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Learning, students' skills and learning technologies (old and new) in the development of accounting education.

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A submission in fulfilment of the requirements for the degree of Doctor of Philosophy of the University of Glasgow

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Abstract

This submission represents a journey of learning about learning within accounting education, and, in particular, the role of learning technologies and students' skills in the process of learning. The work presented was published over the past decade and a half and addresses issues concerned with accounting education both past and present, and includes research on the author of the first printed text on double entry bookkeeping, Fra' Luca Pacioli. The overriding research interest at the core of this submission and which has guided the various and varied phases and themes within in it is a concern to learn from how learning technologies are and have been an integral part of the educational environment, and to gain insight into how learning technologies might best be utilised in the field of accounting education.

The work is presented in two themes with an additional two publications related to methodological approach. The first theme is related to students' skills and technology and the second theme includes historical research into early accounting education. The published work in these themes is predominantly represented by research published in leading refereed journals in the fields of accounting education and accounting history.

The additional two publications are included as they relate to and illustrate the methodological approaches that underlie the overall approach to the research that is presented and developed in the two themes: an approach that privileges, as far as practical, subjects' contextual understandings of their worlds.

Given the diversity of the work included in this submission there is no single research question and there are a diverse range of contributions. The work included contributes to our understanding of the introduction and utilisation of learning technologies in the teaching of accounting, both printed books in the 15th century and Information Technology (IT) in the late 20th/early 21st centuries, and the skills required to facilitate learning within the discipline of accounting. The practical value and importance of the research is supported by, *inter alia*, reference to the author's applied work (not part of the submission) that illustrates how the published work contributes to good practice in skills development and the introduction and integration of learning technologies in the accounting curriculum.

The papers on IT skills adds to our understanding of the IT skills that students bring with them to university, and raises awareness of the need to challenge the taken for granted assumptions about the abilities of new generations of students. The work on generic skills, whilst showing the importance of skills development also highlights the complexities in this area particularly in relation to issues concerned with confidence in making choices, in the subject matter, via modelling choices, and in time management: not knowing what to do, what to study. The paper on matrix accounting in a Russian university illustrates the potential of an approach to accounting education that is facilitated by the use of IT based learning.

The work on Pacioli contributes significantly to our knowledge and understanding of Pacioli as a pioneer in the field of accounting education, and the role of his writing within *Summa* in the education, development and spread of double entry bookkeeping and accounting, in particular by relating the works to literature in fields such as renaissance art, educational systems and social development. In contrast, the sole authored work on Pacioli concentrates on an element of the minutiae of the bookkeeping process, the accounting for goods inventory, traces the longevity of this method of recording transactions, and shows how this had potential to provide important decision information to merchants, who were the prime market for Pacioli's writing at the time.

The two themes addressed in this submission include works that have individually made unique and significant contributions to the fields of accounting education and accounting history, and the two publications included to illustrate the methodological approach have made a contribution methodologically and to the finance literature. Taken together the works presented also provide a significant and original contribution to the knowledge and understanding of the role of learning technologies in accounting education and, by investigating new learning technologies in the different periods of time, provide a platform for further research to help us to appreciate the importance of technologies in accounting, and in accounting education.

Dedication

I dedicate this work to my family, particularly to my wife Angela and my children, Lauren and Bethan, who have suffered my inattention and moods over a very long period of time. I can't promise either will improve, but there is now a chance they will!

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Note on referencing

In order to distinguish between references to works included in this submission and other references, references included in the submission are indicated by a code in angled brackets “< >” and standard referencing format using parenthesis “()” is used for other references.

Acknowledgements

First and foremost, I would like to thank all the co-authors with whom I have worked on the papers included in this submission; Alan Sangster, Patricia McCarthy, Margaret Milner, Anna Vysotskaya, John Holland, Paul De Lange, Brendan O'Connell and Giovanna Scataglini-Belghitar. Of these I am particularly indebted to Alan Sangster who is a co-author on seven of these works and who has been a supportive and valuable colleague and friend for many years.

