43.2	21.6	182.0
	NO	Count	44	13	18	4	79
		Expected Count	34.8	16.0	18.8	9.4	79.0
Total		Count	115	53	62	31	261
		Expected Count	115.0	53.0	62.0	31.0	261.0

Q1_1_Use ECU_Ebooks * Q07_Years

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q1.1_I Use ECU Ebooks	YES	Count	58	43	65	10	18	194
		Expected Count	67.2	42.1	54.3	12.9	17.6	194.0
	NO	Count	41	19	15	9	8	92
		Expected Count	31.8	19.9	25.7	6.1	8.4	92.0
Total		Count	99	62	80	19	26	286
		Expected Count	99.0	62.0	80.0	19.0	26.0	286.0

When years controlled for respondent category.

				Q07_Years					Total
Q01_Respondent Category				<1	1-2	3-5	6-9	10+	
STUDENT	Q1.1_I Use ECU Ebooks	YES	Count	52	37	58	5	2	154
			Expected Count	59.7	36.6	47.5	7.5	2.7	154.0
		NO	Count	36	17	12	6	2	73
			Expected Count	28.3	17.4	22.5	3.5	1.3	73.0
	Total		Count	88	54	70	11	4	227
			Expected Count	88.0	54.0	70.0	11.0	4.0	227.0

Appendix G: Association between Purpose and Use of E-books (Thesis Section 5.2.5.1)

Contingency Tables

Coding of Purpose Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

Crosstab

			Q5a6_Exams		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	62	137	199
		Expected Count	56.5	142.5	199.0
	NO	Count	7	37	44
		Expected Count	12.5	31.5	44.0
Total		Count	69	174	243
		Expected Count	69.0	174.0	243.0

Crosstab

			Q5a5_Study		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	133	66	199
		Expected Count	126.1	72.9	199.0
	NO	Count	21	23	44
		Expected Count	27.9	16.1	44.0
Total		Count	154	89	243
		Expected Count	154.0	89.0	243.0

Crosstab

			Q5a2_Recreation		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	61	138	199
		Expected Count	68.8	130.2	199.0
	NO	Count	23	21	44
		Expected Count	15.2	28.8	44.0
Total		Count	84	159	243
		Expected Count	84.0	159.0	243.0

Crosstab

			Q5a7_Thesis		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	105	94	199
		Expected Count	96.6	102.4	199.0
	NO	Count	13	31	44
		Expected Count	21.4	22.6	44.0
Total		Count	118	125	243
		Expected Count	118.0	125.0	243.0

Crosstab

			Q5a4_Assignments		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	149	50	199
		Expected Count	138.4	60.6	199.0
	NO	Count	20	24	44
		Expected Count	30.6	13.4	44.0
Total		Count	169	74	243
		Expected Count	169.0	74.0	243.0

Appendix H: Demographics vs. Purpose of E-book Use: Crosstabs (Thesis Section 5.2.5.2)

Table 5.6: Contingency Tables

Coding of Purpose Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

1. Q5a2_Recreation * Q01_Demographic_ResCat Crosstabulation

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5a2_Recreation	YES	Count	5	57	21	83
		Expected Count	7.5	66.5	8.9	83.0
	NO	Count	17	137	5	159
		Expected Count	14.5	127.5	17.1	159.0
Total		Count	22	194	26	242
		Expected Count	22.0	194.0	26.0	242.0

2. Q5a2_Recreation * Q07_Years Crosstabulation

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q5a2_Recreation	YES	Count	22	19	17	12	13	83
		Expected Count	26.4	19.4	24.3	5.6	7.3	83.0
	NO	Count	54	37	53	4	8	156
		Expected Count	49.6	36.6	45.7	10.4	13.7	156.0
Total		Count	76	56	70	16	21	239
		Expected Count	76.0	56.0	70.0	16.0	21.0	239.0

3. Q5a3_Curriculum * Q01_Demographic_ResCat Crosstabulation

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5a3_Curriculum	YES	Count	9	0	2	11
		Expected Count	1.0	8.8	1.2	11.0
	NO	Count	13	194	24	231
		Expected Count	21.0	185.2	24.8	231.0
Total		Count	22	194	26	242
		Expected Count	22.0	194.0	26.0	242.0

4. Q5a4_Assignments * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q5a4_Assignments	YES	Count	96	56	4	156
		Expected Count	90.3	46.8	18.9	156.0
	NO	Count	14	1	19	34
		Expected Count	19.7	10.2	4.1	34.0
Total		Count	110	57	23	190
		Expected Count	110.0	57.0	23.0	190.0

5. Q5a4_Assignments * Q07_Years Crosstabulation

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q5a4_Assignments	YES	Count	59	40	60	6	1	166
		Expected Count	52.8	38.9	48.6	11.1	14.6	166.0
	NO	Count	17	16	10	10	20	73
		Expected Count	23.2	17.1	21.4	4.9	6.4	73.0
Total		Count	76	56	70	16	21	239
		Expected Count	76.0	56.0	70.0	16.0	21.0	239.0

6. Q5a5_Study * Q01_Demographic_ResCat Crosstabulation

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5a5_Study	YES	Count	11	140	3	154
		Expected Count	14.0	123.5	16.5	154.0
	NO	Count	11	54	23	88
		Expected Count	8.0	70.5	9.5	88.0
Total		Count	22	194	26	242
		Expected Count	22.0	194.0	26.0	242.0

7. Q5a6_Exams * Q06_Age Crosstabulation

			Q06_Age						Total
			18-24	25-33	34-42	43-51	52-60	61+	
Q5a6_Exams	YES	Count	41	15	7	3	2	1	69
		Expected Count	26.4	13.3	15.7	8.4	4.1	1.2	69.0
	NO	Count	50	31	47	26	12	3	
		Expected Count	64.6	32.7	38.3	20.6	9.9	2.8	169.0
Total		Count	91	46	54	29	14	4	
		Expected Count	91.0	46.0	54.0	29.0	14.0	4.0	238.0

8. Q5a7_Thesis * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/HDR	
Q5a7_Thesis	YES	Count	44	22	21	87
		Expected Count	50.4	26.1	10.5	87.0
	NO	Count	66	35	2	103
		Expected Count	59.6	30.9	12.5	103.0
Total		Count	110	57	23	190
		Expected Count	110.0	57.0	23.0	190.0

Appendix I: Association between Access Methods and Use of ECU E-books (Thesis Section 5.2.6.1)

Contingency Tables

Coding of Access Method Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

Crosstab

			Q5b3_catalogue		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	155	41	196
		Expected Count	138.4	57.6	196.0
	NO	Count	13	29	42
		Expected Count	29.6	12.4	42.0
Total		Count	168	70	238
		Expected Count	168.0	70.0	238.0

Crosstab

			Q5b4_metasearch		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	135	61	196
		Expected Count	117.8	78.2	196.0
	NO	Count	8	34	42
		Expected Count	25.2	16.8	42.0
Total		Count	143	95	238
		Expected Count	143.0	95.0	238.0

Crosstab

			Q5b8_Bookseller		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	37	159	196
		Expected Count	46.9	149.1	196.0
	NO	Count	20	22	42
		Expected Count	10.1	31.9	42.0
Total		Count	57	181	238
		Expected Count	57.0	181.0	238.0

Crosstab

			Q5b5_databases		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	132	64	196
		Expected Count	117.8	78.2	196.0
	NO	Count	11	31	42
		Expected Count	25.2	16.8	42.0
Total		Count	143	95	238
		Expected Count	143.0	95.0	238.0

Crosstab

			Q5b13_Scholar		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	106	90	196
		Expected Count	97.2	98.8	196.0
	NO	Count	12	30	42
		Expected Count	20.8	21.2	42.0
Total		Count	118	120	238
		Expected Count	118.0	120.0	238.0

Crosstab

			Q5b1_Suggested Embedded links		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	101	95	196
		Expected Count	93.9	102.1	196.0
	NO	Count	13	29	42
		Expected Count	20.1	21.9	42.0
Total		Count	114	124	238
		Expected Count	114.0	124.0	238.0

Crosstab

			Q5b2_Compulsory Embedded Links		
			YES	NO	Total
Q1_1_Use ECU_Ebooks	YES	Count	87	109	196
		Expected Count	80.7	115.3	196.0
	NO	Count	11	31	42
		Expected Count	17.3	24.7	42.0
Total		Count	98	140	238
		Expected Count	98.0	140.0	238.0

Appendix J: Demographic Patterns in E-book Discovery and Access (Thesis Section 5.2.6.2)

Coding of Access Method Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

Table J1. Demographic Variables vs. E-book Access Methods: Crosstabs

Sr	Demographic variable	E-book access method	n	df	χ^2	*p.*	Effect ϕ *overall*
1	Respondent category	Links via unit's suggested readings	239	2	18.10	.000	.28
1	Programme/level of student study	Links via unit's suggested readings	188	2	11.15	.004	.24
1	Years at ECU	Links via unit's suggested readings	236	4	19.82	.001	.29
1	Respondent category	Unit's compulsory readings links	239	2	20.73	.000	.29
1	Programme/level of student study	Unit's compulsory readings links	188	2	9.81	.007	.23
1	Years at ECU	Unit's compulsory readings links	236	4	16.85	.002	.27
2	Programme/level of student study	Library catalogue	188	2	7.91	.019	.21
2	Mode of student study	Library catalogue	190	2	7.35	.025	.20
2	Mode of student study	Bookseller websites	190	2	10.92	.004	.24
3	Programme/level of student study	Publisher websites	188	2	10.49	.005	.24
4	Years at ECU	Supplier websites	236	4	11.72	.020	.22
5	Respondent category	Other e-book websites	239	2	9.96	.007	.20
6	Respondent category	Google Scholar	239	2	7.71	.021	.18
6	Mode of student study	Google Scholar	190	2	8.68	.013	.21
6	Programme/level of student study	Google Scholar	188	2	6.04	.049	.18

Contingencies for Table J1

Crosstab

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5b1_Access methods_Embedded	YES	Count	10	102	2	114
		Expected Count	10.5	91.6	11.9	114.0
	NO	Count	12	90	23	125
		Expected Count	11.5	100.4	13.1	125.0
Total		Count	22	192	25	239
		Expected Count	22.0	192.0	25.0	239.0

Crosstab

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/HDR	
Q5b1_Access methods_Embedded	YES	Count	61	35	5	101
		Expected Count	58.0	30.6	12.4	101.0
	NO	Count	47	22	18	87
		Expected Count	50.0	26.4	10.6	87.0
Total		Count	108	57	23	188
		Expected Count	108.0	57.0	23.0	188.0

Crosstab

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q5b1_Access methods_Embedded	YES	Count	47	26	32	3	4	112
		Expected Count	35.1	26.1	33.2	7.6	10.0	112.0
	NO	Count	27	29	38	13	17	124
		Expected Count	38.9	28.9	36.8	8.4	11.0	124.0
Total		Count	74	55	70	16	21	236
		Expected Count	74.0	55.0	70.0	16.0	21.0	236.0

Crosstab

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5b2_Embedded	YES	Count	8	91	0	99
		Expected Count	9.1	79.5	10.4	99.0
	NO	Count	14	101	25	140
		Expected Count	12.9	112.5	14.6	140.0
Total		Count	22	192	25	239
		Expected Count	22.0	192.0	25.0	239.0

Crosstab

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q5b2_Embedded	YES	Count	57	29	4	90
		Expected Count	51.7	27.3	11.0	90.0
	NO	Count	51	28	19	98
		Expected Count	56.3	29.7	12.0	98.0
Total		Count	108	57	23	188
		Expected Count	108.0	57.0	23.0	188.0

Crosstab

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q5b2_Embedded	YES	Count	40	24	29	2	3	98
		Expected Count	30.7	22.8	29.1	6.6	8.7	98.0
	NO	Count	34	31	41	14	18	138
		Expected Count	43.3	32.2	40.9	9.4	12.3	138.0
Total		Count	74	55	70	16	21	236
		Expected Count	74.0	55.0	70.0	16.0	21.0	236.0

Crosstab

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q5b3_catalogue	YES	Count	66	47	16	129
		Expected Count	74.1	39.1	15.8	129.0
	NO	Count	42	10	7	59
		Expected Count	33.9	17.9	7.2	59.0
Total		Count	108	57	23	188
		Expected Count	108.0	57.0	23.0	188.0

Crosstab

			Q02_Mode			Total
			On-Campus	Off-Campus	Mixed-Mode	
Q5b3_catalogue	YES	Count	87	23	19	129
		Expected Count	88.3	17.7	23.1	129.0
	NO	Count	43	3	15	61
		Expected Count	41.7	8.3	10.9	61.0
Total		Count	130	26	34	190
		Expected Count	130.0	26.0	34.0	190.0

Q5b8_Bookseller * Q02_Mode Crosstabulation

			Q02_Mode			Total
			On-Campus	Off-Campus	Mixed-Mode	
Q5b8_Bookseller	YES	Count	22	12	9	43
		Expected Count	29.4	5.9	7.7	43.0
	NO	Count	108	14	25	147
		Expected Count	100.6	20.1	26.3	147.0
Total		Count	130	26	34	190
		Expected Count	130.0	26.0	34.0	190.0

Q5b6_Publisher * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q5b6_Publisher	YES	Count	24	11	12	47
		Expected Count	27.0	14.2	5.8	47.0
	NO	Count	84	46	11	141
		Expected Count	81.0	42.8	17.2	141.0
Total		Count	108	57	23	188
		Expected Count	108.0	57.0	23.0	188.0

Q5b7_Supplier * Q07_Years Crosstabulation

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q5b7_Supplier	YES	Count	9	5	9	6	6	35
		Expected Count	11.0	8.2	10.4	2.4	3.1	35.0
	NO	Count	65	50	61	10	15	201
		Expected Count	63.0	46.8	59.6	13.6	17.9	201.0
Total		Count	74	55	70	16	21	236
		Expected Count	74.0	55.0	70.0	16.0	21.0	236.0

Q5b11_OtherWebsites * Q01_Demographic_ResCat Crosstabulation

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5b11_OtherWebsites	YES	Count	4	33	11	48
		Expected Count	4.4	38.6	5.0	48.0
	NO	Count	18	159	14	191
		Expected Count	17.6	153.4	20.0	191.0
Total		Count	22	192	25	239
		Expected Count	22.0	192.0	25.0	239.0

Crosstab

			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q5b13_Scholar	YES	Count	15	96	7	118
		Expected Count	10.9	94.8	12.3	118.0
	NO	Count	7	96	18	121
		Expected Count	11.1	97.2	12.7	121.0
Total		Count	22	192	25	239
		Expected Count	22.0	192.0	25.0	239.0

Crosstab

			Q02_Mode			Total
			On-Campus	Off-Campus	Mixed-Mode	
Q5b13_Scholar	YES	Count	75	10	11	96
		Expected Count	65.7	13.1	17.2	96.0
	NO	Count	55	16	23	94
		Expected Count	64.3	12.9	16.8	94.0
Total		Count	130	26	34	190
		Expected Count	130.0	26.0	34.0	190.0

Crosstab

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q5b13_Scholar	YES	Count	54	25	17	96
		Expected Count	55.1	29.1	11.7	96.0
	NO	Count	54	32	6	92
		Expected Count	52.9	27.9	11.3	92.0
Total		Count	108	57	23	188
		Expected Count	108.0	57.0	23.0	188.0

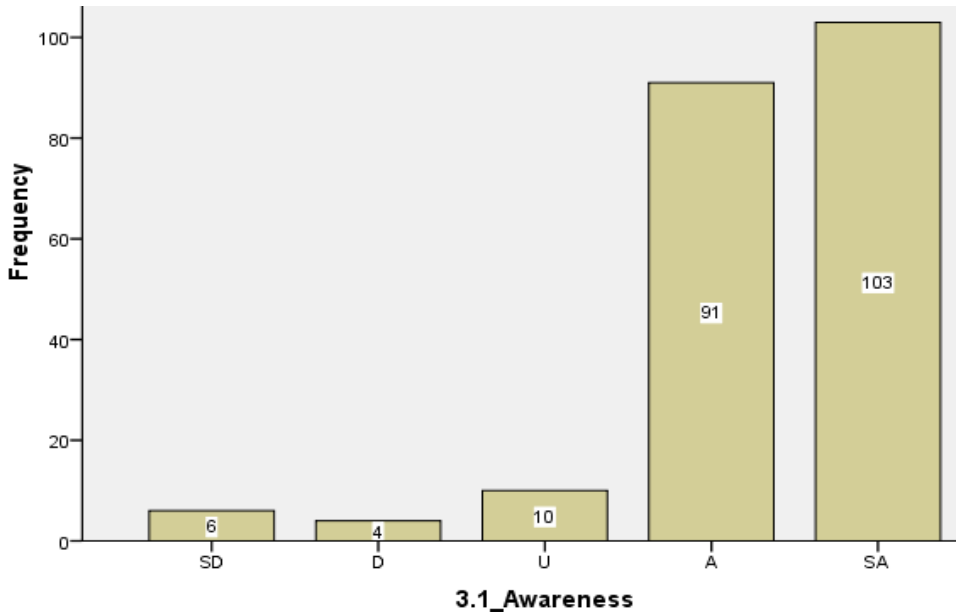
Appendix K: User Perception of ECU Library E-books (Thesis Section 5.2.9)

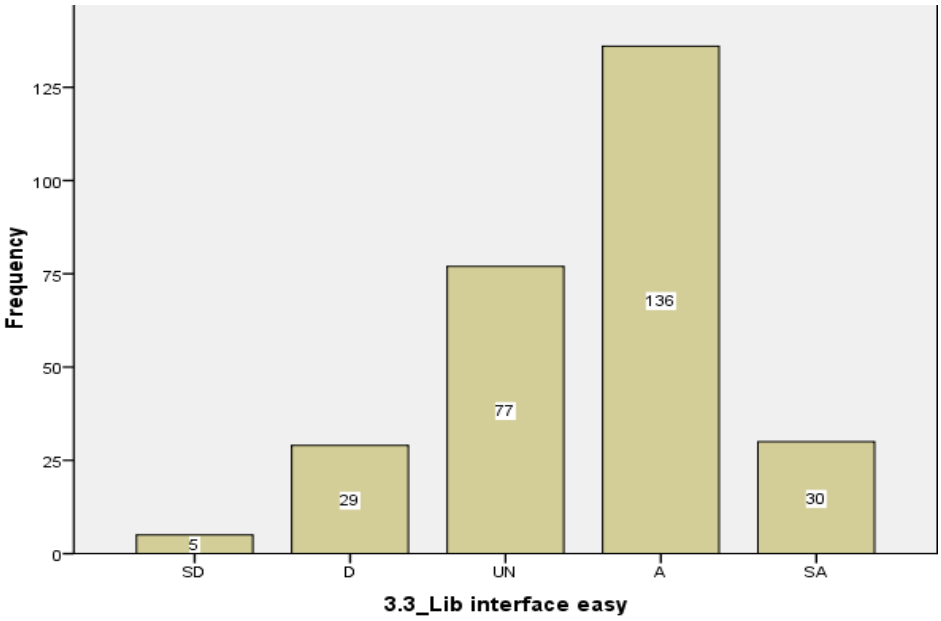
K.I. Awareness and Perception of ECU Library E-books

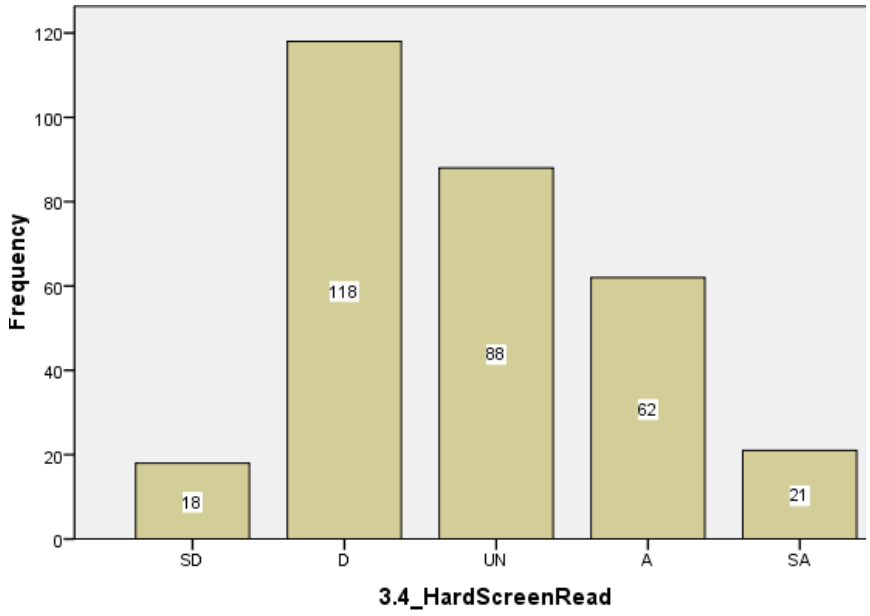
Table K1. Awareness and Perceptions for ECU E-books: Goodness of Fit

