THE DOCTORAL THESIS: THE CONTRIBUTION OF COMPUTER BASED LEARNING

J. F. Martin and G. M. Chapman

ABSTRACT

The completion of a doctoral thesis is widely accepted as the culmination of a long process of advanced study entailing generic and specific skills. Undertaking a research degree poses new challenges not only in specialist subject knowledge but also may necessitate a quantum leap in respect of the IT input. It is the aim of this paper to outline some of the possible ways in which this challenge can be successfully accomplished.

INTRODUCTION

Historically postgraduate students writing a thesis have a wide diversity of experiences in terms of the quality of their research supervision and the completion rates, or the proportion of students who eventually submit a thesis in relation to those who initially registered for a higher degree. The high level of attrition which has historically pervaded this sector, has led to wastage of human resources at both staff and student levels. This has been particularly prevalent amongst those grant-aided students who have made significant contributions to knowledge but have never managed to write it up, thus enabling it to be disseminated to the wider academic community. It is also an institutional problem in that grant awarding agencies such as the Economic and Social Research Council, use performance indicators, principally completion rates in determining the allocation funding. It is the aim of this paper to consider some of the ways in which computer based learning can enhance the quality of the learning experience, enabling it to become a more productive and enjoyable experience for both the postgraduate student and the supervisor. Given the rapid changes, which are continuing to take place in IT, this paper deals with work-in-

progress or perhaps, more accurately, works beginning. Its purpose is to provoke thought and argument rather than providing a carefully worked out and definitive set of prescriptions. The latter would invariably have a short shelf life being rapidly superseded by the ongoing changes in the role of IT.

THE RESEARCH CHALLENGE

In Britain and most other European countries the completion of doctoral thesis denotes the highest academic award. Historically there have been significant variations between one country and another about what exactly constitutes the standard and content of a higher degree. In France, for example, prior to the educational reforms the *doctorat d'Etat,* regarded as the essential qualification for a university professor's chair, traditionally involved up to ten or even fifteen years work in completing an exhaustive document of in the region of 1,000 pages on a highly specialised topic. In the science area this was frequently an important piece of original research. In the Arts, however, there was a tendency for the thesis to become absurdly academic and encyclopaedic, with the examiners demanding what constituted little more than an exhaustive biographical resumé of every published work on the subject, a task that did not necessarily entail a high level of original thought. There was considerable vested opposition to allowing any radical reform of this system.(1) External Examiners who were themselves *docteurs* were reluctant to allow change because of the implications for the value of their own qualifications. There was a tendency for this type of qualification system to act as a means of restricting entry into the profession and for the information to be passed on rather like the monks on Mount Athos historically handed down their secrets.

In Britain a PhD or doctoral qualification is associated with a shorter piece of what is primarily intended to be a piece of original research, usually in the region of 50,000 to 80,000 words. It is awarded following the successful completion of a scheme of further study and research, the results of which are judged by the author's peers to constitute an original contribution to learning. Within the thesis it is essential to provide evidence of systematic study and to relate the results to the general body of knowledge in the subject. The task is intended to be a high quality learning experience enabling the student to be become a critical thinker and in doing so a better self and peer assessor. It requires students to be able to analyse, synthesise and evaluate the principles and practices of their chosen discipline in their written work. The need for a more formal approach to the effective training both staff and students for postgraduate work has been recognised by both The Harris Report, <u>Review of Postgraduate Education</u> 1996 (4)and the Dearing Report <u>Higher Education in the Learning Society</u> 1997.(3) More recently HEFCE, (Higher Education Funding Council) in Britain has advocated a number of radical changes. These include the proposal that academic institutions should be required to meet minimum standards for postgraduate training and be required to provide staff development plans before receiving HEFCE research funds (Review Report 00/37 of Research Consultation). The development of such a framework was also tacitly accepted by the QAA (Quality Assurance Agency) conference in November 2000 when consecutive speakers recognised the need for greater transparency and consistency in the outcome of particular qualifications both within the UK and on an international basis.(6) In order to compete in a global market it is essential to be able to demonstrate that generic research skills are effectively embedded in the teaching and learning experience. It

has also been enshrined by QAA in The Framework For Higher Education Qualifications In England, Wales and Northern Ireland January 2001 which among other factors, notes that doctorates are awarded to students who have demonstrated a detailed understanding of applicable techniques for research and advanced academic study.(7)

It has become increasingly recognised that completing a doctoral thesis not only leads to a career in academia but also offers opportunities to participate in the technologically developing information rich growth industries on which the future prosperity of the economy depends. Such industries require both graduates and postgraduates who, in order to cope with technological change, are able to systemically update their knowledge. Coping with rapid change of this type necessitates recognition of a continuous learning throughout life philosophy entailing the application of generic information skills and subject specific knowledge.