My thanks also go to my submission advisor Catriona Paisey for her encouragement and support; and to John McKernan and Jo Danbolt for encouraging me to prepare this submission.

Author's Declaration

I Gregory Neil Stoner declare that no portion of the work included in this submission has been submitted by the author in support of an application for another degree or qualification of this or any other university, institute of learning or professional body. I declare that, except as indicated by joint authorship or specific acknowledgments shown in the text, the work included in this submission embodies the results of my own work. Information derived from the published and unpublished work of others has been acknowledged.

Section 1: Details of the Published Work & Explanatory Essay

Preface: outline and genesis

This submission represents a journey of learning about learning within accounting education, and, in particular, the role of learning technologies and students' skills in the process of learning. The work arises from my early interest in accounting education dating from the mid-1980s, primarily in the form of scholarship and the reflective practice of teaching, which was developed both whilst teaching accounting and information systems and whilst on secondment to the Scottish Higher Education Funding Council's (SHEFC¹) Learning Technology Dissemination Initiative (LTDI) project in 1995/96. Since then this research interest has developed as published work.

This submission represents a body of research that spans the period from 1996 to 2013. The majority of the work is presented in two themes, predominantly represented by research published in leading refereed journals in the fields of accounting education and accounting history. The two additional publications, major works in their own right but not directly in the fields of this submission, are included as they contribute to the discussion of methodological approaches that underlie the overall approach to the research that is represented and developed in the other themes: an approach that privileges, as far as practical, subjects' contextual understandings of their worlds. Though not included in the submission, a body of further work, largely related to the integration of learning technology in the teaching of accounting, provides evidence of dissemination of the ideas that underlie the work and the practical value of the research publications that are included in the submission.

The structure of the submission

The following part of this submission sets out the published works included arranged in three sections: the two themes and the publications included to illustrate the methodological approach. Within each section a brief introduction outlines the nature of the publications within it and a note is provided on the status of the publications. This is

¹ Now operating as the Scottish Funding Council, SFC.

followed by the explanatory essay which is restricted by regulations and practice to a maximum of 5,000 to 5,500 words. The essay justifies the intellectual significance of the published works, including an explanation of the relationships between the works within the themes, and outlines the developments and interrelationships between the research represented. The essay concludes with an overview of the research and the contribution made, and discusses the limitations and further avenues of research that are being developed and might be developed in the future.

The published works and themes

The published works on which this submission is based fall into the following overlapping areas.

Theme-A: Skills, skills development and technology.

Theme-B: The introduction and use of printed texts in accounting education

Publications related to methodological approach

The published work submitted in each of these areas is listed in the following sections, which include a brief introduction to the area, and the papers within it, and an indication of the status of the outlets in which the work was published. Copyright information and an indication of my personal contribution to the work and the research underlying it are provided in the table in Section 2 of the submission (The published works).

Theme-A: Skills, skills development and technology

Three of these papers deal directly with students' skills and discuss the implications of these for accounting education. The first and third are concerned with students' information technology skills and the fourth examines skills in a broader context, including the notion of learning to learn as an important skill, and reports on a project to integrate these within the first year of the accounting curriculum within a university setting. The second and fifth papers are concerned more directly with technology, and therefore indirectly address issues related with skills. The second looks at the practical and pedagogic implications of the implementation of technologies into the accounting curriculum. The fifth, on matrix accounting in a Russian university, illustrates the potential of an approach to accounting education that is facilitated by the use of IT based learning. The last paper presented is not primarily a work on skills or technology but is included to illustrate the applicability of, and need to consider, students' skills in the design and delivery of the accounting curriculum and to do so taking account of the institutional, international and learning context.