Sr.	**Selected items** (3.1 to 3.30 of questionnaire)	**r**	χ^2	***p***	**Effect w**	**Effect size**
1	3.1. The ECU Library has e-books in its collection	214	230.91	.000	1.04	Large
2	3.3. The Library interface for finding e-books is easy to use	277	195.76	.000	0.84	Large
3	3.4. Library e-books are hard to read on my screen	307	120.96	.000	0.63	Large
4	3.5. I have experienced problems accessing Library e-books over the Internet	304	129.85	.000	0.65	Large
5	3.7. The Library e-book text window is too small	302	161.28	.000	0.73	Large
6	3.8. Library e-book access, copy and print limits are frustrating	281	118.91	.000	0.65	Large
7	3.10. Searching e-books for the information I need is easy	216	158.21	.000	0.86	Large
8	3.14. Typically, I skim read Library e-books	210	205.76	.000	0.99	Large
9	3.16. Library e-books are suitable for longer reading	294	101.37	.000	0.59	Large
10	3.17. Mostly I use Library e-books for quick fact finding	210	141.19	.000	0.82	Large
11	3.18. Mostly, I only view Table of contents (TOC) pages of Library e-books	210	137.95	.000	0.81	Large
12	3.20. Finding information in e-books is difficult	295	132.37	.000	0.67	Large
13	3.21. Typically, I use unit's/subject's embedded links to access e-books	205	96.54	.000	0.69	Large
14	3.22. I use Library e-books because my friend or peer group use e-books	205	149.71	.000	0.85	Large
15	3.23. I use Library e-books on the recommendation of my lecturer/tutor	205	58.88	.000	0.54	Large
16	3.24. I use Library e-books because I have prior personal experience of using e-books	205	122.54	.000	0.77	Large
17	3.25. I use Library e-books due to convenience (anywhere, always accessibility without subject to physical book lending rules)	205	165.22	.000	0.90	Large
18	3.26. I use Library e-books due to functionality features (fulltext searching, highlighting, bookmarking, annotating, downloadability, user customisation)	205	66.98	.000	0.57	Large
19	3.27. I prefer audio version of Library e-books, where available	291	108.50	.000	0.61	Large
20	3.30. E-books and e-journals are different	291	147.20	.000	0.71	Large
21	3.12. Current Library e-book collections satisfy my needs	277	177.02	.000	0.80	Large

K.II. Frequency Bar Charts for Serial-wise 21 items of Table K1



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118
88
62
18
21
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SA
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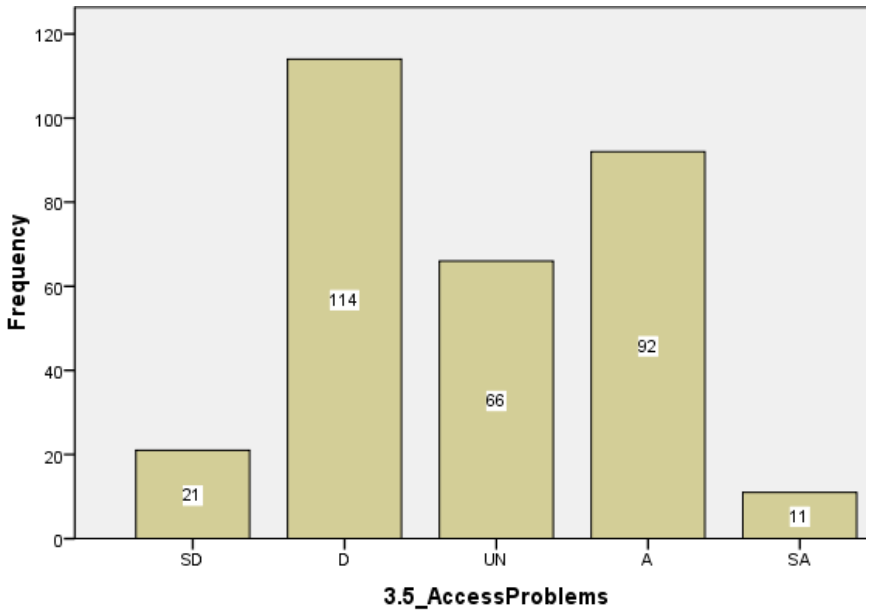
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114
66
92
21
11
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SA
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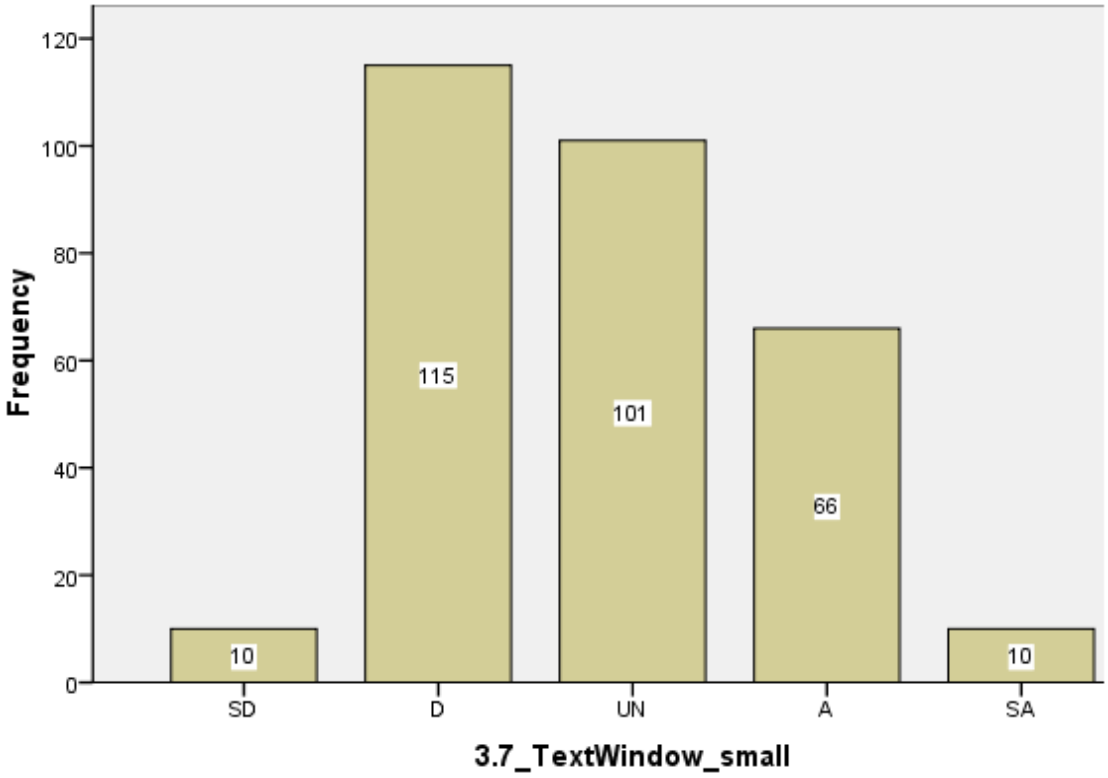
Frequency
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100
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SD
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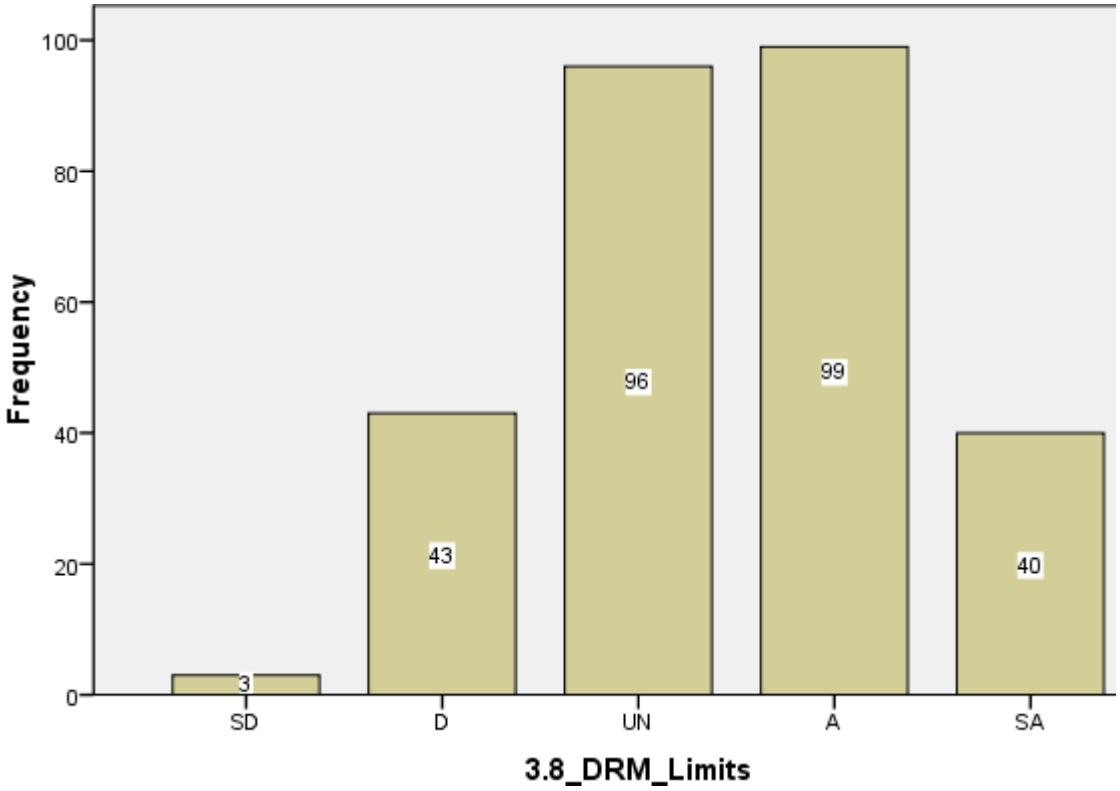
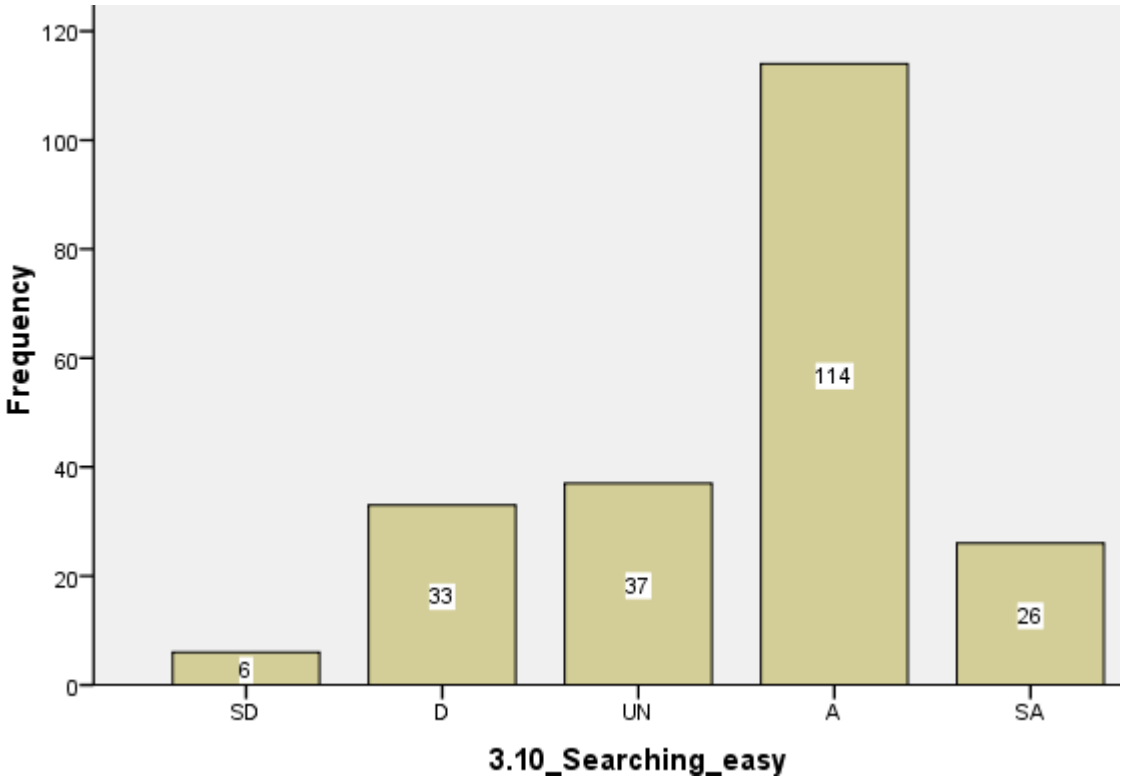
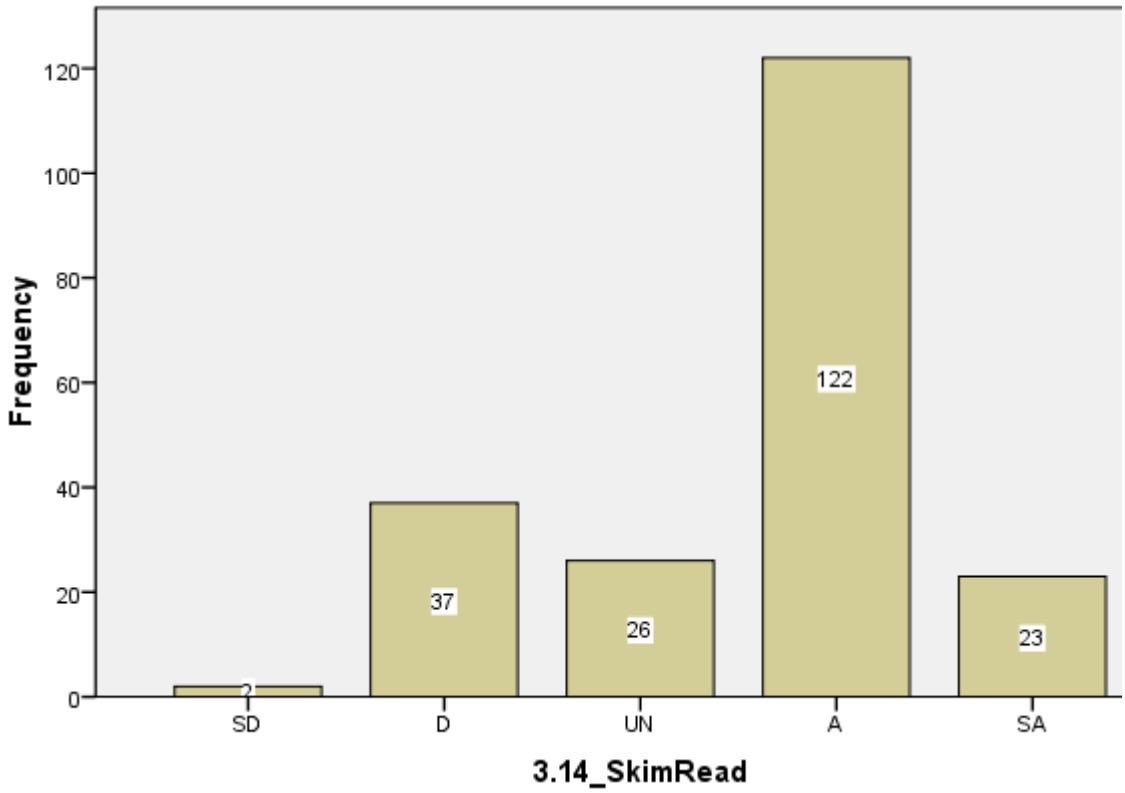
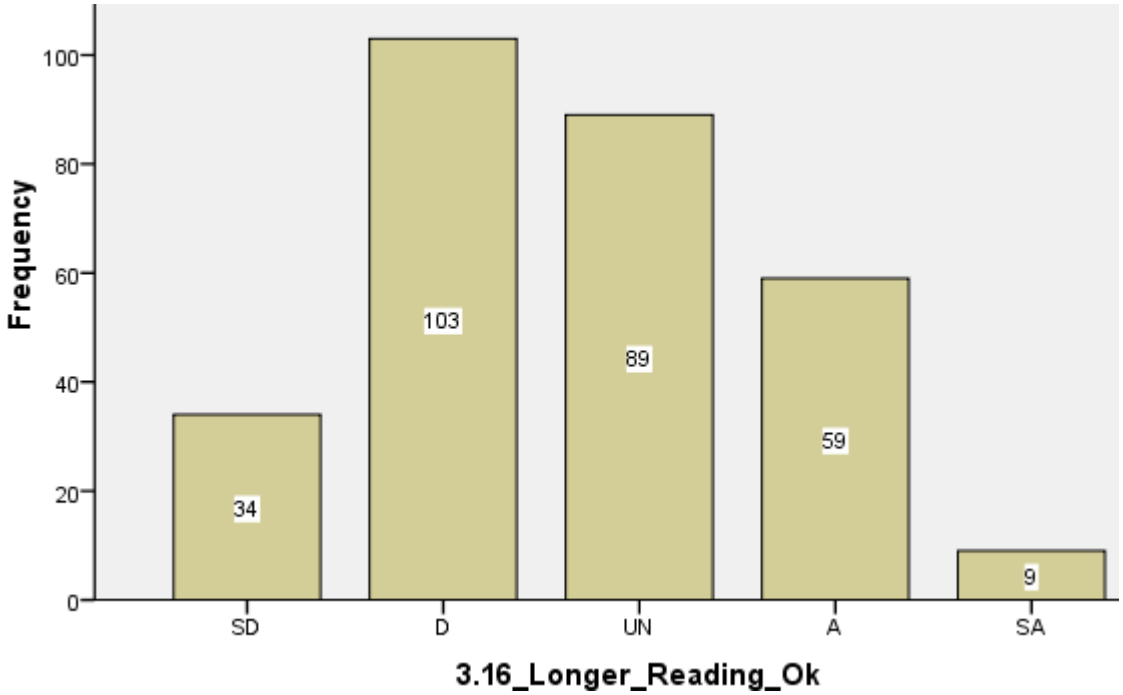
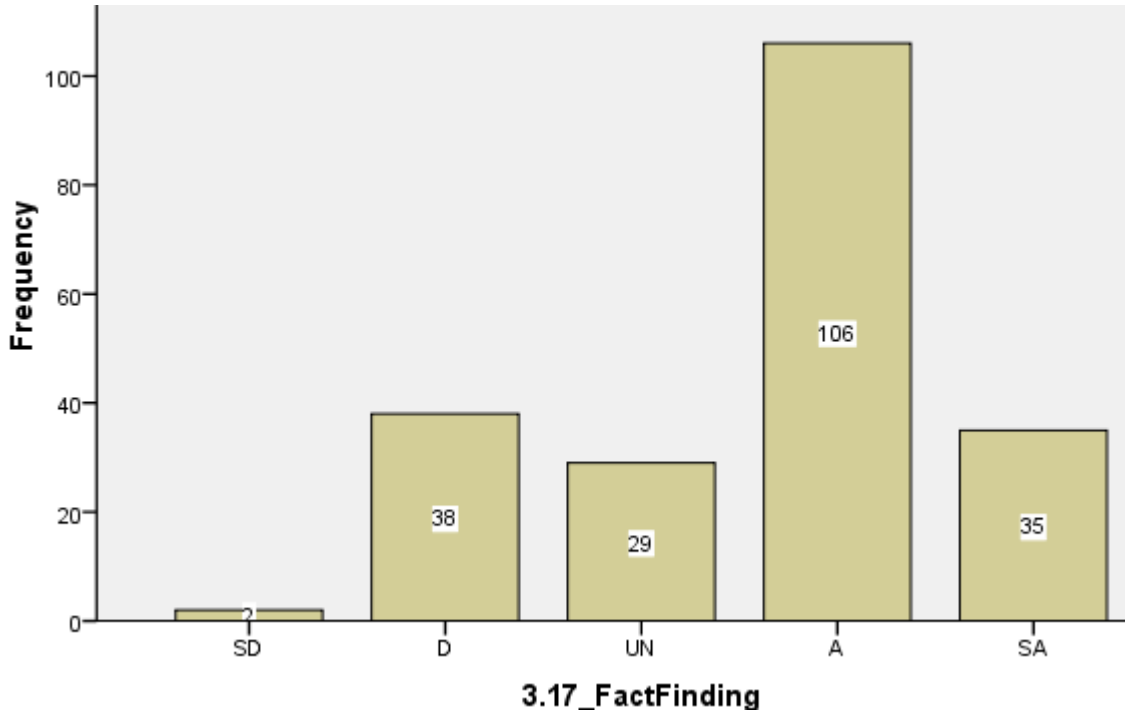
SA
3.7_TextWindow_small