Postgraduate students come from a wide variety of backgrounds in terms of their academic profiles and their age. A common feature is that they all perceive themselves first and foremost as subject specialists, embarking upon an in-depth investigation into a chosen specific area. Their immediate focus tends, not surprisingly, to be dominated by the more immediate research investigation rather than the longer-term task of completion. As such there is a strong tendency for them to want to proceed with the exciting phase of doing the actual research rather than conceptualising the challenge as an information management exercise involving the refinement of their information management skills. Encouraging students and even staff to appreciate the intellectual and productivity benefits to be gained from exploiting the synergistic relationship between high quality research and effective information management remains an important challenge.

Studies indicate that most students are acquainted with the advantages of utilising Information Technology to assist in their project. Their experience of it, however, covers a broad spectrum. On the one extreme there are students whose knowledge and experience is very limited. To paraphase one of our own postgraduates, his experience was derived exclusively from a course he was embarking on with the apt title a 'computing for the terrified.' At the other extreme there are students who have extensive exposure to IT, not only from their period as an undergraduate but also from work experience. Even for these students it is important that they do not become complacent in terms of their attitude to IT. Having completed an undergraduate dissertation using IT, it is invariably very tempting to feel that they are experts in the field and that there is little else that can be usefully learnt. Such an approach is very misleading. First and foremost it takes into account the significant differences between an undergraduate research dissertation and a postgraduate thesis. It is not simply more of the same but requires a quantum leap in terms of the approach to research. Secondly, even for those students who have recently completed their undergraduate dissertation it is essential for them to realise that the rate of progress in the field is so fast that the skills they have acquired may exhibit some technological redundancy. As such the main challenge superiors face is to persuade students to recognise the advantages of IT and to accept the need to update their skills on a regular basis in an area in which, they believe, they are already familiar.

The second stage is to ensure that postgraduates appreciate the valuable role IT can play in all stages of research. It is not simply a means of dealing with the writing up stage of the thesis but an integral part of the project. Embedding C and IT in the learning experience is, I believe, one of the key challenges of the present day. In order to achieve this objective, infrastructure improvements are frequently essential to assist both students and staff. This is particularly problematic given that many academics may themselves have limited experience of the benefits of IT in terms of postgraduate research. Educational research suggested that there is a strong tendency for academics to teach students in a very similar way to which they were taught themselves. As QAA training courses emphasise this baggage from the past may tend to impinge on the rate of technological innovation. The fact that something works for us does not necessarily mean that it is the only way of achieving the objective or that the way we do it is at present is necessarily the most efficient. The educational approach based on the premise if it not broken don't try to fix it can encourage disabilitating inertia in our quest not only for not efficiency in the use of resources but also in our desire to enhance the quality of the learning experience. It entails empowering students to become information managers rather than simply perceiving themselves as research specialists, a view which many academics may not completely endorse. Such a transformation has implications for the research culture of the institution as a whole which involve the IT. Nowhere does the concept of life long learning appear more appropriate than in relation to work for a research degree where the presentation of the finalised product fossilises in print at a particular moment in time, our understanding of a particular issue. Knowledge, which is evolving, can not be updated.

This approach raises the issue that staff, however enthusiastic they are at working on their own, are unlikely to be able to disseminate new technological innovations to the rest of the academic community. At present there exists a number of pioneering individuals and organisations acting as beacons illuminating specific areas, but there is still no overarching way of collectively enlightening the sky. The task of effectively disseminating the benefits of IT, and supporting and embedding the process in the teaching and learning experience, is a formidable challenge at the institutional level in any country. Infrastructure improvements need to be instigated to ensure that both staff and students can be adequately trained so that they understand and utilise the new technology to its best advantage. Rigorously conducted in a dispassionate and rational free standing manner, modules and study guides on the use of IT appear to be an important prerequisite for the effective achievement of this objective.