A	Reference Code <>	Publications	Nature of work
1	A1-1999	Stoner, G (1999) "It is part of youth culture, but are accounting graduates confident in IT?", <i>Accounting Education: an international journal</i> , 8 (3), 217-237. [ISSN: Print, 0963-9284, Online 1468-4489]	Refereed Journal Paper
2	A2-2003	Stoner, G (2003) "Using learning technology resources in teaching management accounting", in Kaye, R and Hawkridge, D (editors) (2003) " <i>Learning & Teaching for Business: Case studies of successful innovation</i> " Published by Kogan Page for BEST (Business Education Support Team: the Learning and Teaching Support Network for Business, Management and Accountancy) [ISBN 0749440252], Republished/printed by Routledge [ISBN 9780749440251]	Refereed Chapter
3	A3-2009	Stoner, G (2009) "Accounting students' IT application skills over a 10 year period", <i>Accounting Education: an international journal</i> , vol. 18, no. 1, pp. 7-31. [ISSN: Print, 0963-9284, Online 1468-4489]	Refereed Journal Paper
4	A4-2010	Stoner, G & Milner, M (2010) "Embedding generic employability skills in an accounting degree: development and impediments", <i>Accounting Education: an international journal</i> , 19(1&2), pp. 123-138. [ISSN: Print, 0963-9284, Online 1468-4489]	Refereed Journal Paper
5	A5-2012	Stoner, G. and Vysotskaya, A (2012) "Introductory Accounting with Matrices at the Southern Federal University, Russia", <i>Issues in Accounting Education</i> 27(4) pp. 1019-1044 [ISSN: Print 0739-3172, Online 1558-7983]	Refereed Journal Paper
6	A6-2013	Stoner, G. and Sangster, A., (2013) Teaching IFRS in the U.K.: Contrasting experiences from both sides of the university divide, <i>Issues in Accounting Education</i> [issue/date awaited, early 2013] (on-line early at http://aaajournals.org/doi/abs/10.2308/iace-50357 : 23/12/2012). [ISSN: Print 0739-3172, Online 1558-7983]	Refereed Journal Paper

Three of these papers (1, 3, & 4) are published in *Accounting Education: an international journal*, the international journal that is associated with the IAAER (The International Association for Accounting Education and Research) which is one of the two leading journals in the field: paper 3 was the runner-up best paper in 2009 in the journal. The other leading journal in the field is the American Accounting Association journal *Issues in Accounting Education*, in which the final two papers (5 & 6) are published. The remaining output (2) is a refereed paper in a book published with the support of the Higher Education Funding Council's, Learning Technology Support Network² and edited by two influential professors in the field of technology in business and open education at the time.

Theme-B: The introduction and use of printed texts in accounting education

The work here considers the introduction of one of the earliest forms of learning technology, the introduction of printed books, into the dissemination and teaching of bookkeeping and accounting inspired by the publication of *Summa de Arithmetica, Geometria, Proportioni et Proportionalita* by Fra' Luca Pacioli in 1494.

² Which has now be absorbed within the Higher Education Academy (HEA), originally via the Business Management Accounting and Finance subject centre of the HEA.