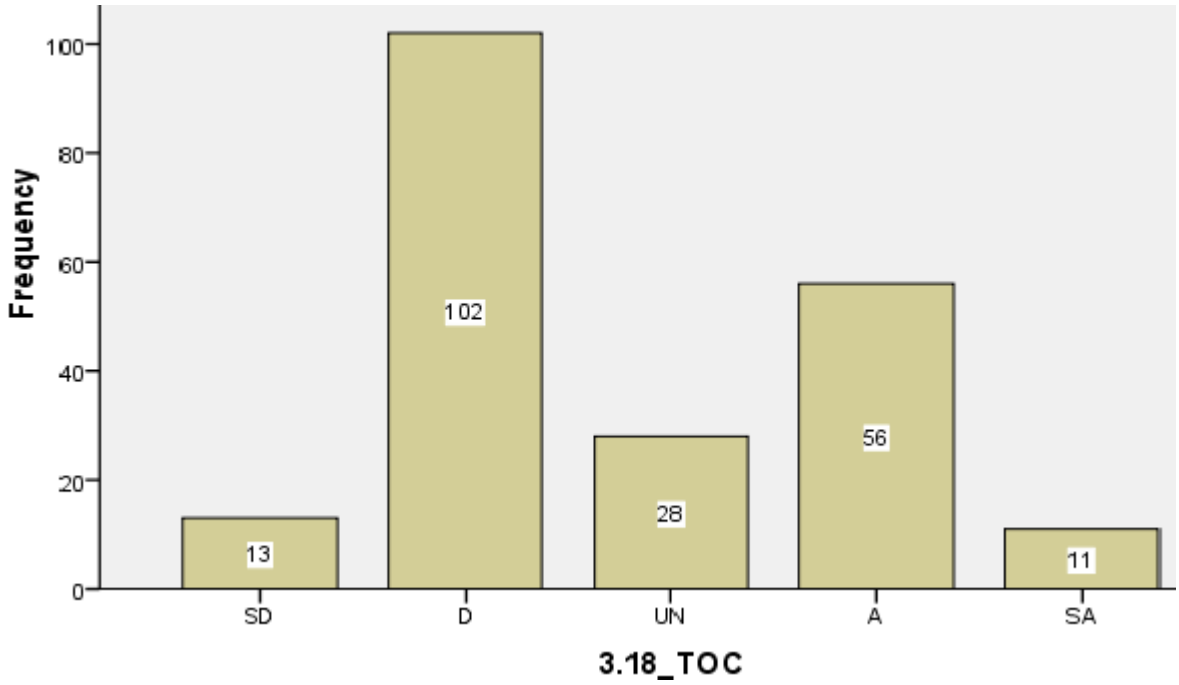

Frequency
100
80
60
40
20
0
3
43
96
99
40
SD
D
UN
A
SA
3.8_DRM_Limits

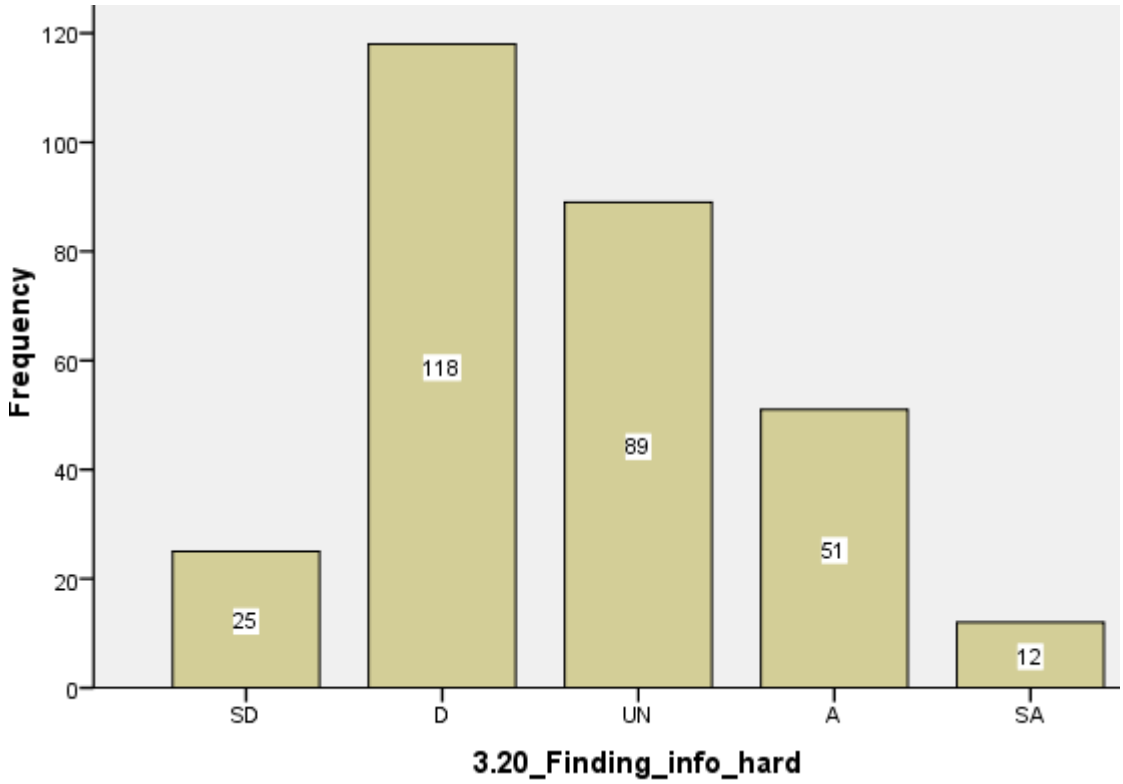

Frequency
120
100
80
60
40
20
0
6
33
37
114
26
SD
D
UN
A
SA
3.10_Searching_easy

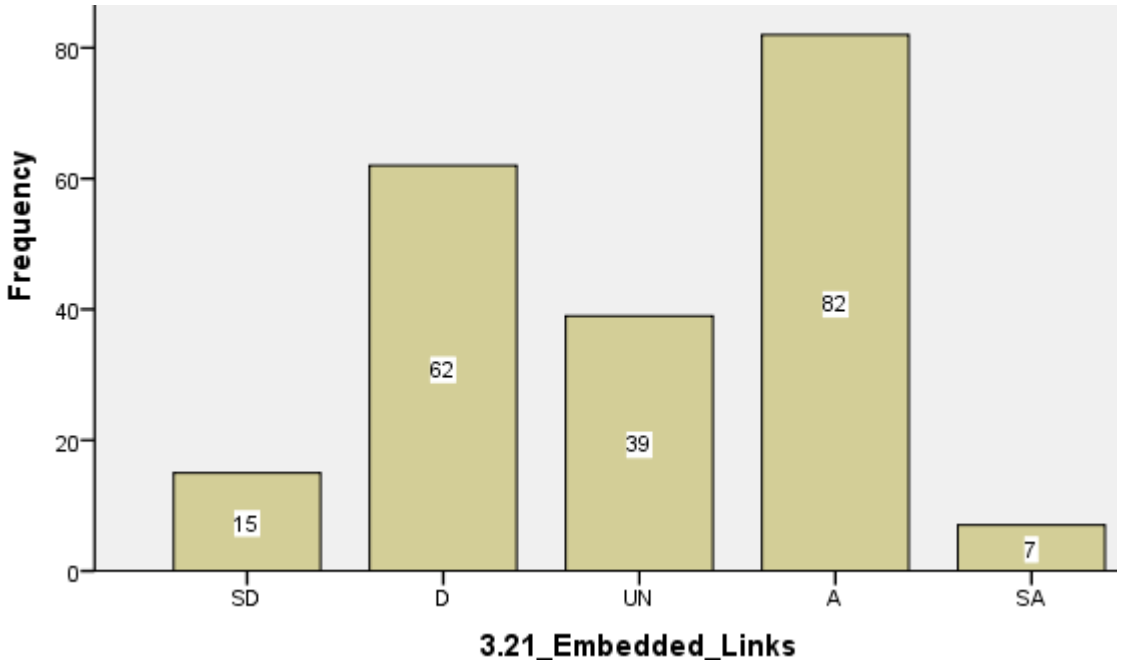

Frequency
120
100
80
60
40
20
0
2
37
26
122
23
SD
D
UN
A
SA
3.14_SkimRead

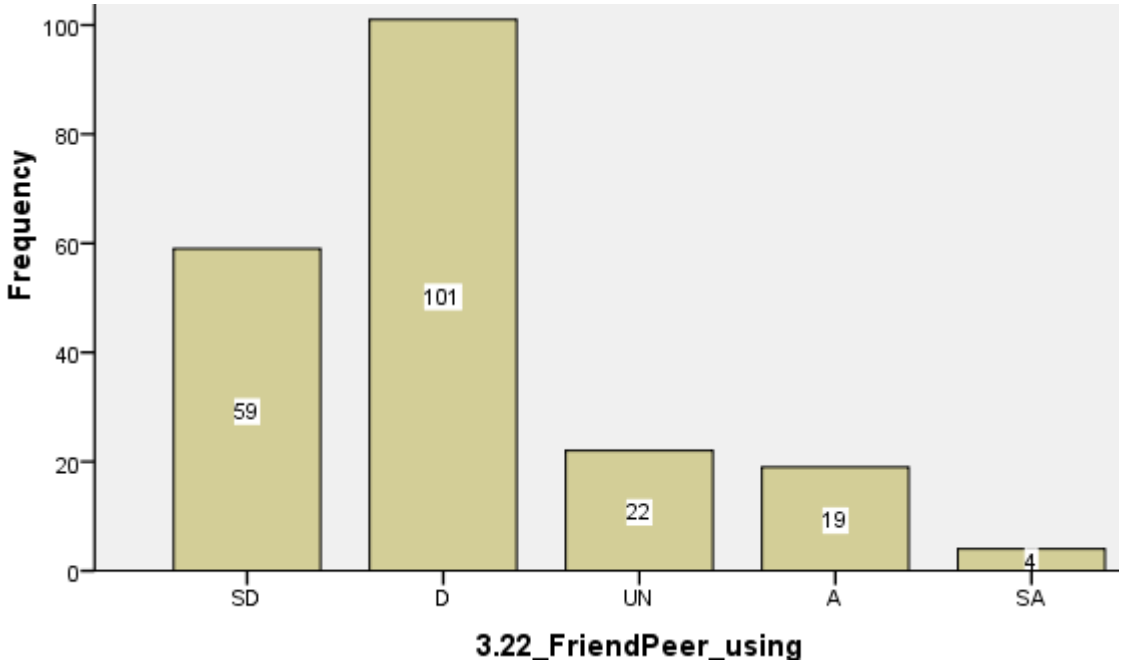

Frequency
100
80
60
40
20
0
34
103
89
59
9
SD
D
UN
A
SA
3.16_Longer_Reading_Ok

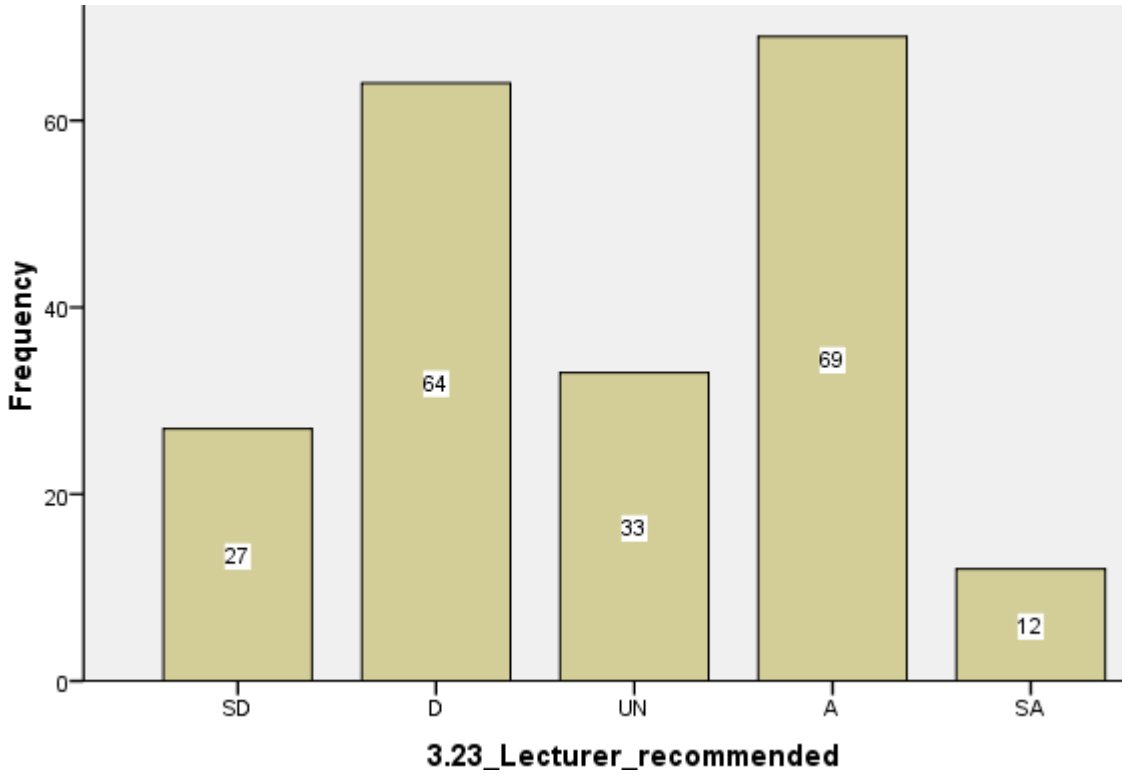

Frequency
100
80
60
40
20
0
2
38
29
106
35
SD
D
UN
A
SA
3.17_FactFinding

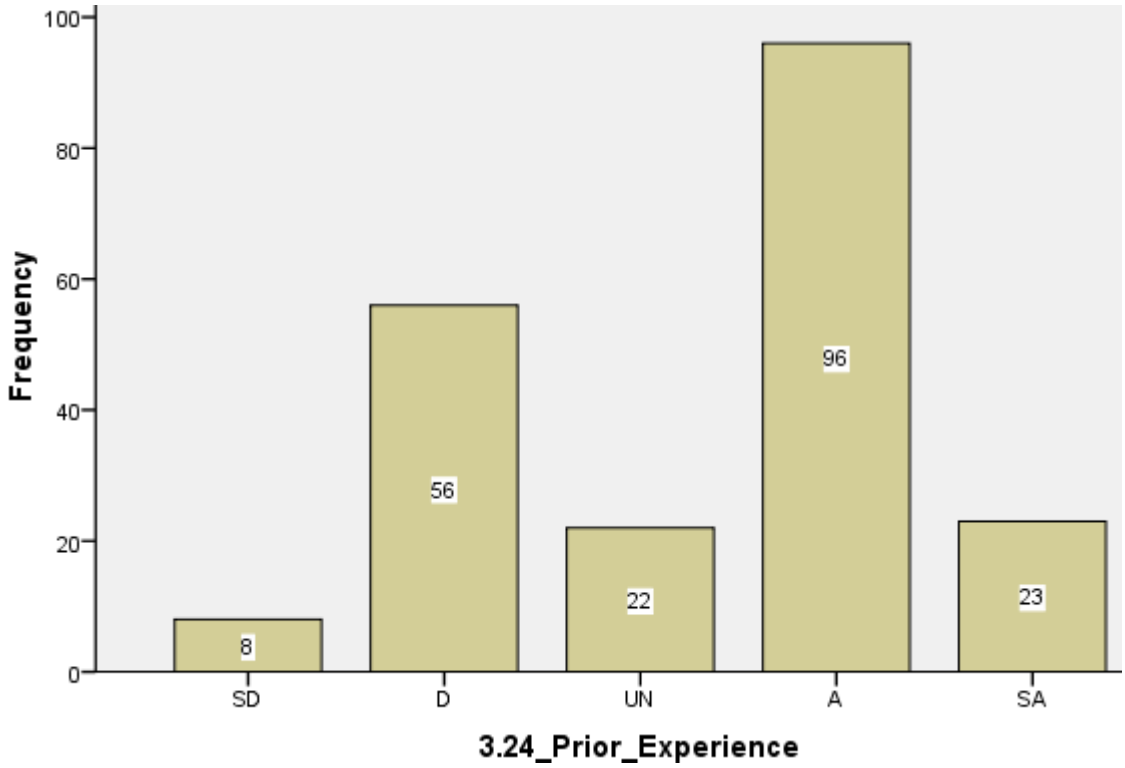

Frequency
100
80
60
40
20
0
13
102
28
56
11
SD
D
UN
A
SA
3.18_TOC

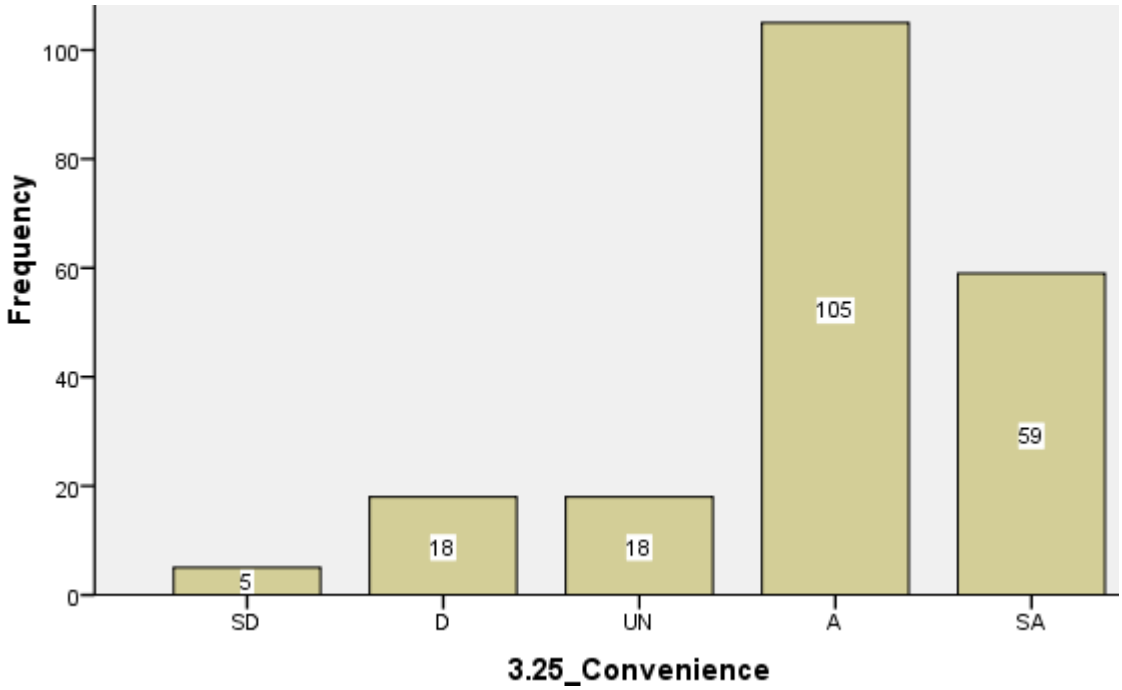

Frequency
120
100
80
60
40
20
0
25
118
89
51
12
SD
D
UN
A
SA
3.20_Finding_info_hard