The recent proliferation of part-time Higher degree students has made these challenges even more problematic in terms of the isolation and the difficulties of achieving contact on a regular basis. Resource constraints such as the need to earn a living and to pay their fees and actually carry out the research, means that many are compelled to adopt a utilitarian approach to the challenge of acquiring a Higher degree. One possible way in which this might be alleviated is with the establishment of an e-mail notice board, which can provide effective ways of enabling staff and students to keep in contact with each other on a regular basis. A much more radical approach, however, would be to empower students with the necessary IT expertise and skills to enable them to transform their approach to research.

It is widely accepted that the four key stages in the completion of a thesis entailing planning, research, writing and editing. These are not all necessarily discrete self-contained stages of a linear progression but overlap with each other. (8)Subject disciplines vary in respect of the degree of leeway they offer to postgraduates to pursue their own area of research. Some, when commercial sponsorship is involved, offer prescribed areas of research with specific pre-ordained aims and objectives. Others offer a greater degree of opportunity for the student to participate in deciding the parameters and scope of the research project.

A cost-benefit analysis of the investment of resources into each of the separate stages reveals that the vast majority of students consider the actual practical research the most enjoyable and also the most productive aspect of their postgraduate programme. In contrast feedback from postgraduates suggests that the completion of the thesis entailing the writing up stage, and the editing stage is associated with a much lower level of job satisfaction. A time and motion study approach indicates that a considerable proportion of the student's time is spent on relatively mundane tasks such as a literature search, compiling references, cross checking the data and, in some cases, looking for misplaced notes. Some of these tasks are not only underutilising the student's expertise and talents but can also be demoralising experience undermining productivity and commitment. They give postgraduates them a false impression of the research process in general and their own worth in particular. Fortunately these very tasks would benefit from mechanisation and the substitution of technology for manual effort.

Expectations between staff and students may also change as they move from full-time grant aided research to undertaking part-time work, attempting to complete their thesis under their own steam. The termination of the full time phase of research and the shift to becoming a part-time student seeking to complete the writing up stage of the thesis can be a demoralising experience for many. Information overload coupled with the need to present the thesis in accordance with academic conventions can contribute to a high level of attrition. One obvious solution is to encourage students to write it up as they go along. This can be a useful way of clarifying the challenge and ensuring that the difficult task of writing up the material in an acceptable format is not left until the end, when they are more isolated and the challenge is even more demanding. A detailed grounding in IT can be an even more effective way of ensuring that this final phase does not become an insurmountable obstacle for the student.

MAKING THE MOST OF THE WORD PROCESSOR

Word processors, basically designed for typing and editing text, contain many useful features which make the task easier and can have revolutionary impact on the productivity and quality of the finished product. Knowledge of the IT system is frequently taken for granted by the user. Research suggests that a significant number of students, although they are competent to use IT to deal with undergraduate dissertations, may not be exploiting it to its full potential when they are faced with the methodological challenges at postgraduate level. In order to maximise the potential of the word processor, it is essential for students to participate in a specialised word-processing course specifically linked to the higher degree requirements and the subject specific requirements.

Before embarking upon the task the styles and templates need to be considered by the researcher. Styles allow for the standard formatting of paragraphs and characters, are easy to apply and modify and can be reused in many different types of documents. Templates, which enable a standard formatting of the document, allow for the incorporation of styles, macros and autotext.

There are a number of minor issues which also need to be considered:-

- Potential problem of compatibility with one machine to another
- The need to protect and retain backup copies of the material in the event of viruses
- Office Assistant; this can be disabled if required.
- Auto-correct, advisable to turn off features which you don't require
- Spelling and Grammar, don't forget to use the correct dictionary and writing style
- Language, foreign language dictionaries are available, and this language can be merged in to a text
- Footnotes/endnotes need to incorporated in accordance with the degree regulations.

NETWORKED RESOURCES FOR THE RESEARCHER

Networked resources are available in a variety of forms. There is of course the perennial problem that in order to gain access to all Quality resources they need to be paid for. Such payments can be one-off or by subscription. The fact that different Institutions have different budget structures to fund access of this type may lead to inconsistencies in provision.