B	Reference Code <>	Publications	Nature of work
7	B7-2007	Sangster, A, Stoner, G and McCarthy, P (2007) "Lessons for the classroom from Luca Pacioli", <i>Issues in Accounting Education</i> , vol. 22, no. 3, pp. 447-457. [ISSN: Print 0739-3172, Online 1558-7983] ³	Refereed Journal Paper
8	B8-2008	McCarthy, P, Sangster, A and Stoner, G (2008) "Pacioli and Humanism: pitching the text in Summa Arithmetica", <i>Accounting History</i> , vol. 13, no. 2, pp.183-206. [ISSN: Print 1032-3732, Online 1749-3374]	Refereed Journal Paper
9	B9-2008	Sangster, A, Stoner, G and McCarthy, P (2008), "The Market For Luca Pacioli's Summa Arithmetica", <i>Accounting Historians Journal</i> , vol. 35, no. 1, pp. 111-134. [ISSN 0148-4184; E-ISSN 0148-4182]	Refereed Journal Paper
10	B10-2010	Stoner, G (2010) "Pacioli's goods inventory accounts and learning" Published proceedings of the conference: <i>Accounting: The Past, Present and Future</i> , 16-17 February 2010, Kuban State University, Krasnodar, Russian Federation. [translation of the Russian] pp.63-81 [ISBN 978-5-93491-370-1] ⁴	Selected and refereed conference papers ⁵
11	B11-2011	Stoner, G. (2011) 'The perseverance of Pacioli's goods inventory accounting system.' <i>Accounting History</i> , Vol. 16 no. 3, 313-329. [ISSN: Print 1032-3732, Online 1749-3374]	Refereed Journal Paper
12	B12-2011	Sangster, A., Stoner, G. and McCarthy, P. (2011) "In Defense of Pacioli", <i>Accounting Historians Journal</i> , Volume 38, Number 2, pp. 105-124, [ISSN:0148-4184; E-ISSN 0148-4182]	Refereed Journal Paper
13	B13-2012	Sangster, A., Stoner, G., De Lange, P., O'Connell, B. & Scatalini-Belghitar, G (2012) 'Pacioli's forgotten book: The merchant's ricordanze' <i>Accounting Historians Journal</i> , 39(2), pp.27-44. [ISSN:0148-4184; E-ISSN 0148-4182]	Refereed Journal Paper
14	B14-2013	Sangster, A., Stoner, G., Scatalini-Belghitar, G., De Lange, P., and O'Connell, B. (2013) "Pacioli's Example Entries – A Conundrum Resolved?", <i>Abacus</i> , vol. 49 issue 3 [pp. to be confirmed] (on-line early at http://onlinelibrary.wiley.com/doi/10.1111/j.1467-6281.2012.00372.x/abstract : 29/1/2013) [ISSN- Print: 0001-3072 Online: 1467-6281]	Refereed Journal Paper

The first paper (7) is published in the leading American accounting education journal (the journal of the Teaching Learning and Curriculum Section of the American Accounting Association). Five of the papers are published in international specialist accounting history journals, 8 and 11 in the Australian journal *Accounting History* and

³ This work was also included in the PhD by Publication of Alan Sangster (Sangster, A., 2008, *Changing Practice in Accounting Education – Experimentation, Innovation, and Encouragement*, PhD by Publication, The University of Glamorgan.

⁴ Also published in electronic conference proceedings, Accounting History International Conference 2010 (Wellington) (refereed acceptance) [<http://www.victoria.ac.nz/sacl/6ahic/conference-papers.aspx>, 12/5/2010] European Accounting Association 33rd Annual Conference 2010 (Istanbul) (refereed acceptance) [<http://www.eaa2010.org/r/home>, 18/5/2010].

⁵ **NB** this paper has subsequently been split into 3 separate papers on the advice of the academic reviewers, the first is Published <B11-2011>, the other 2 are in redrafting.

9, 12 and 13 in *The Accounting Historians Journal* (the journal of the Academy of Accounting Historians, based in the US). The conference proceedings paper (10) was a plenary paper at the conference in Russia (published in the proceedings) and was a refereed paper at key international conferences, and is included as it presents (in nascent form) important developments of the published sole authored work (11). The last paper (14) is in the international general accounting journal *Abacus*.

Publications related to methodological approach

This submission also draws on the following works which form a basis for some of the more detailed methodologies utilised within the substantive works above and also informs the overall methodological approach of the submission. The methodology section of the ABR paper and the more detailed case studies chapter were derived from earlier work, including an unpublished conference paper (Stoner, 1987).

C	Reference Code <>	Publications	Nature of work
15	C15-1996	Holland, J B and Stoner, G (1996) 'Dissemination of Price Sensitive Information and Management of Voluntary Corporate Disclosure', <i>Accounting and Business Research</i> , 26 (4), pp 295-313. [ISSN: 0001 4788]	Refereed Journal Paper
16	C16-2004	Stoner, G and Holland, J B (2004) "Case Studies in Finance Research", In C. Humphrey and W. Lee (eds.) " <i>Real Life Guide to Accounting Research: A behind the scenes view of using qualitative research methods.</i> " Elsevier, Amsterdam & London. [ISBN: 0-08-043972-1 - Hardback] Republished in paperback (2008), by CIMA publications/ Elsevier, Oxford [ISBN 10: 0080489923]	Refereed chapter in seminal book

Accounting and Business Research is a leading international journal in the accounting field and the journal article (15) was awarded an ANBAR citation of excellence (for the quality of writing). The book chapter (16), was development alongside the methodology section of the ABR paper and, though published later, was a refereed contribution to the seminal book that arose from the innovative conference "*Beneath the Numbers: Reflections on the Use of Qualitative Methods in Accounting Research*" held in Portsmouth in 1996: a conference supported by the Institute of Chartered Accountants in England and Wales (ICAEW).