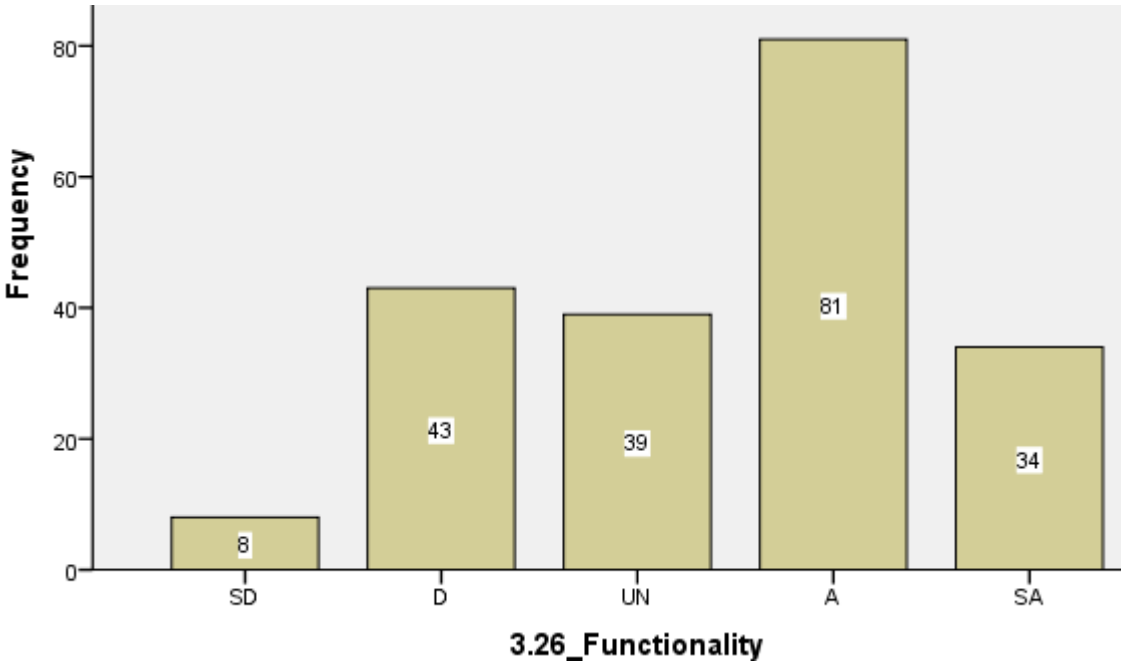

Frequency
80
60
40
20
0
15
62
39
82
7
SD
D
UN
A
SA
3.21_Embedded_Links

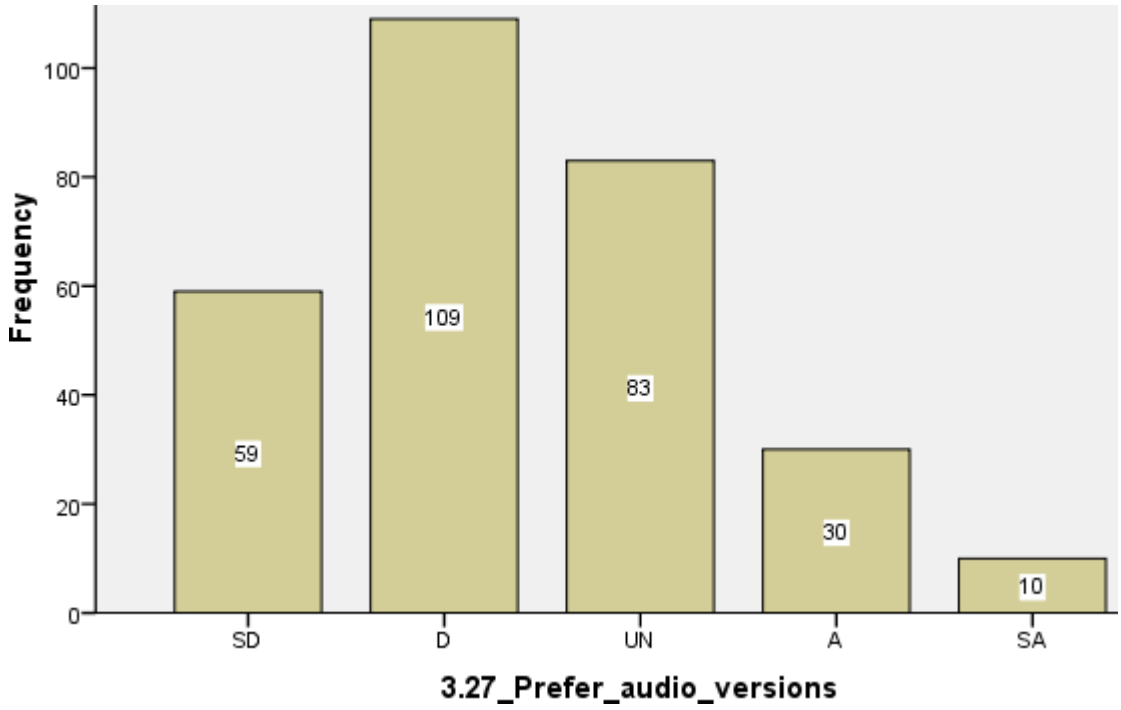

Frequency
100
80
60
40
20
0
59
101
22
19
4
SD
D
UN
A
SA
3.22_FriendPeer_using

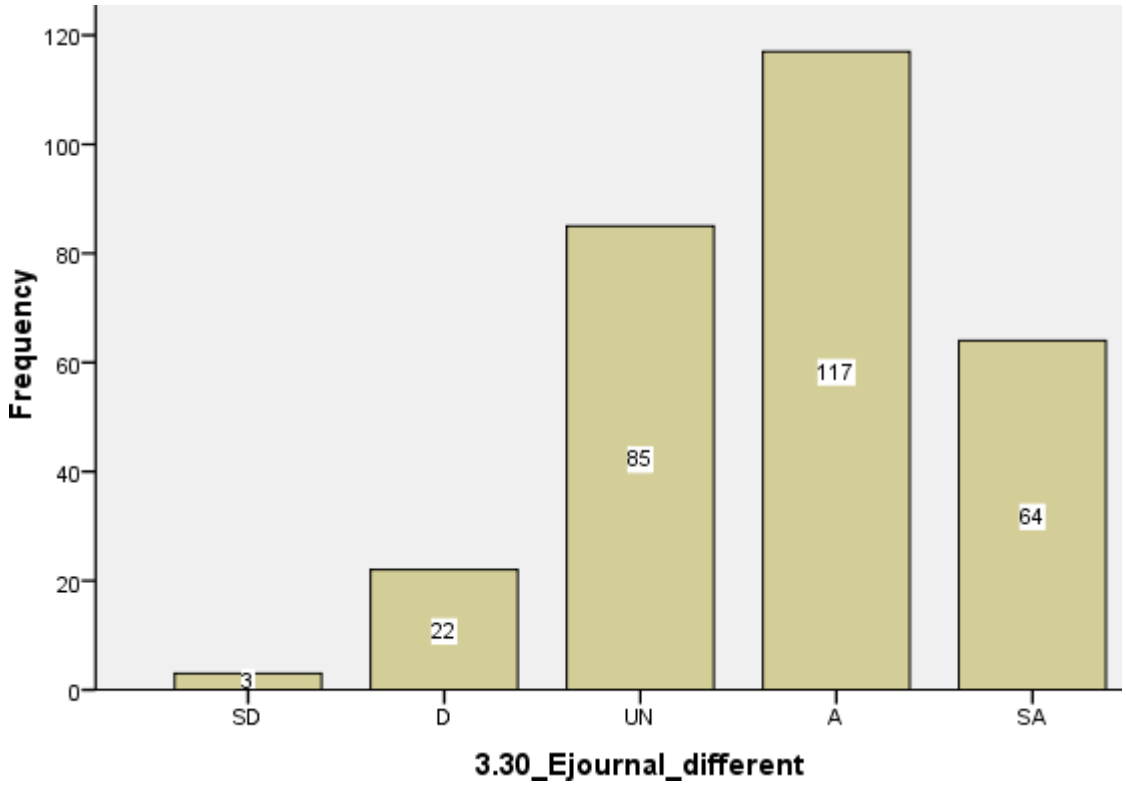

Frequency
60
40
20
0
27
64
33
69
12
SD
D
UN
A
SA
3.23_Lecturer_recommended

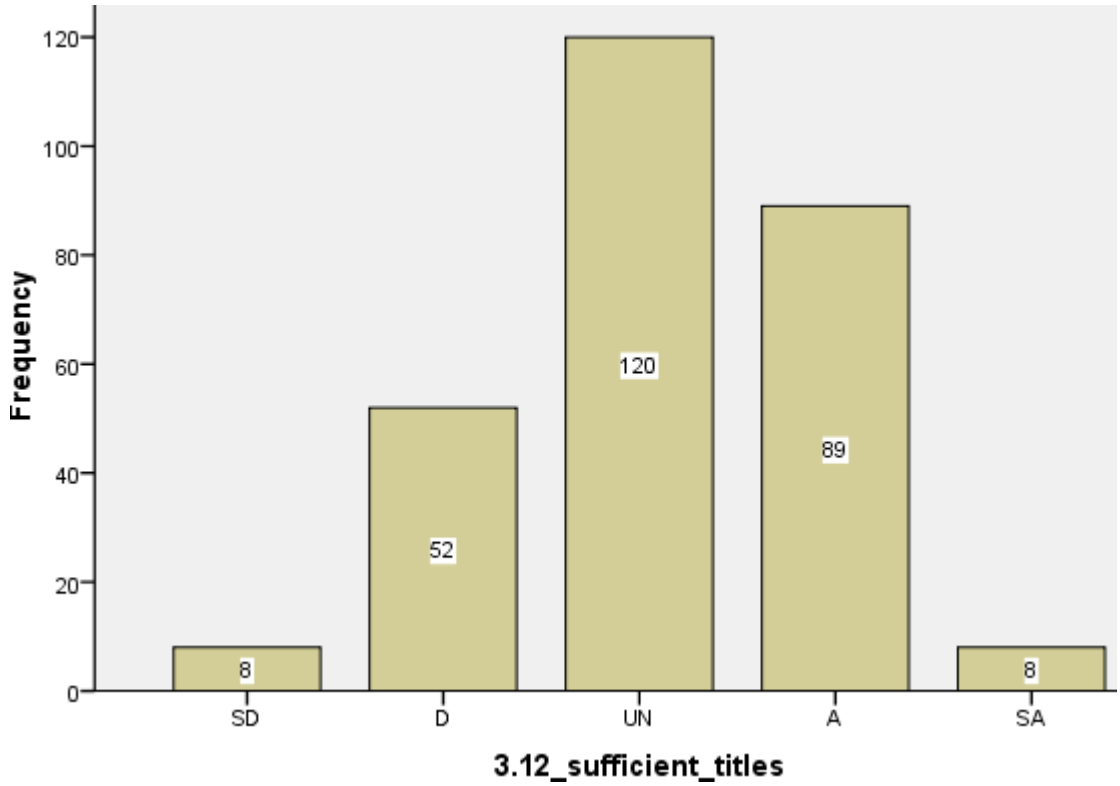

Frequency
100
80
60
40
20
0
8
56
22
96
23
SD
D
UN
A
SA
3.24_Prior_Experience


Frequency
100
80
60
40
20
0
5
18
18
105
59
SD
D
UN
A
SA
3.25_Convenience


Frequency
80
60
40
20
0
8
43
39
81
34
SD
D
UN
A
SA
3.26_Functionality


Frequency
100
80
60
40
20
0
59
109
83
30
10
SD
D
UN
A
SA
3.27_Prefer_audio_versions


Frequency
120
100
80
60
40
20
0
3
22
85
117
64
SD
D
UN
A
SA
3.30_Ejournal_different



Tables for Finding 5.10.10

Q3_17_FactFinding * Q3_16_Longer_Reading_Ok Crosstabulation

			Q3_16_Longer_Reading_Ok					Total
			SD	D	UN	A	SA	
Q3_17_FactFinding	SD	Count	1	0	0	0	1	2
		Expected Count	.3	.7	.5	.5	.1	2.0
	D	Count	3	14	8	12	1	38
		Expected Count	4.9	14.1	9.0	8.9	1.1	38.0
	UN	Count	5	5	10	9	0	29
		Expected Count	3.7	10.8	6.9	6.8	.8	29.0
	A	Count	10	47	24	25	0	106
		Expected Count	13.6	39.4	25.2	24.7	3.0	106.0
	SA	Count	8	12	8	3	4	35
		Expected Count	4.5	13.0	8.3	8.2	1.0	35.0
Total		Count	27	78	50	49	6	210
		Expected Count	27.0	78.0	50.0	49.0	6.0	210.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	99% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	48.450[a]	16	.000	.001[b]	.001	.001
Likelihood Ratio	38.508	16	.001	.001[b]	.001	.001
Fisher's Exact Test	35.606			.001[b]	.001	.001
Linear-by-Linear Association	2.627[c]	1	.105	.109[b]	.107	.112
N of Valid Cases	210					

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .06.

b. Based on 100000 sampled tables with starting seed 79654295.

c. The standardized statistic is -1.621.

Symmetric Measures

		Value	Approx. Sig.	Monte Carlo Sig.		
				Sig.	99% Confidence Interval	
					Lower Bound	Upper Bound
Nominal by Nominal	Phi	.480	.000	.001[a]	.001	.001
	Cramer's V	.240	.000	.001[a]	.001	.001
N of Valid Cases		210				

a. Based on 100000 sampled tables with starting seed 79654295.

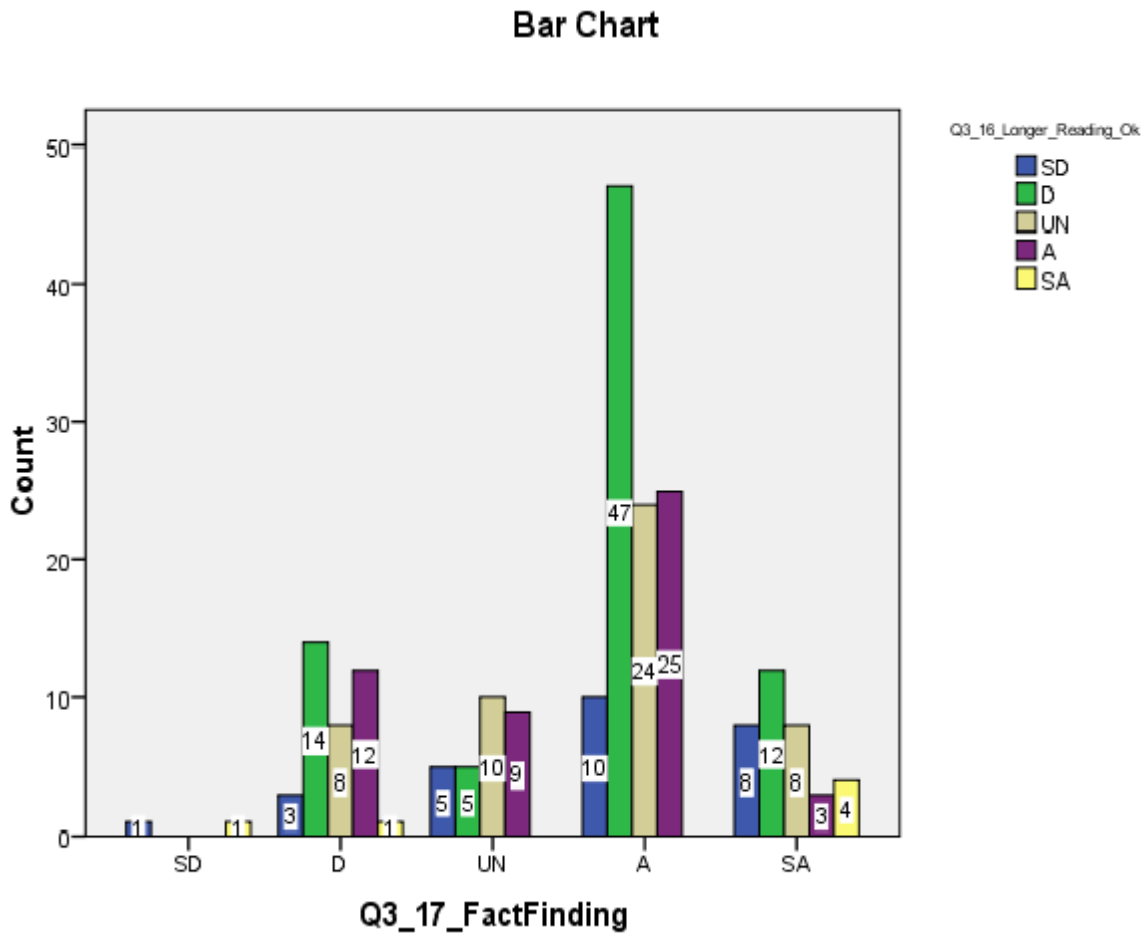


Table for Finding 5.10.16

Q3_24_Prior_Experience * Q3_1_Awareness Crosstabulation

			Q3_1_Awareness					Total
			SD	D	U	A	SA	
Q3_24_Prior_Experience	SD	Count	1	0	0	1	6	8
		Expected Count	.2	.2	.4	3.3	4.0	8.0
	D	Count	1	1	3	28	23	56
		Expected Count	1.4	1.1	2.7	23.1	27.7	56.0
	UN	Count	1	0	6	8	6	21
		Expected Count	.5	.4	1.0	8.6	10.4	21.0
	A	Count	1	3	1	42	49	96
		Expected Count	2.4	1.9	4.7	39.5	47.5	96.0
	SA	Count	1	0	0	5	17	23
		Expected Count	.6	.5	1.1	9.5	11.4	23.0
Total		Count	5	4	10	84	101	204
		Expected Count	5.0	4.0	10.0	84.0	101.0	204.0

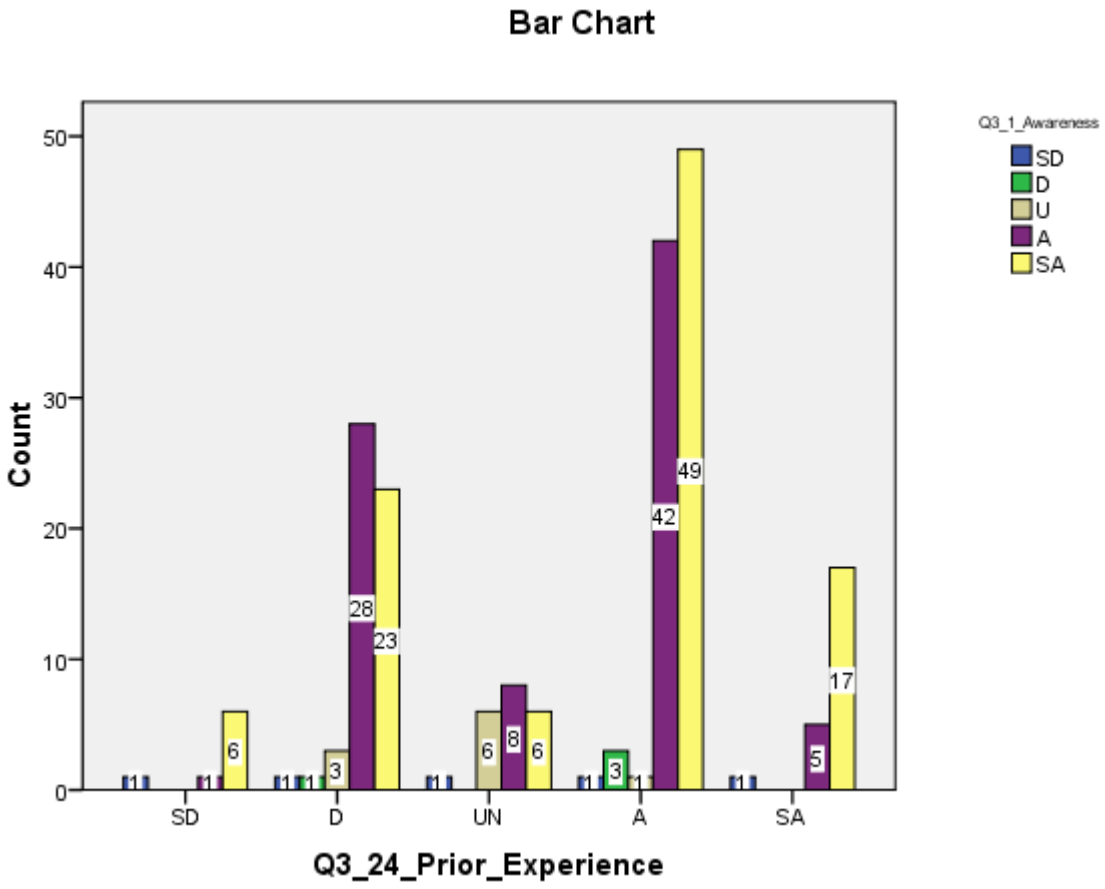
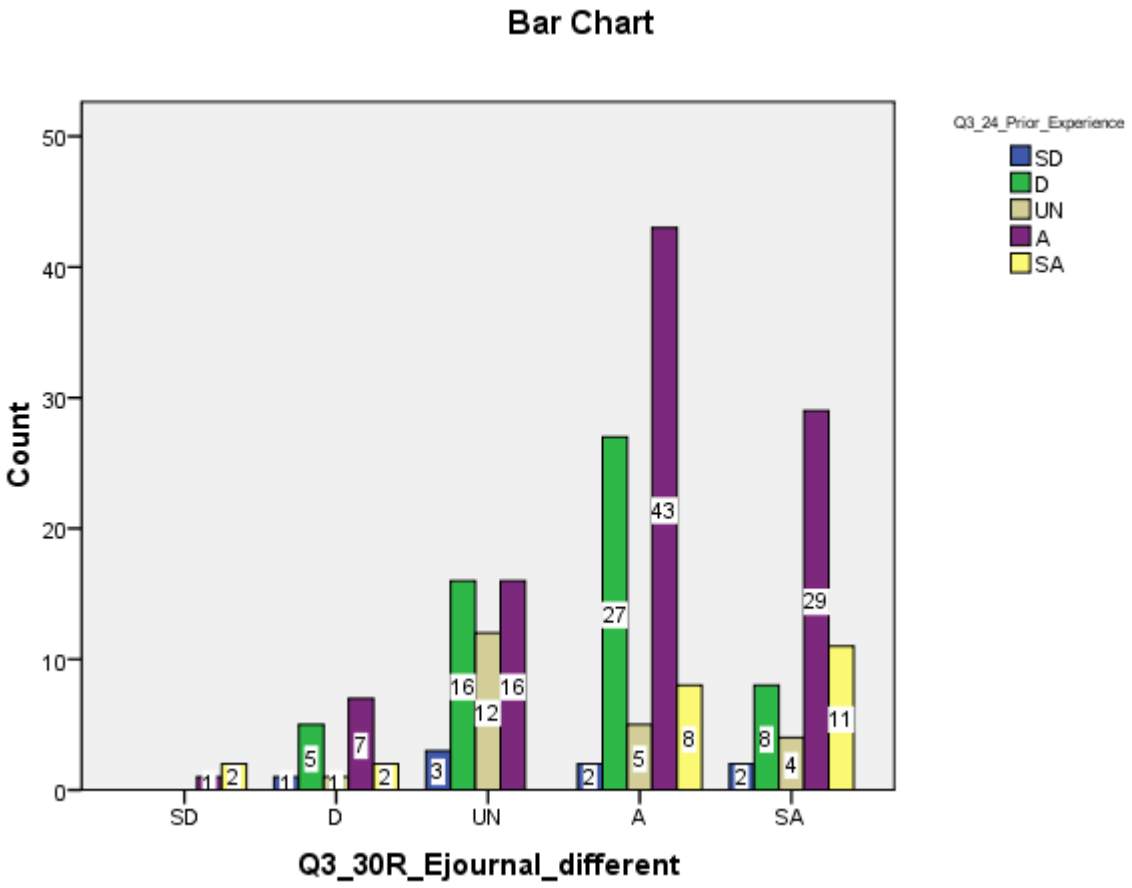