There are though a number of providers ranging from the more traditional publishers to specialist e-publishers. Some of the key players in this field include National Data Centres:EDINA, MIMAS and BIDS. Joint Information Systems Committee: CHEST: National library consortia and DNE. Such providers enable the information to be delivered as part of a digital library in a seamless way. The most common method is to create a unified interface where they is no need for the reader to be concerned about the location of the resource.

There are a wide variety of sources available ranging from Library catalogues, newspapers and journals to more subject specific resources.

Index to Theses is a database to postgraduate theses produced by students at academic establishments in the UK, It provides a useful starting point to find out what has been completed in particular areas see http://www.theses.com

Newspapers have their own www specific sites which enable you to access either their ongoing news service or their archive collection of past newspapers. Newspapers are also available on CD/ROMS and Historical collections including Chadwyck-Healey's Times Products. These guides are a good starting point to locating how specific topics have been treated in particular newspapers.

Journals both traditional and electronic have proved to be a major growth area. Most of them are dominated by the sciences.

If you wish to use a specific title the most direct way is to use OPAC, which accesses over 800 journals directly. The library or base station, which you are using to carry out the search, will however, only have access to the titles for which the library has a print subscription. It is also possible to use OPAC to find out which journals are available by searching its Electronic Resources catalogue. Some of these are linked to individual publishing house deals.

It is possible to obtain a full-text of articles from academic journals. At present there are problems in terms of the number of sites which exist and the degree of overlap, issues which are further compounded by the existence of print subscriptions. These problems are generally relatively minor, given the benefits to be gained from accessing the archives. To make effective use of these tools it is useful to identify the specific research topic you intend to explore and to remain throughout the search, sharply focused on the topic. Exploring minor issues can quickly leads to the investigation going off at a tangent and undermining its usefulness. Surfing the web may appear an attractive proposition but it benefits in acquiring a block of pleads specific to a single topic may be limited. Subject specific resources can be a more productive way of achieving this objective. It is possible to check catalogues and bibliographies to identify research publications.

SUBJECT-SPECIFIC RESOURCES:

To find out what has been written on a particular topic rather than explore a particular journal the most effective method is to search electronic databases**.** Some databases provide the full text of articles whilst other only provide citations or summaries of articles. Databases enable the user to identify precisely which periodicals contain articles about the chosen topic. Almost invariably it is necessary to have a personal Athens Account to access databases. It is possible to locate other passwords by clicking Passwords above the submit button. To identify which databases are the most relevant it is possible to use the subject are of the web pages which lists key resources in your selected area

ZETOC provides access to the British Library Electronic Table of Contents databases containing more than 15 million article titles extracted from the 20,000 most important research journals in the world dating back to 1993. It is updated daily with an additional 10,000 new titles. It also contains a unique collection of over 100,000 conference papers indexed to title level. Located at http://zetoc.mimas.ac.uk/ it requires an Athens account.

Other possible sources include MIMAS-ISI Web of Science, formerly BIDS consisting of three large, Citation indexes which may be searched separately or in any combination. These are:
Arts and Humanities Citation Index
Science Citation Index
Social Sciences Citation Index and a separate
Index To Scientific and Technical Proceedings

Each database indexes the core journals in its general area in terms of research and scholarly articles in addition to book and other reviews, editorials, letters and biographical material. In the case of the Science Citation Index there is a full index of more than 5,300 of the leading science, engineering and medicine journals with over 17 million references, 70 per cent of which contain abstracts. While the indexes do not contain the full text of journal articles, they do contain the biographies or reference lists of the articles cited in the databases making it possible to search for cited authors or works. Coverage dates back to 1981 and all the indexes are updated weekly. In the case of the Index to Scientific and Technical Proceedings the coverage starts in 1990 and includes international proceedings. In excess of 1,000 conferences are added to its quarterly update.

Many of these share the common problem of cost, which can be prohibitive, to individuals or even in some case to organisations. CHEST deals are however available where it is possible to benefit from a common discounted price. Other complications are in terms of speed of access to the archives, restrictions on access and the existence of password protected archives.

There is also a wide range of more prosaic sites worth scouring that give access to the recent developments in specific areas. The problem is how to differentiate the best from less good. One possible solution is to instigate a subject specific notice board in which students are encouraged to share their views on the merits of each of the websites. Such a development has the added advantage of encouraging a higher take up rate of computer facilities.