Explanatory Essay

Introduction

The core research interest of this submission is to learn how learning technologies are, and have been, an integral part of the educational environment, to gain insight into how learning technologies might best be utilised in the field of accounting education and to help understand the relationships between students' skills and learning. The research started in the 1980s with an interest in how well students were equipped with the skills required to utilise effectively the new learning technologies of the time, those imbedded in computer systems, and to use the technology tools that were becoming so important in the practice of accounting. This work⁶ informed curriculum development, and aspects of it were published (Stoner, 1985), presented at accounting conferences (Stoner and Nisbet, 1989 & 1990⁷), and incorporated in an official professional handbook (ICAEW, 1990) but is not part of this submission. This early pedagogic interest was reinforced during a year on secondment to the innovative Learning Technology Dissemination Initiative (LTDI) project (based at Heriot-Watt University and funded by the Scottish Higher Education Funding Council, SHEFC⁸) as a learning technology consultant for the academic year 1995/96. Since that period this research interest has developed into published works in leading international journals and in a variety of other media. The most highly regarded of this published work is presented as the first theme of this submission:

Theme-A: Skills, skills development and technology

The second theme of this submission relates to historical research on the work of Fra' Luca Pacioli and his *Summa* which includes the earliest known printed exposition of double entry bookkeeping⁹ (DEB). This research has been carried out since 2006:

Theme-B: The introduction and use of printed texts into the teaching of
accounting

A portion of this research was carried out in collaboration with Professor Sangster (and has involved a variety of other collaborators) and covers several aspects of Pacioli's book and the structure of accounting education in Italy at the end of the 15th Century.

⁶ None of this research was submitted to refereed journals.

⁷ Two quite distinct papers, despite their improbably similar (near identical) titles.

⁸ Now the Scottish Funding Council (SFC)

⁹ The bookkeeping treatise *Particularis de Computis et Scripturis*, contained within Pacioli's *Summa de Arithmetica, Geometria, Proportioni et Proportionalita*, printed in Venice in 1494.

The remaining, sole authored, portion of this theme relates the content and mode of writing of Pacioli's bookkeeping treatise to modern thinking on accounting education and examines the persistence, and relevance, of Paciolian methods in the succeeding centuries.

These themes may seem barely related, however, both relate to periods when education generally and accounting education were being revolutionised by new technologies of learning and the dissemination of knowledge: Information Technology (IT) in the twentieth century and printing in the fifteenth (Eisenstein, 2005; Mills, 1994).

In addition to the published work in the two themes two further publications are included in the submission in a third section:

Publications related to methodological approach.

These are included as they help to illustrate and support the methodological approach that underpins the research in the two themes.

Clearly the collection of published work included in the submission was not originally guided by a single research question. The primary contributions are in two separate areas; students' skills and technology in accounting education and accounting history associated with the publication of Pacioli's *Summa*. However, both these areas are linked by an interest in the introduction and utilisation of learning technologies in the teaching of accounting and the skills required to facilitate learning within the discipline of accounting, as is clearly illustrated in by the first included publication on Pacioli <B7-2007> : a paper which is published in an accounting education journal and relates to similarities between Pacioli's text and the suggested structures of modern distance learning materials. These spheres of research constitute a very broad, and potentially very important, area of understanding. The contribution of the work included in this submission provides a variety of insights into our understanding of aspects of the themes.