Table for Finding 5.10.20

Q3_30_Ejournal_different * Q3_24_Prior_Experience Crosstabulation

			Q3_24_Prior_Experience					Total
			SD	D	UN	A	SA	
Q3_30_Ejournal_different	SD	Count	0	0	0	1	2	3
		Expected Count	.1	.8	.3	1.4	.3	3.0
	D	Count	1	5	1	7	2	16
		Expected Count	.6	4.4	1.7	7.5	1.8	16.0
	UN	Count	3	16	12	16	0	47
		Expected Count	1.8	12.8	5.0	22.0	5.3	47.0
	A	Count	2	27	5	43	8	85
		Expected Count	3.3	23.2	9.1	39.8	9.5	85.0
	SA	Count	2	8	4	29	11	54
		Expected Count	2.1	14.8	5.8	25.3	6.1	54.0
Total		Count	8	56	22	96	23	205
		Expected Count	8.0	56.0	22.0	96.0	23.0	205.0



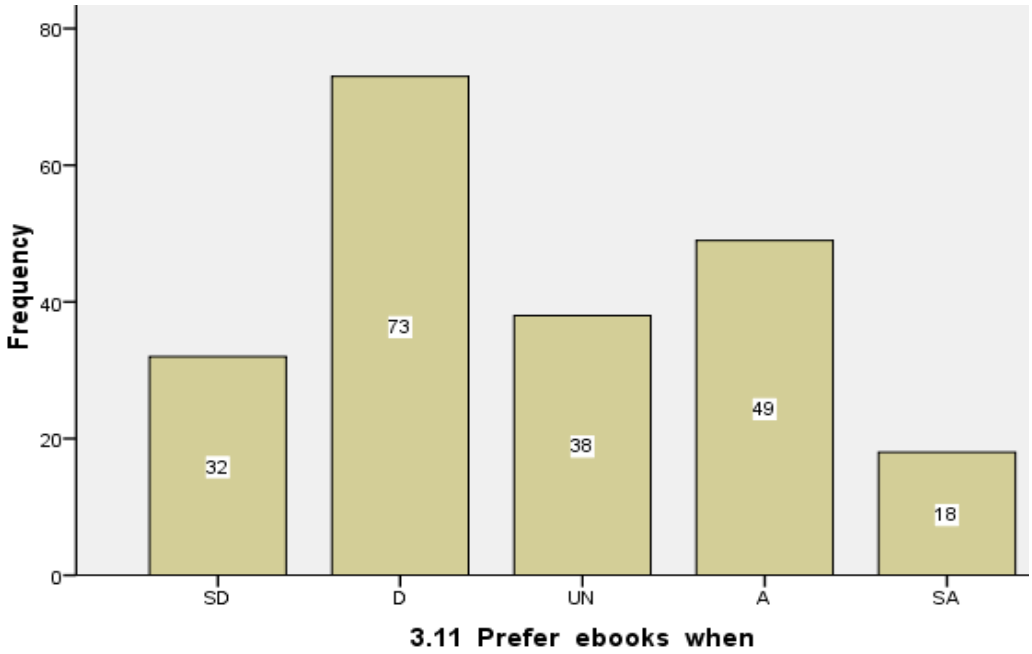
Appendix L: Preference for Format (Thesis Section 5.2.9.1)

(Survey items 3.2, 3.11, 3.15, and 3.2 vs. 3.16)

Table L1. Preference for Format: Goodness of Fit

Items (3.2, 3.11, and 3.15 of questionnaire)	**n**	χ^2	***p***	**Effect size *w***
3.2. I prefer hard copy books to e-books	273	41.85	.000	0.39, medium
3.11. I prefer Library e-books to physical books when both are available	210	40.52	.000	0.44, medium
3.15. I use Library e-books when their physical counterparts are not available	209	160.45	.000	0.88, large

Frequency bar charts of items in Table L1 (frequency distribution of item 3.2 is given in Section 5.2.9.1)



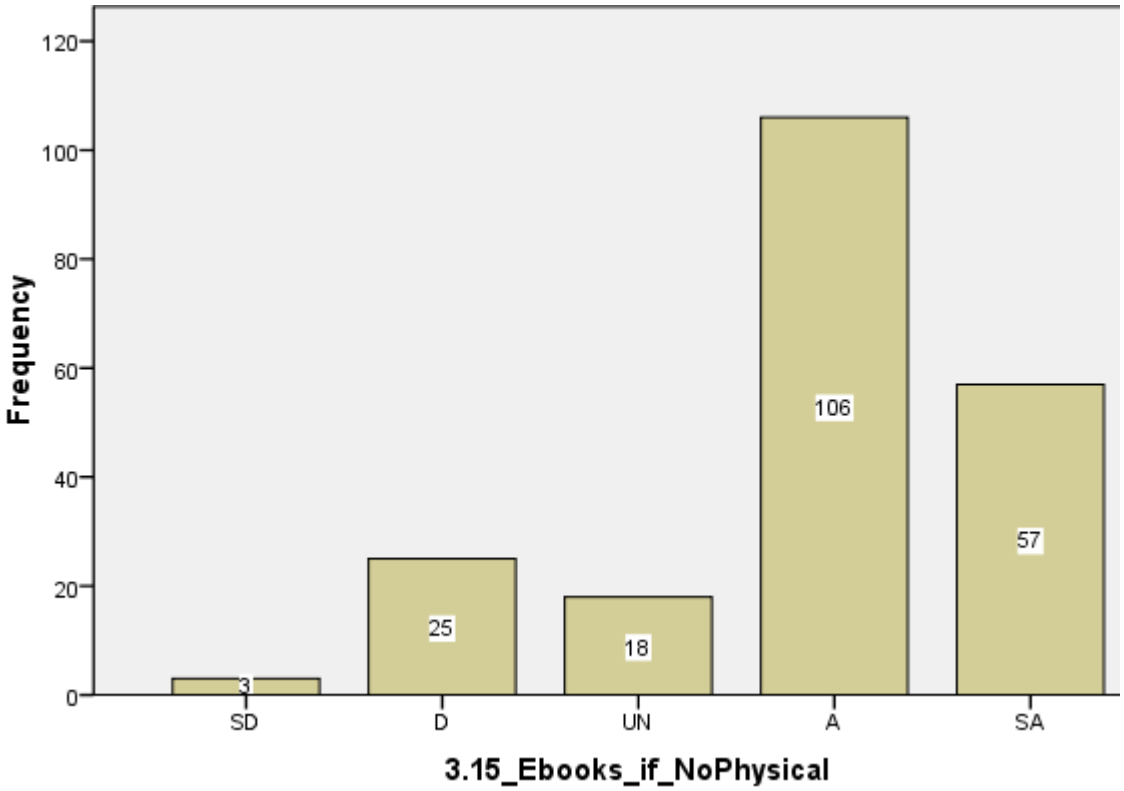


Table for Finding 5.11.2

3.2_prefer_hardcopy * 3.16_Longer_Reading_Ok Crosstabulation

			3.16_Longer_Reading_Ok					Total
			SD	D	UN	A	SA	
3.2_prefer_hardcopy	SD	Count	2	2	5	2	3	14
		Expected Count	1.7	4.9	3.9	3.1	.4	14.0
	D	Count	0	16	14	23	3	56
		Expected Count	6.8	19.5	15.6	12.4	1.7	56.0
	UN	Count	5	19	22	13	0	59
		Expected Count	7.2	20.5	16.4	13.1	1.8	59.0
	A	Count	7	34	17	13	1	72
		Expected Count	8.8	25.0	20.1	15.9	2.2	72.0
	SA	Count	18	20	15	7	1	61
		Expected Count	7.5	21.2	17.0	13.5	1.9	61.0
Total		Count	32	91	73	58	8	262
		Expected Count	32.0	91.0	73.0	58.0	8.0	262.0

Appendix M: User Perception of ECU E-books and Demography (Thesis Section 5.2.9.2)

(Survey items 3.1-3.30 vs. items 7.1 -7.5): Crosstabulation

M.I. Pearson Chi-square Test Results (13 tests)

Table M1. Relationship between Demographics and Perception of ECU E-books

Sr	Demographics	Perception	Chi-square statistics				
			n	df	χ^2	*P (MC)*	Effect Size ϕ
1	Age (Q7.4)	Awareness (Q3.1)	157	8	25.66	.001	.40, medium
	When controlled for respondent category (Q7.1)		136	8	20.92	.005	.39, medium
	When controlled for gender (Q7.3)		73	8	28.88	.000	.63, large
2	Years at ECU (Q7.5)	Access, copy and print limits (Q3.8)	256	16	36.13	.006	.38, medium
	When controlled for student programme of study (Q7.1.2)		122	12	30.66	.008	.50, large
3	Programme of student study Q7.1.2)	Current Library e-book collections sufficiency (Q3.12)	207	8	21.97	.006	.33, medium
4	Years at ECU (Q7.5)	Typically, skim reading (Q3.14)	196	16	35.09	.010	.42, medium
	When controlled for student programme of study (Q7.1.2)		86	12	97.46	.001	1.06, large
5	Respondent category (Q7.1)	Embedded links (Q3.21)	199	8	22.14	.007	.33, medium
5	Programme of student study Q7.1.2)	Embedded links (Q3.21)	156	8	22.10	.006	.38, medium
5	Programme of student study Q7.1.2)	Social influence (Q3.22)	156	8	22.16	.009	.38, medium
5	Programme of student study Q7.1.2)	Recommendation of lecturer/tutor (Q3.23)	156	8	30.76	.000	.44, medium
6	Programme of student study Q7.1.2)	Prior personal experience of using e-books (Q3.24)	156	8	20.92	.008	.37, medium

M.II. Contingency Data for Table M1

Q3_1_Awareness * Q06_Age Crosstabulation

			Q06_Age			Total
			18-24	25-33	34-42	
Q3_1_Awareness	SD	Count	0	1	2	3
		Expected Count	1.4	.8	.9	3.0
	D	Count	3	1	0	4
		Expected Count	1.8	1.0	1.1	4.0
	U	Count	7	0	1	8
		Expected Count	3.7	2.0	2.3	8.0
	A	Count	40	19	11	70
		Expected Count	32.1	17.8	20.1	70.0
	SA	Count	22	19	31	72
		Expected Count	33.0	18.3	20.6	72.0
Total		Count	72	40	45	157
		Expected Count	72.0	40.0	45.0	157.0

When controlled for respondent category (Q7.1)

Q3_1_Awareness * Q06_Age * Q01_ResCat Crosstabulation

				Q06_Age			
Q01_ResCat				18-24	25-33	34-42	Total
STUDENT	Q3_1_Awareness	SD	Count	0	1	2	3
			Expected Count	1.6	.8	.7	3.0
		D	Count	3	1	0	4
			Expected Count	2.1	1.0	.9	4.0
		U	Count	7	0	1	8
			Expected Count	4.2	2.1	1.8	8.0
		A	Count	39	17	7	63
			Expected Count	32.9	16.2	13.9	63.0
		SA	Count	22	16	20	58
			Expected Count	30.3	14.9	12.8	58.0
	Total		Count	71	35	30	136
			Expected Count	71.0	35.0	30.0	136.0

When controlled for gender (Q7.3)

Q3_1_Awareness * Q06_Age * Q05_Gender Crosstabulation

Q05_Gender				Q06_Age 18-24	25-33	34-42	Total
MALE	Q3_1_Awareness	SD	Count	0	1	0	1
			Expected Count	.5	.2	.3	1.0
		D	Count	2	1	0	3
			Expected Count	1.5	.7	.8	3.0
		U	Count	5	0	1	6
			Expected Count	3.0	1.4	1.6	6.0
		A	Count	24	11	3	38
			Expected Count	19.3	8.8	9.9	38.0
		SA	Count	6	4	15	25
			Expected Count	12.7	5.8	6.5	25.0
	Total		Count	37	17	19	73
			Expected Count	37.0	17.0	19.0	73.0

Q3_8_DRM_Limits * Q07_Years Crosstabulation

			Q07_Years <1	1-2	3-5	6-9	10+	Total
Q3_8_DRM_Limits	SD	Count	1	0	1	0	0	2
		Expected Count	.7	.4	.6	.1	.2	2.0
	D	Count	19	10	7	2	3	41
		Expected Count	14.3	8.5	12.0	2.7	3.5	41.0
	UN	Count	42	15	13	8	7	85
		Expected Count	29.6	17.6	24.9	5.6	7.3	85.0
	A	Count	15	22	40	4	8	89
		Expected Count	30.9	18.4	26.1	5.9	7.6	89.0
	SA	Count	12	6	14	3	4	39
		Expected Count	13.6	8.1	11.4	2.6	3.4	39.0
Total		Count	89	53	75	17	22	256
		Expected Count	89.0	53.0	75.0	17.0	22.0	256.0

When controlled for student programme of study (Q7.1.2)

Q3_8_DRM_Limits * Q07_Years * Q03_Program Crosstabulation

Q03_Program				Q07_Years <1	1-2	3-5	6-9	10+	Total
UNDERGRAD	Q3_8_DRM Limits	SD	Count	1	0	0	0		1
			Expected Count	.5	.2	.3	.0		1.0
		D	Count	11	4	4	1		20
			Expected Count	9.0	4.1	6.7	.2		20.0
		UN	Count	31	9	10	0		50
			Expected Count	22.5	10.2	16.8	.4		50.0
		A	Count	5	11	19	0		35
			Expected Count	15.8	7.2	11.8	.3		35.0
		SA	Count	7	1	8	0		16
			Expected Count	7.2	3.3	5.4	.1		16.0
	Total		Count	55	25	41	1		122
			Expected Count	55.0	25.0	41.0	1.0		122.0

Q3_12_sufficient_titles * Q03_Program Crosstabulation

			Q03_Program UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	Total
Q3_12_sufficient_titles	SD	Count	2	2	2	6
		Expected Count	3.5	1.7	.7	6.0
	D	Count	17	14	8	39
		Expected Count	23.0	11.3	4.7	39.0
	UN	Count	63	18	10	91
		Expected Count	53.6	26.4	11.0	91.0
	A	Count	40	22	4	66
		Expected Count	38.9	19.1	8.0	66.0
	SA	Count	0	4	1	5
		Expected Count	2.9	1.4	.6	5.0
Total		Count	122	60	25	207
		Expected Count	122.0	60.0	25.0	207.0

Q3_14_SkimRead * Q07_Years Crosstabulation

			Q07_Years					Total
			<1	1-2	3-5	6-9	10+	
Q3_14_SkimRead	SD	Count	0	0	0	1	0	1
		Expected Count	.3	.2	.3	.1	.1	1.0
	D	Count	14	5	11	2	3	35
		Expected Count	10.5	7.9	11.6	1.8	3.2	35.0
	UN	Count	8	7	2	0	5	22
		Expected Count	6.6	4.9	7.3	1.1	2.0	22.0
	A	Count	32	26	44	7	8	117
		Expected Count	35.2	26.3	38.8	6.0	10.7	117.0
	SA	Count	5	6	8	0	2	21
		Expected Count	6.3	4.7	7.0	1.1	1.9	21.0
Total		Count	59	44	65	10	18	196
		Expected Count	59.0	44.0	65.0	10.0	18.0	196.0

When controlled for student programme of study (Q7.1.2)

Q3_14_SkimRead * Q07_Years * Q03_Program Crosstabulation

				Q07_Years					
Q03_Program				<1	1-2	3-5	6-9	10+	Total
UNDERGRAD	Q3_14_SkimRead	SD	Count	0	0	0	1		1
			Expected Count	.4	.2	.4	.0		1.0
		D	Count	9	1	7	0		17
			Expected Count	6.3	3.8	6.7	.2		17.0
		UN	Count	4	3	0	0		7
			Expected Count	2.6	1.5	2.8	.1		7.0
		A	Count	15	14	25	0		54
			Expected Count	20.1	11.9	21.3	.6		54.0
		SA	Count	4	1	2	0		7
			Expected Count	2.6	1.5	2.8	.1		7.0
	Total		Count	32	19	34	1		86
			Expected Count	32.0	19.0	34.0	1.0		86.0

Q3_21_Embedded_Links * Q01_Demographic_ResCat Crosstabulation						
			Q01_Demographic_ResCat			Total
			ACADEMIC	STUDENT	GENERAL STAFF	
Q3_21_Embedded_Links	SD	Count	2	9	3	14
		Expected Count	1.3	11.2	1.5	14.0
	D	Count	9	40	11	60
		Expected Count	5.7	47.9	6.3	60.0
	UN	Count	4	28	6	38
		Expected Count	3.6	30.4	4.0	38.0
	A	Count	4	75	1	80
		Expected Count	7.6	63.9	8.4	80.0
	SA	Count	0	7	0	7
		Expected Count	.7	5.6	.7	7.0
Total		Count	19	159	21	199
		Expected Count	19.0	159.0	21.0	199.0

Q3_21_Embedded_Links * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/HDR	
Q3_21_Embedded_Links	SD	Count	3	4	2	9
		Expected Count	5.0	3.1	.9	9.0
	D	Count	21	16	3	40
		Expected Count	22.3	13.6	4.1	40.0
	UN	Count	9	9	8	26
		Expected Count	14.5	8.8	2.7	26.0
	A	Count	50	21	3	74
		Expected Count	41.3	25.1	7.6	74.0
	SA	Count	4	3	0	7
		Expected Count	3.9	2.4	.7	7.0
Total		Count	87	53	16	156
		Expected Count	87.0	53.0	16.0	156.0

Q3_22_Friend_using * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q3_22_Friend_using	SD	Count	20	19	7	46
		Expected Count	25.7	15.6	4.7	46.0
	D	Count	36	30	9	75
		Expected Count	41.8	25.5	7.7	75.0
	UN	Count	16	1	0	17
		Expected Count	9.5	5.8	1.7	17.0
	A	Count	14	2	0	16
		Expected Count	8.9	5.4	1.6	16.0
	SA	Count	1	1	0	2
		Expected Count	1.1	.7	.2	2.0
Total		Count	87	53	16	156
		Expected Count	87.0	53.0	16.0	156.0