Another possible way is to use JCR Journal Citation Reports which provide an effective way of journal evaluation and comparison based on the collection and analysis of citation data. Accessible at http://mimas.ac.uk/jcrwed with an Athens username and password it allows the user to search one or more subject categories in respect of Journal Title, total Cites, Impact Factor, Immediacy Index, Current Articles or Cited Half-Life. In the case of Total Cites for example this provides the total number of times each journal has been mentioned in all the journals included in the database during the last year.

Further Reading on this topic:

CHEST (http://www.chest.ac.uk)
JIBS User Group (http://hosted.ukoin.ac.uk/jibs/)

INTERNET RESOURCES

The World Wide Web has produced a knowledge explosion with a multitude of different types of Internet resources including personal Web pages, organisational web pages. newspapers online, electronic journals, discussion lists, Ftp sites.

The challenge is not so much finding sites but how to differentiate between the quality and the less good sites. This can initially be problematic given that the authorship or the organisation, which has provided it is not always easy to identify. It is important to remember that the organisation maintaining the page may change over time and that the page could be a transcription of a print original. Titles of the individual articles are not always apparent and it may be necessary to revert to the main/ home page in order to locate it.

Potential problems: Titles are not easy to identify and changes to online rescues are not stable content can be up dated pages can be deleted and the URL may change. This may be true in terms of authorship where it is not always possible to identify who created the page. Some sites also insist on registration before the user can access any information. In isolated cases this requires the user to provide an e-mail address and cryptically demanding that for your convenience it is necessary for this to be accompanied with your credit card details. In some cases should you not cancel within the 30 free trial period subscription charge will be deducted silently from your account on a monthly basis. Such occurrences are isolated examples and the problems are minuscule in relation to the benefits to be derived from their use.

Essential Information to be obtained when ever possible

Author
Creation Date
Title of Page
Title of Complete Work
Date last updated
URL
Date of Access

A number of useful guides to citing Internet Sources exist including:
International Organisation for Standardisation, Bibliographic References To Electronic Documents http://ww.nlc-bnc.caiso/tc46sc9/index.htm
MLA Documentating Resources on the www. http://www.mla.org/style/resources.htm
Columbia University Press http://www.columbia.edu/cu/cup/cgos/idx basic.htm

Plagiarism and copyright constitute potential problem issues, which are addressed in detail on a number of websites including. These professional, attractive sites are crammed with well-written information providing no-nonsense practical advice.
Copyrights and Wrongs… A Guide to Staff Using The Web, Adam Warren. University of Southampton http://www.soton.ac.uk/-acreg/copy/copystaff.html
The Instructors Guide To Plagiarism. Plagarised.Com http://www.plagiarized.com/
Intellectual Property. Charles Oppenheim,
UKOLNhttp://www.ukoln.ac.uk/services/elib/papers/other/copyright/session/intro.ht ml

BIBLIOGRAPHIC SOFTWARE

Collating the multitude of endnotes which invariably characterise a thesis is not a time consuming but mundane task which can be a very demoralising experience for even the most experienced researcher unless they consistently pursue a meticulous and systematic approach.. It is possible to think of many instances where elusive missing notes usually on obnoxious pieces of papers have proved difficult if not on occasions impossible to locate when the precise reference is required. It is also possible to cite instances where vital bits of the reference have been omitted from the paper version of the text thus necessitating wasteful cross checking. This phase of the project is not necessarily intellectually demanding on its own but more tedious and time consuming exercise. Research from France suggests that the problems in successfully completing this task are a significant reason for the failure to complete the theses within the specified deadline.

This once labour intensive process can be transformed by the use of computerised systems which provide an invaluable means of enhancing the efficiency of dealing with this crucial task Utilising electronic databases, CD-ROM, Online web-based researchers are now able to tap into these resources without having to visit a library. Researchers are also increasingly interested in how they can keep track of the increasing number of references and the full text sources located. The proliferation of accessible databases necessitates the provision of appropriate computer based tools and the provision of specialised training for the task. Within the confines of this paper whilst it is not it is not possible to cover every single package that is available a brief review of the sorts of features and the functionality of the packages is appropriate.

There are several software packages including Endnote, Papyrus, Procite and Reference Manager. All of these packages share a number of features including searching capabilities and the ability to import and create bibliographies in a variety of output styles. With the exception of Papyrus they provide support connections to Z30.50 databases, which enables the operator to store results directly from the program. Their search interfaces do not at present provide the full functionality available from the databases own interface.

As reference information management tools they enable the operator to engage in online searching for bibliography production this enables the operator to open their own existing library sorting references searching for a reference and to extend their own search. Used in this way this allows a systematic appraisal of possible reference sources to be undertaken and appropriate references collated in a library format appropriate to the user.

One of the big advantages of these systems is that it is possible to access remote library Databases and remote catalogues bringing the results back to the software package.

Advanced features include the ability to utilise import filters and customised filters to ensure that the selection of the material is sharply focused The system provides a quick data entry system with consistent keywords and journal abbreviations.

Feedback from industry indicates that these software systems provide an effective means of collating information.

For example Reference Manager is acknowledged to be a small but vital part of Knowledge Management at Shell Global Solutions. When integrated with Microsoft Word it enables the user to produce a formatted reference list frequently needs little subsequent modification. The time invested in maintaining a Reference Manager database is more than recuperated in terms of the time spent in preparing bibliographies. (2)

The selection of the package is a personal decision for users based on finance, organisation, traditions or standards and the perceived use of the package. What is evident is that most research students are unlikely to become acquainted with these sophisticated packages without guidance and specialised training in their use. They are also copyright issues, which need to be addressed before their adoption. Copyright law is one of the most problematic issues facing the new world of electronic media and an area which information professionals need to be aware of particularly in respect of the ability to link directly to the world wide web and capture information from webpages or databases direct capture. A useful starting point in Britain for exploring these issues is Tracey Mulvaney ,UKOLUG Quick Guide to Personal Bibliographic Software, UK Online User Group, 2000. (5)This provides an informative case study based review of the main software packages and explores some of the legal implications involved in utilising this new technology. Another useful text is Gina Wisker's Good Practice Supervising Postgraduate Students, SEDA, 1999 (8)

Useful web addresses include

CITEWISE www,citewise.co
This provides the latest information on personal bibliographic software and a downloadable demonstration disc

ISRESEARCH SOFT www.isresearchsoft.com
A one stop shop which can assist with cross product compatibility and new developments
This brief introductory outline of bibliographic software is really intended to act as a launching pad for academics and students new to these processes.

CONCLUSION

As indicated at the beginning of the paper this is really about work in progress but it appear evident that, in the foreseeable future, the IT revolution will dramatically transform the way postgraduates complete a thesis. Future developments will clearly illustrate IT will be a considerably more complex and differentiated system which exists at present or the way in which we attempt to make sense of it by offering compartmentalised models of IT.

Given that the growth of these sites and the way in which they are being updated likely to remain exponential for the foreseeable future it is impossible to provide a definitive critique of their availability and use. This may best be provided on its own Web page which itself updated on a regular basis. Giving the students an insight into what is at present available and encouraging them to embark upon the task of taking responsibility for their own updating is my main task. It is however evident that postgraduates would befit from a greater exposure to the benefits of computer based learning and that this technology would significantly enhance their productivity. These issues can be addressed with the provision of specialised training courses prior to embarking on the research exercise. Such an approach will significantly enhance the postgraduate's competitive position in what is increasingly becoming a knowledge-driven global economy.

ENDNOTES
(1) Ardagh, J. The New France, Pelican 1978
(2) Carter, E, A. Case Study in Personal Bibliographic Software: The Use of Reference of Reference Manager at Shell Global Solutions UKOLUG Newsletter Vol 11 No3 May/June 2000
(3) Dearing Report Higher Education in the Learning Society , 1997.
(4) Harris Report Review of Postgraduate Education 1996
(5) Mulaney, T UKOLUG: Quick Guide to Personal Bibliographic Software<Ukonline User Group 2000
(6) QAA Review Report 00/37 of Research Consultation 2000
(7) QAA The Framework for Qualifications of Higher Education in Scotland January 2001
(8) Wisker, G. Good Practice Supervising Postgraduate Students SEDA 1999

Dr J F Martin
School of Humanities and Social Science
De Montfort University
The Gateway
Leicester
LE1 9BH
UK
E-mail jfmartin@dmu.ac.uk
Tel + 44(0)116 2551551 Ex 8680

Professor G M Chapman
Director
International Office
De Montfort University
The Gateway
Leicester
LE1 9BH
UK
E-mail gmc@dmu.ac.uk
Tel +44(0)116 2506087