Q3_23_Lecturer_recommended * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q3_23_Lecturer_recommended	SD	Count	5	9	6	20
		Expected Count	11.2	6.8	2.1	20.0
	D	Count	18	18	8	44
		Expected Count	24.5	14.9	4.5	44.0
	UN	Count	19	4	0	23
		Expected Count	12.8	7.8	2.4	23.0
	A	Count	35	20	2	57
		Expected Count	31.8	19.4	5.8	57.0
	SA	Count	10	2	0	12
		Expected Count	6.7	4.1	1.2	12.0
Total		Count	87	53	16	156
		Expected Count	87.0	53.0	16.0	156.0

Q3_24_Prior_Experience * Q03_Program Crosstabulation

			Q03_Program			Total
			UNDERGRAD	POSTGRAD COURSEWORK	HONORS/ HDR	
Q3_24_Prior_Experience	SD	Count	1	6	1	8
		Expected Count	4.5	2.7	.8	8.0
	D	Count	23	16	3	42
		Expected Count	23.4	14.3	4.3	42.0
	UN	Count	11	4	0	15
		Expected Count	8.4	5.1	1.5	15.0
	A	Count	45	21	6	72
		Expected Count	40.2	24.5	7.4	72.0
	SA	Count	7	6	6	19
		Expected Count	10.6	6.5	1.9	19.0
Total		Count	87	53	16	156
		Expected Count	87.0	53.0	16.0	156.0

Appendix N: Use of Electronic Resources/Platforms vs. User Perception (Thesis Section 5.2.9.3)

Table 5.10 (survey items 4a.1-4a.9 and items 3.1-3.30): Contingency Tables

Q3_1_Awareness * Q4a1_Frequency_PC Crosstabulation

			Q4a1_Frequency_PC					Total
			NEVER	2	3	4	OFTEN	
Q3_1_Awareness	SD	Count	2	1	0	1	1	5
		Expected Count	.9	.7	.6	.7	2.2	5.0
	D	Count	1	1	1	0	1	4
		Expected Count	.7	.6	.5	.5	1.7	4.0
	U	Count	1	4	2	2	0	9
		Expected Count	1.6	1.3	1.0	1.2	3.9	9.0
	A	Count	8	15	11	18	31	83
		Expected Count	14.4	12.3	9.5	11.1	35.7	83.0
	SA	Count	23	9	9	6	54	101
		Expected Count	17.5	15.0	11.5	13.5	43.5	101.0
Total		Count	35	30	23	27	87	202
		Expected Count	35.0	30.0	23.0	27.0	87.0	202.0

Q3_3_Lib_interface_easy * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_3_Lib_interface_easy	SD	Count	4	0	0	1	0	5
		Expected Count	.8	1.2	1.4	1.0	.6	5.0
	D	Count	7	2	11	4	4	28
		Expected Count	4.7	6.9	7.8	5.5	3.1	28.0
	UN	Count	19	20	19	12	4	74
		Expected Count	12.4	18.3	20.5	14.6	8.2	74.0
	A	Count	12	35	34	27	18	126
		Expected Count	21.1	31.1	35.0	24.9	13.9	126.0
	SA	Count	2	8	9	8	3	30
		Expected Count	5.0	7.4	8.3	5.9	3.3	30.0
Total		Count	44	65	73	52	29	263
		Expected Count	44.0	65.0	73.0	52.0	29.0	263.0

Q3_5_Access_problems * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_5_Access_ Problems	SD	Count	5	4	5	4	2	20
		Expected Count	3.7	4.7	5.6	3.9	2.2	20.0
	D	Count	13	26	38	22	10	109
		Expected Count	20.1	25.4	30.4	21.3	11.8	109.0
	UN	Count	21	20	12	4	4	61
		Expected Count	11.3	14.2	17.0	11.9	6.6	61.0
	A	Count	9	17	22	24	14	86
		Expected Count	15.9	20.1	24.0	16.8	9.3	86.0
	SA	Count	5	0	3	2	1	11
		Expected Count	2.0	2.6	3.1	2.1	1.2	11.0
Total		Count	53	67	80	56	31	287
		Expected Count	53.0	67.0	80.0	56.0	31.0	287.0

Q3_7_textWindow_small * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_7_textWindow_ small	SD	Count	3	1	3	1	0	8
		Expected Count	1.5	1.9	2.2	1.5	.9	8.0
	D	Count	10	22	35	28	13	108
		Expected Count	20.1	25.4	29.9	20.8	11.7	108.0
	UN	Count	31	28	20	10	8	97
		Expected Count	18.0	22.8	26.9	18.7	10.6	97.0
	A	Count	8	15	16	16	7	62
		Expected Count	11.5	14.6	17.2	12.0	6.7	62.0
	SA	Count	1	1	5	0	3	10
		Expected Count	1.9	2.4	2.8	1.9	1.1	10.0
Total		Count	53	67	79	55	31	285
		Expected Count	53.0	67.0	79.0	55.0	31.0	285.0

Q3_10_Searching_easy * Q4a1_Frequency_PC Crosstabulation

			Q4a1_Frequency_PC					Total
			NEVER	2	3	4	OFTEN	
Q3_10_Searching_easy	SD	Count	2	0	0	2	2	6
		Expected Count	1.0	.9	.7	.8	2.6	6.0
	D	Count	5	2	3	2	20	32
		Expected Count	5.5	4.7	3.6	4.3	13.9	32.0
	UN	Count	4	1	11	5	15	36
		Expected Count	6.2	5.3	4.1	4.8	15.6	36.0
	A	Count	18	22	8	17	39	104
		Expected Count	17.9	15.4	11.8	13.8	45.1	104.0
	SA	Count	6	5	1	1	12	25
		Expected Count	4.3	3.7	2.8	3.3	10.8	25.0
Total		Count	35	30	23	27	88	203
		Expected Count	35.0	30.0	23.0	27.0	88.0	203.0

Q3_12_sufficient_titles * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_12_sufficient_titles	SD	Count	2	2	1	0	3	8
		Expected Count	1.5	1.9	2.2	1.6	.8	8.0
	D	Count	7	10	13	13	8	51
		Expected Count	9.6	11.9	14.0	10.2	5.3	51.0
	UN	Count	35	30	29	15	8	117
		Expected Count	22.1	27.3	32.1	23.4	12.1	117.0
	A	Count	6	20	28	23	9	86
		Expected Count	16.2	20.1	23.6	17.2	8.9	86.0
	SA	Count	1	1	3	3	0	8
		Expected Count	1.5	1.9	2.2	1.6	.8	8.0
Total		Count	51	63	74	54	28	270
		Expected Count	51.0	63.0	74.0	54.0	28.0	270.0

Q3_13_Formats_attractive * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_13_Formats_ attractive	SD	Count	3	0	1	2	4	10
		Expected Count	2.0	2.3	2.8	1.9	1.1	10.0
	D	Count	7	15	22	8	5	57
		Expected Count	11.1	13.1	15.7	10.9	6.2	57.0
	UN	Count	34	30	31	17	10	122
		Expected Count	23.8	28.1	33.6	23.4	13.2	122.0
	A	Count	10	19	24	25	12	90
		Expected Count	17.6	20.7	24.8	17.2	9.7	90.0
	SA	Count	2	2	1	3	0	8
		Expected Count	1.6	1.8	2.2	1.5	.9	8.0
Total		Count	56	66	79	55	31	287
		Expected Count	56.0	66.0	79.0	55.0	31.0	287.0

Q3_14_SkimRead * Q4a6_reader Crosstabulation

			Q4a6_reader					Total
			NEVER	2	3	4	OFTEN	
Q3_14_SkimRead	SD	Count	0	0	0	0	2	2
		Expected Count	1.2	.3	.3	.1	.1	2.0
	D	Count	25	6	2	3	1	37
		Expected Count	22.6	6.0	4.7	2.0	1.6	37.0
	UN	Count	15	2	4	1	1	23
		Expected Count	14.0	3.7	2.9	1.2	1.0	23.0
	A	Count	67	21	19	7	5	119
		Expected Count	72.7	19.3	15.2	6.4	5.3	119.0
	SA	Count	17	4	1	0	0	22
		Expected Count	13.4	3.6	2.8	1.2	1.0	22.0
Total		Count	124	33	26	11	9	203
		Expected Count	124.0	33.0	26.0	11.0	9.0	203.0

Q3_30_Ejournal_different * Q4a9_Ejournals Crosstabulation

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q3_30_Ejournal_different	SD	Count	0	0	0	1	2	3
		Expected Count	.6	.7	.8	.6	.3	3.0
	D	Count	2	5	7	5	2	21
		Expected Count	4.0	4.9	5.7	4.1	2.3	21.0
	UN	Count	24	20	26	5	9	84
		Expected Count	16.0	19.5	23.0	16.6	9.0	84.0
	A	Count	22	31	34	21	9	117
		Expected Count	22.3	27.1	32.0	23.1	12.6	117.0
	SA	Count	7	11	12	25	9	64
		Expected Count	12.2	14.8	17.5	12.6	6.9	64.0
Total		Count	55	67	79	57	31	289
		Expected Count	55.0	67.0	79.0	57.0	31.0	289.0

Appendix O: Expectation Confirmation and Gratification for ECU E-books (Thesis Section 5.2.11)

Contingency Tables

Q3_28_Satisfied Q3_12_sufficient_titles Crosstabulation

			Q3_12_sufficient_titles					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	2	2	4	1	0	9
		Expected Count	.3	1.8	2.7	3.9	.4	9.0
	Dissatisfied	Count	2	16	4	5	0	27
		Expected Count	.8	5.5	8.0	11.6	1.1	27.0
	Neither satisfied nor dissatisfied	Count	1	11	22	7	1	42
		Expected Count	1.2	8.6	12.5	18.0	1.6	42.0
	Satisfied	Count	1	13	28	68	4	114
		Expected Count	3.3	23.4	33.9	48.9	4.4	114.0
	Highly satisfied	Count	0	0	3	7	3	13
		Expected Count	.4	2.7	3.9	5.6	.5	13.0
Total		Count	6	42	61	88	8	205
		Expected Count	6.0	42.0	61.0	88.0	8.0	205.0

Q3_28_Satisfied Q3_3_Lib_interface_easy Crosstabulation

			Q3_3_Lib_interface_easy					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	1	0	2	3	3	9
		Expected Count	.2	.9	1.8	4.9	1.2	9.0
	Dissatisfied	Count	0	10	2	12	3	27
		Expected Count	.5	2.7	5.3	14.8	3.7	27.0
	Neither satisfied nor dissatisfied	Count	2	5	17	16	1	41
		Expected Count	.8	4.0	8.1	22.4	5.7	41.0
	Satisfied	Count	1	5	19	75	14	114
		Expected Count	2.2	11.2	22.5	62.3	15.7	114.0
	Highly satisfied	Count	0	0	0	5	7	12
		Expected Count	.2	1.2	2.4	6.6	1.7	12.0
Total		Count	4	20	40	111	28	203
		Expected Count	4.0	20.0	40.0	111.0	28.0	203.0

Q3_28_Satisfied Q3_6_Customisation Crosstabulation

			Q3_6_Customisation					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	0	2	2	3	2	9
		Expected Count	.2	2.8	3.7	1.8	.5	9.0
	Dissatisfied	Count	0	8	8	7	4	27
		Expected Count	.7	8.4	11.1	5.4	1.4	27.0
	Neither satisfied nor dissatisfied	Count	2	7	22	9	2	42
		Expected Count	1.0	13.1	17.2	8.4	2.3	42.0
	Satisfied	Count	0	46	47	20	1	114
		Expected Count	2.8	35.6	46.7	22.8	6.1	114.0
	Highly satisfied	Count	3	1	5	2	2	13
		Expected Count	.3	4.1	5.3	2.6	.7	13.0
Total		Count	5	64	84	41	11	205
		Expected Count	5.0	64.0	84.0	41.0	11.0	205.0

Q3_28_Satisfied Q3_13_Formats_attractive Crosstabulation

			Q3_13_Formats_attractive					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	1	1	2	4	1	9
		Expected Count	.3	1.9	3.0	3.5	.3	9.0
	Dissatisfied	Count	3	8	11	5	0	27
		Expected Count	.8	5.8	9.1	10.4	.9	27.0
	Neither satisfied nor dissatisfied	Count	1	8	25	7	1	42
		Expected Count	1.2	9.0	14.1	16.2	1.4	42.0
	Satisfied	Count	1	26	30	54	3	114
		Expected Count	3.3	24.5	38.4	43.9	3.9	114.0
	Highly satisfied	Count	0	1	1	9	2	13
		Expected Count	.4	2.8	4.4	5.0	.4	13.0
Total		Count	6	44	69	79	7	205
		Expected Count	6.0	44.0	69.0	79.0	7.0	205.0

Q3_28_Satisfied Q3_25_Convenience Crosstabulation

			Q3_25_Convenience					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	1	1	0	6	1	9
		Expected Count	.2	.8	.8	4.6	2.6	9.0
	Dissatisfied	Count	1	3	3	10	10	27
		Expected Count	.7	2.4	2.4	13.8	7.8	27.0
	Neither satisfied nor dissatisfied	Count	1	7	9	15	10	42
		Expected Count	1.0	3.7	3.7	21.5	12.1	42.0
	Satisfied	Count	2	7	6	72	27	114
		Expected Count	2.8	10.0	10.0	58.4	32.8	114.0
	Highly satisfied	Count	0	0	0	2	11	13
		Expected Count	.3	1.1	1.1	6.7	3.7	13.0
Total		Count	5	18	18	105	59	205
		Expected Count	5.0	18.0	18.0	105.0	59.0	205.0

Q3_28_Satisfied * Q3_19_Use_Pleasant Crosstabulation

			Q3_19_Use_Pleasant					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	3	2	2	2	0	9
		Expected Count	.5	1.2	3.2	3.8	.3	9.0
	Dissatisfied	Count	2	6	8	10	1	27
		Expected Count	1.4	3.6	9.6	11.5	.9	27.0
	Neither satisfied nor dissatisfied	Count	2	9	18	12	1	42
		Expected Count	2.3	5.5	15.0	17.8	1.4	42.0
	Satisfied	Count	4	10	42	56	2	114
		Expected Count	6.1	15.0	40.6	48.4	3.9	114.0
	Highly satisfied	Count	0	0	3	7	3	13
		Expected Count	.7	1.7	4.6	5.5	.4	13.0
Total		Count	11	27	73	87	7	205
		Expected Count	11.0	27.0	73.0	87.0	7.0	205.0

Q3_28_Satisfied * Q3_5_AccessProblems Crosstabulation

			Q3_5_AccessProblems					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	1	3	0	3	2	9
		Expected Count	.6	3.8	1.2	3.0	.4	9.0
	Dissatisfied	Count	1	8	2	14	2	27
		Expected Count	1.7	11.5	3.6	9.1	1.2	27.0
	Neither satisfied nor dissatisfied	Count	4	9	12	15	2	42
		Expected Count	2.7	17.8	5.5	14.1	1.8	42.0
	Satisfied	Count	4	61	13	33	3	114
		Expected Count	7.2	48.4	15.0	38.4	5.0	114.0
	Highly satisfied	Count	3	6	0	4	0	13
		Expected Count	.8	5.5	1.7	4.4	.6	13.0
Total		Count	13	87	27	69	9	205
		Expected Count	13.0	87.0	27.0	69.0	9.0	205.0

Q3_28_Satisfied * Q3_20_Finding_info_hard Crosstabulation

			Q3_20_Finding_info_hard					Total
			SD	D	UN	A	SA	
Q3_28_Satisfied	Highly dissatisfied	Count	2	2	2	1	2	9
		Expected Count	.8	4.3	2.0	1.6	.4	9.0
	Dissatisfied	Count	5	10	4	6	2	27
		Expected Count	2.4	12.8	5.9	4.7	1.2	27.0
	Neither satisfied nor dissatisfied	Count	3	14	17	5	3	42
		Expected Count	3.7	19.9	9.2	7.4	1.8	42.0
	Satisfied	Count	6	64	20	22	2	114
		Expected Count	10.0	53.9	25.0	20.0	5.0	114.0
	Highly satisfied	Count	2	7	2	2	0	13
		Expected Count	1.1	6.2	2.9	2.3	.6	13.0
Total		Count	18	97	45	36	9	205
		Expected Count	18.0	97.0	45.0	36.0	9.0	205.0

Coding of Access Method Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

Q3_28_Satisfied * Q5b_OneSearch Crosstabulation

			Q5b4_OneSearch		
			YES	NO	Total
Q3_28_Satisfied	Highly dissatisfied	Count	9	0	9
		Expected Count	6.2	2.8	9.0
	Dissatisfied	Count	15	11	26
		Expected Count	17.9	8.1	26.0
	Neither satisfied nor dissatisfied	Count	20	19	39
		Expected Count	26.8	12.2	39.0
	Satisfied	Count	81	31	112
		Expected Count	76.9	35.1	112.0
	Highly satisfied	Count	11	1	12
		Expected Count	8.2	3.8	12.0
Total		Count	136	62	198
		Expected Count	136.0	62.0	198.0

Q3_28_Satisfied * Q5b5_Databases Crosstabulation

			Q5b5_Databases		
			YES	NO	Total
Q3_28_Satisfied	Highly dissatisfied	Count	8	1	9
		Expected Count	6.0	3.0	9.0
	Dissatisfied	Count	21	5	26
		Expected Count	17.3	8.7	26.0
	Neither satisfied nor dissatisfied	Count	24	15	39
		Expected Count	26.0	13.0	39.0
	Satisfied	Count	68	44	112
		Expected Count	74.7	37.3	112.0
	Highly satisfied	Count	11	1	12
		Expected Count	8.0	4.0	12.0
Total		Count	132	66	198
		Expected Count	132.0	66.0	198.0

Q3_28_Satisfied * Q4b2_Laptop Crosstabulation

			Q4b2_Laptop				Total
			U	N	S	VS	
Q3_28_Satisfied	Highly dissatisfied	Count	4	1	2	2	9
		Expected Count	.4	1.6	4.8	2.2	9.0
	Dissatisfied	Count	2	4	13	6	25
		Expected Count	1.1	4.3	13.4	6.1	25.0
	Neither satisfied nor dissatisfied	Count	1	7	23	9	40
		Expected Count	1.8	6.9	21.4	9.8	40.0
	Satisfied	Count	2	21	63	25	111
		Expected Count	5.1	19.3	59.5	27.2	111.0
	Highly satisfied	Count	0	1	4	6	11
		Expected Count	.5	1.9	5.9	2.7	11.0
Total		Count	9	34	105	48	196
		Expected Count	9.0	34.0	105.0	48.0	196.0

Appendix P: Expectation Confirmation and Continuance Intention for ECU E-books (Thesis Section 5.2.12)

Contingency Tables

			Q3.28_Satisfied					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	0	0	1	0	1
		Expected Count	.0	.1	.2	.6	.1	1.0
	D	Count	1	2	0	1	0	4
		Expected Count	.2	.5	.8	2.2	.3	4.0
	UN	Count	1	3	14	3	0	21
		Expected Count	.9	2.8	4.3	11.7	1.3	21.0
	A	Count	6	12	20	82	2	122
		Expected Count	5.4	16.1	25.0	67.8	7.7	122.0
	SA	Count	1	10	8	27	11	57
		Expected Count	2.5	7.5	11.7	31.7	3.6	57.0
Total		Count	9	27	42	114	13	205
		Expected Count	9.0	27.0	42.0	114.0	13.0	205.0

			Q3.25_Convenience					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.0	.1	.1	.5	.3	1.0
	D	Count	0	4	0	0	0	4
		Expected Count	.1	.4	.4	2.0	1.2	4.0
	UN	Count	1	5	7	8	0	21
		Expected Count	.5	1.8	1.8	10.8	6.0	21.0
	A	Count	2	9	9	79	23	122
		Expected Count	3.0	10.7	10.7	62.5	35.1	122.0
	SA	Count	1	0	2	18	36	57
		Expected Count	1.4	5.0	5.0	29.2	16.4	57.0
Total		Count	5	18	18	105	59	205
		Expected Count	5.0	18.0	18.0	105.0	59.0	205.0

			Q3.19_Use_Pleasant					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.1	.1	.4	.4	.0	1.0
	D	Count	3	1	0	0	0	4
		Expected Count	.2	.5	1.4	1.7	.1	4.0
	UN	Count	1	7	10	2	1	21
		Expected Count	1.1	2.8	7.5	8.9	.7	21.0
	A	Count	6	15	48	51	2	122
		Expected Count	6.5	16.1	43.4	51.8	4.2	122.0
	SA	Count	0	4	15	34	4	57
		Expected Count	3.1	7.5	20.3	24.2	1.9	57.0
Total		Count	11	27	73	87	7	205
		Expected Count	11.0	27.0	73.0	87.0	7.0	205.0

			Q3.13_Formats_attractive					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.0	.2	.3	.4	.0	1.0
	D	Count	2	2	0	0	0	4
		Expected Count	.1	.9	1.3	1.5	.1	4.0
	UN	Count	0	4	12	3	2	21
		Expected Count	.6	4.5	7.1	8.1	.7	21.0
	A	Count	2	27	41	50	2	122
		Expected Count	3.6	26.2	41.1	47.0	4.2	122.0
	SA	Count	1	11	16	26	3	57
		Expected Count	1.7	12.2	19.2	22.0	1.9	57.0
Total		Count	6	44	69	79	7	205
		Expected Count	6.0	44.0	69.0	79.0	7.0	205.0

			Q3.20_Finding_info_hard					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	0	0	0	1	1
		Expected Count	.1	.5	.2	.2	.0	1.0
	D	Count	0	0	0	2	2	4
		Expected Count	.4	1.9	.9	.7	.2	4.0
	UN	Count	4	3	9	2	3	21
		Expected Count	1.8	9.9	4.6	3.7	.9	21.0
	A	Count	6	61	25	27	3	122
		Expected Count	10.7	57.7	26.8	21.4	5.4	122.0
	SA	Count	8	33	11	5	0	57
		Expected Count	5.0	27.0	12.5	10.0	2.5	57.0
Total		Count	18	97	45	36	9	205
		Expected Count	18.0	97.0	45.0	36.0	9.0	205.0

			Q3.24_Prior_Experience					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.0	.3	.1	.5	.1	1.0
	D	Count	0	3	0	0	1	4
		Expected Count	.2	1.1	.4	1.9	.4	4.0
	UN	Count	0	11	5	5	0	21
		Expected Count	.8	5.7	2.3	9.8	2.4	21.0
	A	Count	4	29	11	72	6	122
		Expected Count	4.8	33.3	13.1	57.1	13.7	122.0
	SA	Count	3	13	6	19	16	57
		Expected Count	2.2	15.6	6.1	26.7	6.4	57.0
Total		Count	8	56	22	96	23	205
		Expected Count	8.0	56.0	22.0	96.0	23.0	205.0

			Q3.10_Searching_easy					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.0	.2	.2	.5	.1	1.0
	D	Count	0	3	1	0	0	4
		Expected Count	.1	.6	.7	2.1	.5	4.0
	UN	Count	2	1	9	7	2	21
		Expected Count	.6	3.3	3.7	10.9	2.6	21.0
	A	Count	2	19	20	70	11	122
		Expected Count	3.6	19.0	21.4	63.1	14.9	122.0
	SA	Count	1	9	6	29	12	57
		Expected Count	1.7	8.9	10.0	29.5	7.0	57.0
Total		Count	6	32	36	106	25	205
		Expected Count	6.0	32.0	36.0	106.0	25.0	205.0

			Q3.4_HardScreenRead					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	1	0	0	0	1
		Expected Count	.1	.4	.2	.2	.1	1.0
	D	Count	0	1	0	0	3	4
		Expected Count	.3	1.7	.9	.9	.2	4.0
	UN	Count	2	5	8	6	0	21
		Expected Count	1.3	9.1	4.7	4.6	1.2	21.0
	A	Count	2	54	31	27	8	122
		Expected Count	7.7	53.0	27.4	26.8	7.1	122.0
	SA	Count	9	28	7	12	1	57
		Expected Count	3.6	24.7	12.8	12.5	3.3	57.0
Total		Count	13	89	46	45	12	205
		Expected Count	13.0	89.0	46.0	45.0	12.0	205.0

			Q3.26_Functionality					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.0	.2	.2	.4	.2	1.0
	D	Count	0	3	1	0	0	4
		Expected Count	.2	.8	.8	1.6	.7	4.0
	UN	Count	1	6	6	6	2	21
		Expected Count	.8	4.4	4.0	8.3	3.5	21.0
	A	Count	2	24	24	58	14	122
		Expected Count	4.8	25.6	23.2	48.2	20.2	122.0
	SA	Count	4	10	8	17	18	57
		Expected Count	2.2	12.0	10.8	22.5	9.5	57.0
Total		Count	8	43	39	81	34	205
		Expected Count	8.0	43.0	39.0	81.0	34.0	205.0

			Q3.16_Longer_Reading_ok					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.1	.4	.2	.2	.0	1.0
	D	Count	4	0	0	0	0	4
		Expected Count	.5	1.5	1.0	.9	.1	4.0
	UN	Count	5	6	5	4	1	21
		Expected Count	2.8	7.9	5.0	4.7	.6	21.0
	A	Count	8	54	29	30	1	122
		Expected Count	16.1	45.8	29.2	27.4	3.6	122.0
	SA	Count	9	17	15	12	4	57
		Expected Count	7.5	21.4	13.6	12.8	1.7	57.0
Total		Count	27	77	49	46	6	205
		Expected Count	27.0	77.0	49.0	46.0	6.0	205.0

			Q3.21_Embedded_Links					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	0	0	0	1	1
		Expected Count	.1	.3	.2	.4	.0	1.0
	D	Count	0	1	1	2	0	4
		Expected Count	.3	1.2	.8	1.6	.1	4.0
	UN	Count	1	4	7	9	0	21
		Expected Count	1.5	6.4	4.0	8.4	.7	21.0
	A	Count	5	37	23	54	3	122
		Expected Count	8.9	36.9	23.2	48.8	4.2	122.0
	SA	Count	9	20	8	17	3	57
		Expected Count	4.2	17.2	10.8	22.8	1.9	57.0
Total		Count	15	62	39	82	7	205
		Expected Count	15.0	62.0	39.0	82.0	7.0	205.0

			Q3.11_Prefer_ebooks_when					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	1	0	0	0	0	1
		Expected Count	.2	.4	.2	.2	.1	1.0
	D	Count	4	0	0	0	0	4
		Expected Count	.6	1.4	.7	.9	.3	4.0
	UN	Count	3	7	7	3	1	21
		Expected Count	3.2	7.5	3.8	4.8	1.7	21.0
	A	Count	17	50	19	30	6	122
		Expected Count	18.4	43.4	22.0	28.0	10.1	122.0
	SA	Count	6	16	11	14	10	57
		Expected Count	8.6	20.3	10.3	13.1	4.7	57.0
Total		Count	31	73	37	47	17	205
		Expected Count	31.0	73.0	37.0	47.0	17.0	205.0

			Q3.5_AccessProblems					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	0	0	1	0	1
		Expected Count	.1	.4	.1	.3	.0	1.0
	D	Count	0	0	0	2	2	4
		Expected Count	.3	1.7	.5	1.3	.2	4.0
	UN	Count	1	5	6	8	1	21
		Expected Count	1.3	8.9	2.8	7.1	.9	21.0
	A	Count	4	58	18	37	5	122
		Expected Count	7.7	51.8	16.1	41.1	5.4	122.0
	SA	Count	8	24	3	21	1	57
		Expected Count	3.6	24.2	7.5	19.2	2.5	57.0
Total		Count	13	87	27	69	9	205
		Expected Count	13.0	87.0	27.0	69.0	9.0	205.0

			Q3.18_TOC					Total
			SD	D	UN	A	SA	
Q3.29_Continuance Intention	SD	Count	0	0	0	1	0	1
		Expected Count	.1	.5	.1	.3	.1	1.0
	D	Count	0	1	0	2	1	4
		Expected Count	.2	2.0	.5	1.1	.2	4.0
	UN	Count	0	6	4	9	2	21
		Expected Count	1.1	10.3	2.9	5.5	1.1	21.0
	A	Count	1	64	17	33	7	122
		Expected Count	6.5	60.1	16.7	32.1	6.5	122.0
	SA	Count	10	30	7	9	1	57
		Expected Count	3.1	28.1	7.8	15.0	3.1	57.0
Total		Count	11	101	28	54	11	205
		Expected Count	11.0	101.0	28.0	54.0	11.0	205.0

Coding of Purpose Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

			Q5a2_Recreation		
			YES	NO	Total
Q3.29_Continuance Intention	SD	Count	0	1	1
		Expected Count	.3	.7	1.0
	D	Count	0	4	4
		Expected Count	1.2	2.8	4.0
	UN	Count	5	15	20
		Expected Count	6.1	13.9	20.0
	A	Count	28	92	120
		Expected Count	36.4	83.6	120.0
	SA	Count	28	28	56
		Expected Count	17.0	39.0	56.0
Total		Count	61	140	201
		Expected Count	61.0	140.0	201.0

Coding of Access Method Selection:

Yes: Those e-book users, either ECU or third party, who selected this option.

No: Those e-book users, either ECU or third party, who did not select this option.

			Q5b4_OneSearch		
			YES	NO	Total
Q3.29_Continuance Intention	SD	Count	0	1	1
		Expected Count	.7	.3	1.0
	D	Count	3	1	4
		Expected Count	2.7	1.3	4.0
	UN	Count	9	10	19
		Expected Count	13.1	5.9	19.0
	A	Count	74	45	119
		Expected Count	81.7	37.3	119.0
	SA	Count	50	5	55
		Expected Count	37.8	17.2	55.0
Total		Count	136	62	198
		Expected Count	136.0	62.0	198.0

Appendix Q: Other Factors affecting ECU E-book Use (Thesis Section 5.2.13)

Table Q1. Other Factors affecting ECU E-book Use: Crosstabs

		I use ECU Library e-books (Q1.1)			
Sr	**Factor**	n	χ^2	*p*	Effect Size φ
1	The Library interface for finding e-books is easy to use (Q3.3)	276	35.25	.000	.36
2	I have experienced problems accessing Library e-books over the Internet (Q3.5)	301	32.31	.000	.33
3	The Library e-book text window is too small (Q3.7)	299	33.97	.000	.34
4	Library e-book access, copy and print limits are frustrating (Q3.8)	278	43.43	.000	.40
5	Current Library e-book collections satisfy my needs (Q3.12)	274	66.48	.000	.49
6	Library e-book formats are attractive (Q3.13)	291	26.44	.000	.30
7	Using Library e-books is a pleasant experience (Q3.19)	271	17.86	.001	.26
8	Finding information in e-books is difficult (Q3.20)	292	29.72	.000	.32
9	Frequency of using e-journals (Q4a.9)	293	35.08	.000	.35

Contingency Data Tables for Table Q1

			Q3.3_Lib_interface_easy					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	4	21	42	118	28	213
		Expected Count	3.9	22.4	59.4	104.2	23.2	213.0
	NO	Count	1	8	35	17	2	63
		Expected Count	1.1	6.6	17.6	30.8	6.8	63.0
Total	Count		5	29	77	135	30	276
	Expected Count		5.0	29.0	77.0	135.0	30.0	276.0

			Q3.5_AccessProblems					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	14	90	28	72	9	213
		Expected Count	14.9	80.7	46.0	63.7	7.8	213.0
	NO	Count	7	24	37	18	2	88
		Expected Count	6.1	33.3	19.0	26.3	3.2	88.0
Total		Count	21	114	65	90	11	301
		Expected Count	21.0	114.0	65.0	90.0	11.0	301.0

			Q3_7_textWindow_small					Total
			SD	D	UN	A	SA	
Q1_1_Use ECU_Ebooks	YES	Count	8	97	49	50	9	213
		Expected Count	7.1	81.9	69.8	47.0	7.1	213.0
	NO	Count	2	18	49	16	1	86
		Expected Count	2.9	33.1	28.2	19.0	2.9	86.0
Total		Count	10	115	98	66	10	299
		Expected Count	10.0	115.0	98.0	66.0	10.0	299.0

			Q3.8_DRM_Limits					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	3	36	51	88	35	213
		Expected Count	2.3	32.9	72.8	74.3	30.6	213.0
	NO	Count	0	7	44	9	5	65
		Expected Count	.7	10.1	22.2	22.7	9.4	65.0
Total		Count	3	43	95	97	40	278
		Expected Count	3.0	43.0	95.0	97.0	40.0	278.0

			Q3.12_sufficient_titles					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	6	42	62	89	8	207
		Expected Count	6.0	38.5	89.1	67.2	6.0	207.0
	NO	Count	2	9	56	0	0	67
		Expected Count	2.0	12.5	28.9	21.8	2.0	67.0
Total		Count	8	51	118	89	8	274
		Expected Count	8.0	51.0	118.0	89.0	8.0	274.0

			Q3.13_Formats_attractive					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	6	44	69	81	7	207
		Expected Count	7.1	41.3	86.8	66.2	5.7	207.0
	NO	Count	4	14	53	12	1	84
		Expected Count	2.9	16.7	35.2	26.8	2.3	84.0
Total		Count	10	58	122	93	8	291
		Expected Count	10.0	58.0	122.0	93.0	8.0	291.0

			Q3.19_Use_Pleasant					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	11	26	72	91	7	207
		Expected Count	9.9	28.3	84.0	77.9	6.9	207.0
	NO	Count	2	11	38	11	2	64
		Expected Count	3.1	8.7	26.0	24.1	2.1	64.0
Total		Count	13	37	110	102	9	271
		Expected Count	13.0	37.0	110.0	102.0	9.0	271.0

			Q3.20_Finding_info_hard					Total
			SD	D	UN	A	SA	
Q1.1_Use ECU Ebooks	YES	Count	18	99	43	38	9	207
		Expected Count	17.0	83.7	61.7	36.2	8.5	207.0
	NO	Count	6	19	44	13	3	85
		Expected Count	7.0	34.3	25.3	14.8	3.5	85.0
Total		Count	24	118	87	51	12	292
		Expected Count	24.0	118.0	87.0	51.0	12.0	292.0

			Q4a9_Ejournals					Total
			NEVER	2	3	4	OFTEN	
Q1.1_Use ECU Ebooks	YES	Count	21	45	62	47	25	200
		Expected Count	38.9	45.1	54.6	41.0	20.5	200.0
	NO	Count	36	21	18	13	5	93
		Expected Count	18.1	20.9	25.4	19.0	9.5	93.0
Total		Count	57	66	80	60	30	293
		Expected Count	57.0	66.0	80.0	60.0	30.0	293.0

Appendix R: Reported Issues with E-books: Analysis of Open-ended Comments (Thesis Section 5.2.15)

R1. Limitations/DRM

This section comprises limitations of e-books the users experienced while using, especially print, copy, download, and loan provisions. The users were annoyed with different download procedures for each e-book supplier. Staff from Library also addressed this issue keeping in view these limits. Examples include:

- "... most eBooks cost a snuck [much] as a physical book. And ... the loan is only for a day and is only accessible via BlueReader app on an iPad ... However, when an ebook is all that is available, and it is only accessible for a day and cannot be printed - the student suffers inconvenience as a result if [of] this technological shift".
- "Ebooks need to be far more user-friendly -- especially in terms of transferring and reading on mobile devices such as iPads. The 'borrowing' experience should mirror more closely that of a physical book. As in, longer loan periods (especially for postrgrads [sic] who are engaged in long-term reseaerch [sic] projects). I would ideally like to be able to easily download library ebooks onto my iPad and keep them there for at least a couple of months before needing to reissue".
- "Make E-books permanently available, not so they will disappear after X amount of days after having been downloaded".
- "I believe the more we can reduce the DRM of ebooks, the better the ebook service will be. In addition to DRM, there's a problem of duplication of content and when publishers withdraw their content from an ebook provider to launch their own platform - this becomes very difficult to manage from a librarian's perspective".

R2. Usability

Respondents highlighted the usability issues involved in e-book adoption. Most common was the eye strain and headache especially in longer reading. Other issues

involved jarring text when scrolling, small viewing area, unsmooth and time-consuming navigation between pages, and uneasy flicking. Examples include:

- "... Most of the time it [e-book] freezes and cuts you off while doing downloads".
- "Paper books are easier to read and quicker to scan through".

R3. Verisimilitude, Intimacy, and Preference

Respondents expressed their personal likeness, and preference for physical books as reasons of non-use of e-books. According to some e-book is not a "real" book. Examples include:

- "... The actual sensory feeling of picking up a book and reading it, adds to the pleasure - while reading a book on a tablet is devoid of that sense and seems abstract".
- "I find it more productive to read from hard copy books".
- "I don't find them [e-books] interested".

R4. Platform/Devices

Most comments were about improving compatibility with mobile devices, especially smartphones. One reason for liking but not using e-books was the unaffordability for e-reader devices. Some shared their pleasant experiences of using e-books on iPad and Kindle. Examples include:

- "device's native ebook reader, in particular iOS devices, works fine. ECU library eBook should be integrated with such native app for a seemless [sic] sync and more efficient use".
- "Some publishers don't make it easy to read e-books when there aren't chapters to be able click around. Also apple products synch up so if I read a book on my ipad then it will be on the correct page on my iphone".
- "I use a kindle for 'recreation reading' and laptop for acessesing [sic] library ebooks for uni coursework & assignments".

R5. Collection insufficiency and integration

Few of the respondents were concerned about the insufficient e-book titles available to suffice their needs when compared with physical book collections. Examples include:

- "...Unfortunately not all courses have ebooks- Our course text was not available as ebook and not available in Australia- It was very difficult to obtain. Lecturers need to understand the logistics of gaining a text before assigning it as course reading- same with ejournals...".
- "... E-books are good for general background research but are limited in your ability to have multiple information sources sitting side-by-side for analysis".
- "I would like to see some of the popular books from the library turned into e-books so that everyone can access them".
- "Nothing is as good as the real thing but the ability to access it from anywhere makes it a very valuable tool. I wish that they [ECU Library] had more books available online".

R6. Accessibility

Respondents were of the view that e-books should be more accessible. Particular comments concerned:

- "It is slightly complicated to access the e-books via the links on [ECU] library onesearch".
- "The proxy access at ecu [ECU] is poor and clearly ignores the students ability to access the desired links and ebooks. There is limited access to the whole information of an ebook and sometimes only shows samples. ECU Internet security needs to be updated".

Two of the comments concerned accessibility issues in the areas where there were Internet connectivity and speed problems.

R7. Miscellaneous

Students suggested that there should be a brief list of recommended readings in the courseware system in lieu of references so that they may not download all the books based on references. One reason for not using ECU Library e-books was the availability of same titles on Google. One comment was for ECU Library regarding improving students' awareness for e-books. Since publishers consider the year of e-book when it is digitised, not originally published in print format, one comment concerned:

- "Sometimes using ebooks provide other challenges in terms of having the correct citations for the ebooks used. Quite often, ebooks have different publication information eg year of publication even though they are the exact edition of the print version. Publication standards for ebook should be improved".

R8. Circumstantial Use

Some respondents were of the view that e-book or type of e-book use was based on particular circumstances or situation. Examples include:

- "use of E books depends on the circumstances. e.g. prefer E-book on Ipad during lecture time. because tables in lecture theatures [sic] are too small for large, heavy textbooks. Prefer physical textbooks at home/library due to personal experience".
- "Never used eReaders or electronic books as I still enjoy the experience of holding and reading a book, but I can understand the benefits of eBooks which is so much easier when travelling".
- "I use academic e-books in a diiferent [sic] way than e-books for recreational reading. Academic e-books are for skimming and finding useful information for assignments etc".
- "Tend to use ebooks for specific technical knowledge rather than general research".

R9. Facilitating Conditions

Comments here concerned ECU Library support services, for example:

- “enable us to access documents that are of relevance”.
- “E-books remands a good source of data that can allow anyone to research specific data, however i believe the main target audience that needs help with E-books are newly enrolled students and students that stuggle [sic] with computers”.
- “I think that the ECU Library One Search can be a little non-user friendly. If i search for a phrase or keywords from a certain date in texts that aren't newspaper articles, then when I change my search in the search box, I have to then input all my parameters again which gets frustrating after a while, especially if you keep forgetting that you have to input your preferences again”.

R10. Forced Adoption

Students concerned that they should not be forced to adopt e-books. Examples include:

- “While I have no doubt e-Books are superseding print copies at a rapid pace, I have been disappointed that the needs of students who prefer hard copies are not adequately catered for. I don't like being forced to read an e-Book because the library which I fund with a hefty study fee does not have the book I want to read in print”.
- “Using E-books should be an option not a requirement in assignments”.

R11. Format

Users were concerned and confused with different formats of e-resources, for example:

- “ePub are currently poorly defined, iBooks, pdfs are different and many journals are coming out with their own readers”.

R12. Target Audience/Age Factor

Two of the respondents associated the e-book uptake with age factor. Examples include:

- "... Older generations on the other hand are generally less multimedia literate. Especially across the elderly where text size begins to play a big part in the popularity of e-books".
- "I am a middle aged ... I am not at all confident with technology and feel very intimidated by it".

Some of the respondents acknowledged that they became aware of the resource through this survey. Examples include:

- "participating in this has made me more aware of resources".
- "I haven't used e-Books before however it does sound like a service worth looking into".
- "...i understand many advantages of ebook after this survey and will increase my use of ecu library ebooks".
- "The only time I have used an e-book was for an English class. It wouldn't let me copy or print any of the text. As a teacher this has put me off using e-books until this survey. If you can highlight and print and actually use the resource then I would consider trying it again".

Appendix S: EBL Data Tables (Thesis Section 6.1)

S.I. Most Frequent EBL Titles

Tables S1, S2, and S3 list the most frequently used 10 EBL titles year-wise ranked according to sum of minutes consumed.

Table S1. Most Frequent EBL Titles 2010

Rank	Title	Users	Views	Minutes
1	Australian essential tort law	69	244	16,230
2	Stadia : a design and development guide*	44	283	14,202
3	Psychology of food choice	50	251	13,352
4	Strategic human resource management : a guide to action*	69	209	12,945
5	Sublime communication technologies*	22	204	12,649
6	Instant notes in sport and exercise bio-mechanics	77	199	9,764
7	Communication, language and literacy from birth to five*	41	149	9,301
8	Classroom management : sound theory and effective practice	68	169	9,220
9	Lu's basic toxicology : fundamentals, target organs, and risk	15	54	8,986
10	Body of nature and culture*	11	62	8,861

*Title had embedded courseware link.

Table S2. Most Frequent EBL Titles 2011

Rank	Title	Users	Views	Minutes
1	Sublime communication technologies*	33	388	35,678
2	Stadia : a design and development guide*	53	321	18,746
3	Business value of IT : managing risks, optimizing performance and measuring results	30	194	18,665
4	Security risk management body of knowledge	67	222	16,122
5	Psychology of safety handbook	89	466	15,550
6	Visible learning : a synthesis of over 800 meta-analyses relating to achievement*	101	273	12,629
7	Australian essential tort law	64	178	12,551
8	Body of nature and culture*	17	140	11,876
9	Maybe tomorrow	23	104	10,212
10	Instant notes in sport and exercise bio-mechanics	57	189	9,927

*Title had embedded courseware link.

Table S3. Most Frequent EBL Titles 2012

Rank	Title	Users	Views	Minutes
1	Psychology of safety handbook	119	638	13,740
2	Reforming child protection	84	328	12,377
3	Business value of it : managing risks, optimizing performance and measuring results	21	184	10,857
4	Learning and teaching early math : the learning trajectories approach	91	305	9,735
5	Principles and practice of social marketing : an international perspective	36	265	9,671
6	Health communication : from theory to practice	54	275	9,559
7	Prejudice : its social psychology	58	194	8,905
8	Essential epidemiology : an introduction for students and health professionals	55	258	7,906
9	Gifted young children : a guide for teachers and parents	62	283	7,373
10	Stadia : a design and development guide*	48	257	6,498

*Title had embedded courseware link.

S.II. Month-wise EBL E-book Transactions

Table S4. Month-wise E-book Transactions

	2010	**2011**	**2012**
JAN	368	1,527	788
FEB	1,346	2,097	2,597
MAR	11,242	9,495	13,085
APR	9,392	10,098	15,104
MAY	9,731	10,516	13,576
JUN	2,893	3,895	4,045
JUL	2,408	1,977	2,675
AUG	8,998	9,121	14,665
SEP	7,591	10,571	13,838
OCT	6,926	7,837	12,575
NOV	3,015	2,955	3,580
DEC	1,280	661	745
Total	**65,190**	**70,750**	**97,273**

S.III. Daily EBL E-book Use/Transactions

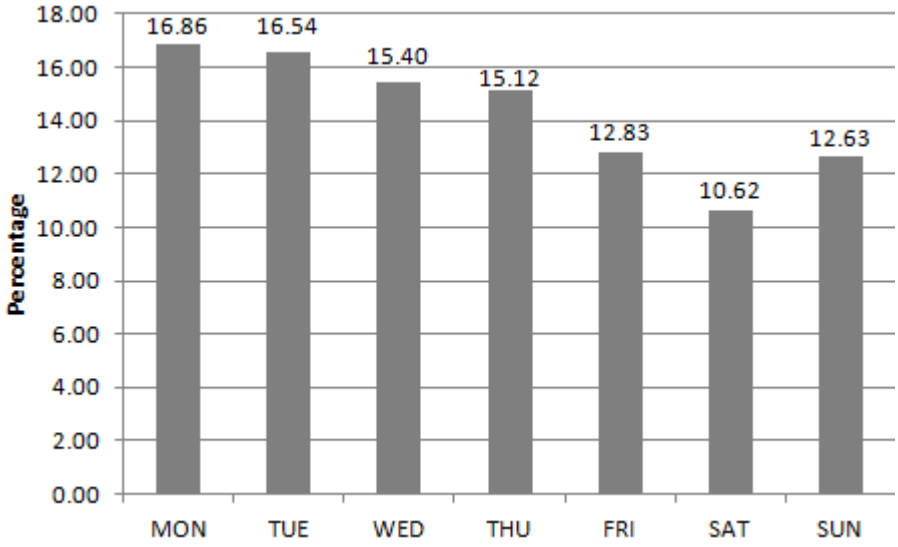


Figure S1. EBL daily use/transactions 2010

Appendix T: Ebrary Academic Complete (Thesis Section 6.2)

T.I. Glossary of Ebrary Terms used in Usage Reports

The terms used in Ebrary usage reports are defined below (Ebrary support center, n.d., Admins: usage reports).

- Sessions: "The number of times a title is opened and the user performs at least one copy, print, view (page turn), or download" (para.7).
- Views: "the number of page turns. A page view is counted only once 10 seconds have elapsed between page turns" (para. 7).
- Copies: "The number of times the InfoTools copy command is used" (para. 7).
- Prints: "The number of pages printed" (para. 7).
- Chapter/Range Downloads: "The number of PDF downloads (*not* the number of pages downloaded)" (para. 7).
- Full Title Downloads: "Number of full-document downloads through ADE [Adobe Digital Editions]" (para. 7).
- Turnaways: "Applies only to titles that are single-user (including multiple single-user-only copies of the same title, including 3USER licenses). When user whose access would exceed the limit set in the license, that user is 'turned away', or denied immediate access to the title" (para. 13).
- Wait Queue: "The number of times a user tries to open a single-user-only book that is in use by someone else and they agree to join the queue to wait for access" (para. 13).
- Section requests: The sum of the number of pages viewed, copies made, pages printed, instances of pdf and/or full-document downloads (para. 13).
- Searches WITHIN a title; by Title: "The number of times a search for text WITHIN an Ebrary book was performed, i.e. the number of times the magnifying glass icon or the 'Search Document' button was used for searching WITHIN the document" (para. 13).
- Regular searches and Result click. "The number of times a search for books was done on the Ebrary platform" (para 13).

- Result click: “The number of books that were opened from a search on the Ebrary platform. Note: we only count a book as being opened when the user clicks on its title or cover to open the book (i.e. opens in QuickView) AND only if at least one page is turned” (para. 13). Regular searches have been reported in Table 5.34.

T.II. Ebrary’s DRM Restrictions

One page at a time (maximum 30% of pages) can be copied by selecting the desired text. Maximum 30% of pages can be printed from any part of an e-book by selecting a print range. A chapter/range (maximum 30% of pages) of an e-book can be downloaded as a standard image-PDF format to view offline using most computers and devices, including the Kindle, without additional software. Bibliographical detail of the e-book along with copyright information is displayed on every page of downloaded/printed chapters. Additional Ebrary alphanumeric code of nearly 40 characters in a watermark style is also displayed at four different places on every page of a downloaded chapter/range. Ebrary interface displays two separate paginations, for example, page 75 (90 of 209). The entire e-book in a special format can be downloaded to read offline via Adobe Digital Editions for a 7 to 14 days loan with automatic expiry. A downloaded chapter/range can be printed as per stated limits, but not copied, whereas the entirely downloaded e-book can neither be copied nor printed. Separate user account with Ebrary in addition to ECU one is required to use download and some customisation features.

T.III. Ebrary Collection

Table T1. Ebrary Subject-wise E-book Collection (Titles) on 15 September, 2013

Rank	Subject	Collection (# of titles)	%
1	Social sciences	18,027	21.25
2	Language and literature	11,403	13.44
3	Science	9,186	10.83
4	Philosophy, psychology, religion	8,198	9.66
5	Medicine	6,726	7.93
6	Technology	6,109	7.20
7	History (general) and history of Europe	4,876	5.75
8	History: America	3,862	4.55
9	Political science	3,130	3.69
10	Education	2,792	3.29
11	Geography, anthropology, recreation	2,744	3.23
12	Law	2,392	2.82
13	Music and books on music	1,317	1.55
14	Fine arts	1,195	1.41
15	Agriculture	1,025	1.21
16	Military science	743	0.88
17	Bibliography, library science, information resources (general)	574	0.68
18	Auxiliary sciences of history	337	0.40
19	Naval science	123	0.14
20	General works	70	0.08
	Total	**84,829**	**100**

T.IV. Ebrary Usage

Table T2. Subject-wise Ebrary Usage 2011

Rank	Subject	Section requests	% of total requests
1	Medicine & Health	29,318	5.26
2	Education	25,384	4.56
3	Social Sciences*	21,884	3.92
4	Psychology	21,003	3.77
5	Business & Management	13,526	2.43
6	Computing	6,826	1.22
7	Engineering & Technology	5,464	0.98
8	Political Science	5,278	0.95
9	History	4,055	0.73
10	Geography & Travel	3,554	0.64
11	Music	3,533	0.63
12	Philosophy	2,949	0.53
13	General	2,413	0.43
14	Language & Literature	2,309	0.41
15	Economics	2,154	0.39
16	Arts	1,736	0.31
17	Mathematics	872	0.16
18	Biology	641	0.12
19	Environmental Science	619	0.11
20	Religion	515	0.09
21	Chemistry	431	0.08
	Total	**154,464**	**27.72**

*DDC22 (301-307, 360-369) (Dewey, 2003)

Table T3. Subject-wise Ebrary Usage 2012

Rank	Subject	Section requests	% of Total requests
1	Social Sciences*	55,069	6.84
2	Medicine & Health	46,383	5.76
3	Education	32,245	4.01
4	Psychology	18,330	2.28
5	General	15,859	1.97
6	Computing	13,258	1.65
7	Business & Management	12,925	1.61
8	Language & Literature	10,518	1.31
9	History	8,608	1.07
10	Political Science	8,405	1.04
11	Economics	7,249	0.90
12	Philosophy	6,157	0.77
13	Music	4,825	0.60
14	Biology	4,113	0.51
15	Engineering & Technology	3,625	0.45
16	Agriculture	3,350	0.42
17	Arts	3,085	0.39
18	Geography & Travel	2,197	0.27
19	Media	1,572	0.20
20	Physics	1,420	0.18
21	Law	1,327	0.17
22	Religion	905	0.11
23	Mathematics	537	0.07
24	Chemistry	434	0.05
	Total	**262,396**	**32.63**

*DDC22 (301-307, 360-369) (Dewey, 2003)

Table T4. Most Frequently used Ebrary Titles 2011

Title (rank-wise)	**Publisher**	**Section requests**	**% of total requests**
Encyclopedia of elder care : the comprehensive resource on geriatric and social care	Springer	5,482	0.98
Social psychology	Lawrence Erlbaum	3,088	0.55
Discipline with dignity : new challenges, new solutions (3rd edition)	ASCD	2,620	0.47
Teachers and assistants working together : a handbook	McGraw-Hill	2,062	0.37
Britannica concise encyclopedia	Encyclopaedia Britannica	1,943	0.35
Classroom instruction that works : research-based strategies for increasing student achievement	ASCD	1,940	0.35
Perimeter security	McGraw-Hill	1,924	0.35
Multiple intelligences : new horizons	Basic Books	1,773	0.32
Feminine endings : music, gender, and sexuality	University of Minnesota	1,717	0.31
Strategic human resource management : a guide to action (4th edition)	Kogan Page	1,612	0.29
Chest pain : advanced assessment and management skills	John Wiley & Sons	1,519	0.27
Dictionary of human geography (5th edition)	Wiley	1,494	0.27
Infection prevention and control : theory and practice for healthcare professionals	Wiley	1,373	0.25
Project quality management : why, what and how	J. Ross	1,356	0.24
Social influences	Routledge	1,313	0.24
Beyond discipline : from compliance to community (10th anniversary edition)	ASCD	1,300	0.23
Paediatric handbook (8th edition)	BMJ Books	1,294	0.23
Facility design and management handbook	McGraw-Hill	1,289	0.23
Psychology of food choice (frontiers in nutritional sciences, volume 3)	CABI	1,279	0.23
Active listening : improve your ability to listen and lead	Center for Creative Leadership	1,271	0.23
Total		**37,649**	**6.76**

Table T5. Most Frequently used Ebrary Titles 2012

Title (rank-wise)	**Publisher**	**Section requests**	**% of total requests**
Britannica concise encyclopedia	Encyclopaedia Britannica	10,942	1.36
Social work skills : a practice handbook	McGraw-Hill	8,405	1.04
Dictionary of human geography (5th edition)	Wiley	8,269	1.03
Why the humanities matter : a commonsense approach	University of Texas	5,298	0.66
When chicken soup isn't enough : stories of nurses standing up for themselves, their patients, and their profession	Cornell University	5,188	0.65
Humanism	Routledge	4,399	0.55
Historical performance of music : an introduction	Cambridge University	4,118	0.51
Psychology of food choice (frontiers in nutritional sciences, volume 3)	CABI	3,665	0.46
Medicines : the comprehensive guide (6th edition)	A & C Black	3,296	0.41
Uprootings/regroundings : questions of home and migration	Berg	3,218	0.40
Discipline with dignity : new challenges, new solutions (3rd edition)	ASCD	3,129	0.39
Misconceptions in primary science	Open University	3,035	0.38
Criminal behaviour : explanation and prevention	Taylor & Francis	2,963	0.37
Serial killers : the method and madness of monsters	Penguin Putnam	2,479	0.31
Edspeak : a glossary of education terms, phrases, buzzwords, and jargon	ASCD	2,451	0.31
Environmental economics for tree huggers and other skeptics	Island Press	2,263	0.28
Doing your research project (5th edition)	Open University	2,174	0.27
International classification of functioning, disability and health : children and youth version	World Health Organization	2,158	0.27
Inner bird: anatomy and evolution	UBC	2,065	0.26
History and crime	SAGE	2,048	0.25
Total		**81,563**	**10.16**

Table T6. Month-wise Ebrary Section Requests 2011-2012

Month	Section requests 2011	% of total requests 2011	Section requests 2012	% of total requests 2012	% change, 2011-12
JAN	4	0.001	12,039	1.496	300,875
FEB	6,560	1.176	21,742	2.701	231.43
MAR	68,842	12.344	116,446	14.467	69.15
APR	77,232	13.848	121,759	15.127	57.65
MAY	103,386	18.538	105,614	13.121	2.16
JUN	29,269	5.248	29,641	3.682	1.27
JUL	12,221	2.191	20,795	2.583	70.16
AUG	59,750	10.713	98,888	12.285	65.50
SEP	86,904	15.582	127,041	15.783	46.19
OCT	72,330	12.969	101,820	12.650	40.77
NOV	31,680	5.680	32,633	4.054	3.01
DEC	9,533	1.709	16,508	2.051	73.17
Total	**557,711**	**100**	**804,926**	**100**	**N/A**

Table T7. Publishers Analysis at Ebrary 2011

Sr	Publisher	# of Titles used	% of total titles used	Section requests	% of all requests
1	McGraw-Hill	847	7.87	62,424	11.19
2	Routledge	758	7.04	49,356	8.85
3	Oxford University	565	5.25	26,519	4.76
4	Wiley	302	2.80	19,720	3.54
5	Jessica Kingsley	306	2.84	19,125	3.43
6	Open University	150	1.39	16,075	2.89
7	Springer	130	1.21	14,349	2.58
8	Cambridge University	358	3.32	13,091	2.35
9	Ashgate	266	2.47	13,400	2.40
10	ASCD	113	1.05	12,443	2.23
11	John Wiley & Sons	156	1.45	11,049	1.98
12	Sage	129	1.20	10,304	1.85
13	Palgrave Macmillan	222	2.06	8,071	1.45
14	National Academies	289	2.68	8,762	1.57
15	Kluwer Academic	150	1.39	8,062	1.45
16	CABI	129	1.20	7,560	1.36
17	Guilford	69	0.64	7,970	1.43
18	Kogan Page	119	1.11	7,376	1.32
19	Course Technology	114	1.06	7,026	1.26
20	Emerald Group	242	2.25	6,594	1.18
	Total	**5,414**	**50.28**	**329,276**	**59.07**

Table T8. Publishers Analysis at Ebrary 2012

Sr	Publisher	# of Titles used	% of total titles used	Section requests	% of all requests
1	Wiley	689	4.31	51,580	6.41
2	Routledge	810	5.07	51,398	6.39
3	McGraw-Hill	243	1.52	33,888	4.21
4	Open University	219	1.37	33,425	4.15
5	Oxford University	858	5.37	32,491	4.04
6	Cambridge University	409	2.56	20,247	2.52
7	Jessica Kingsley	405	2.54	20,123	2.5
8	Ashgate	506	3.17	18,160	2.26
9	Continuum International	423	2.65	17,457	2.17
10	Global Media	349	2.19	16,988	2.11
11	Springer	209	1.31	12,528	1.56
12	National Academies	398	2.49	11,992	1.49
13	MIT	192	1.20	9,017	1.12
14	BRILL	233	1.46	8,616	1.07
15	Greenwood	202	1.26	8,292	1.03
16	Palgrave Macmillan	271	1.70	7,676	0.95
17	World Scientific	201	1.26	5,998	0.75
18	University of Chicago	211	1.32	5,937	0.74
19	Emerald Group	278	1.74	5,498	0.68
20	University of Minnesota	218	1.37	5,060	0.63
	Total	**7,324**	**45.86**	**376,371**	**46.78**

T.V. EBL vs Ebrary: Comparison of Use, 2011-2012 combined

Table T9. Monthly EBL's Transactions vs. Ebrary's Section Requests

	2011		2012	
Month	**EBL**	**Ebrary**	**EBL**	**Ebrary**
JAN	1,527	4	788	12,039
FEB	2,097	6,560	2,597	21,742
MAR	9,495	68,842	13,085	116,446
APR	10,098	77,232	15,104	121,759
MAY	10,516	103,386	13,576	105,614
JUN	3,895	29,269	4,045	29,641
JUL	1,977	12,221	2,675	20,795
AUG	9,121	59,750	14,665	98,888
SEP	10,571	86,904	13,838	127,041
OCT	7,837	72,330	12,575	101,820
NOV	2,955	31,680	3,580	32,633
DEC	661	9,533	745	16,508
Total	**70,750**	**557,711**	**97,273**	**804,926**

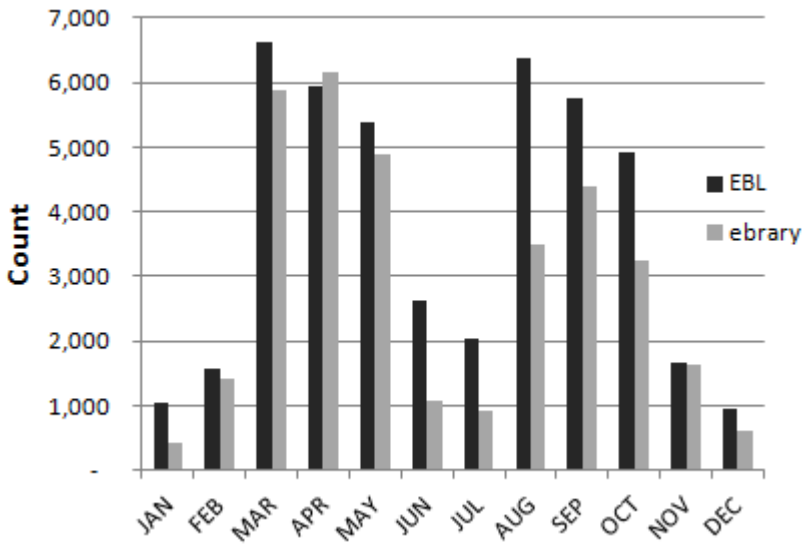


Figure T1. Month-wise Searches at EBL and Ebrary, 2011-2012 combined