Methodological and philosophical approaches

Methodologically the publications included in this submission are diverse, particularly at the detailed level. However, the research, and its interpretation in this submission, was guided by a subjectivist and intersubjectivist view of ontology and subjectivist and interpretative view of epistemology. Though the two non-themed papers included do

not comprehensively set out this methodological approach, they do illustrate the genesis of the methodological approach adopted, and are included for that reason. Specifically <C16-2004> is an elaboration and reworking of the methodology described in <C15-1996>, which was derived from my preliminary research in the 1980s on phenomenological methodology (including, Stoner, 1987).

In essence methodologically the research reflects the desire to see the phenomenon of the research from the perspective of the participants in their (social) setting:

“...it was important to use a methodology that was focused on the individual ...”
in order to *“...provide the basis for the establishment of understandings of the interpersonal and social construction of everyday decisions and action...”*
<C15-1996, p.299>

and to adopt methods

“...designed to delve into the real worlds of the interviewees... to gain insights into how they saw their actions within the contexts... of which they are a part.”
<C16-2004, p.41>.

We

“...sought to relate subjects’ individual reflections with each other... to search for evidence of shared understandings... [and] to synthesise these reflections and understandings with our own projections... in order to describe some tentative “models” of the nature of... information flows.” ... “As such... adopting an ontological stance somewhat similar to the assumption of ‘Reality as Symbolic Discourse’ as elaborated by Morgan & Smircich (1980: 494).”
<C16-2004, p.42¹⁰>

Although the methodological stances of the various papers included in this submission are diverse, the notion of the predominance of the participants’ experience is reflected in most of the research included, as briefly set out in the remainder of this section.

The clearest embodiment of this methodological approach is <A4-2010> where research data is predominantly the verbal transcripts of students in focus groups that were conducted on broadly phenomenological grounds throughout the first year of their accounting degree. In the work on IT skills <A1-1999 & A3-2009> pragmatic compromises were necessary in order to achieve the comprehensive survey data.

¹⁰ Typing error in original corrected *synthesise* for *synthesis*.

However, even here elements of the subjectivist approach are evident in the way the questions were asked and in the interpretation of data from the students' perspectives. The later paper <A3-2009> presents a robust defence of the broadly subjectivist perspective and methods adopted, in particular against the more positivistic approaches that McCourt Larres *et al* (2003) put forward. Other work in the theme is less clearly methodologically subjectivist, though use of student derived data is evident in <A5-2012> and <A2-2003>, and <A6-2013> is based on the reflections of the authors on their experiences.

The approach taken in the historical research (Theme-B) is broadly that of interpretational history (Previts, Parker and Coffman; 1990a&b) informed from a relatively subjectivist position. Within this research a clear stance is taken that it is necessary to attempt to see the developments within the context of their time and place and from the perspectives of the participants of the time, to avoid anachronistic interpretations. This is particularly clear in <B9-2008 & B12-2011>, not least as the argument in the second of these is largely concerned with Yamey's (2010) failure to do so, and in <B10-2010> which examines issues from potential subjects' perspectives. The remainder of the historical papers are based largely on the analysis of the authors' texts¹¹, used as primary evidence of their writing and teaching, and other secondary sources in order to contribute to the historiography of the field. Throughout the analysis and interpretations primacy of position is given, as far as practical, to the participants in the history, thereby maintaining a broadly subjectivist stance.

Skills, skills development and technology (Theme-A)

There is a long history of debate on the role of university degrees, particularly practice related degrees such as those in accounting, in the development of vocational knowledge and skills. This debate coupled with the periodically reawakened debates since the 1980s about employability skills¹² forms the basic literature background of the skills papers within this theme. Papers <A1-1999> & <A3-2009> are concerned exclusively with IT and related computer skills, and were motivated primarily by the introduction and increasing use of computers into the teaching and practice of accounting. <A4-2010> considers a much broader range of employability skills,

¹¹ Some in translation.

¹² Broadly comparable portfolios of these skills being labelled with various terms including enterprise, generic, transferable, key and employability skills,

including the “learning to learn” or “lifelong learning” skills that are an important part of the portfolio of employability skills that are thought of to represent “graduateness”, and is at the heart of the Higher Education agenda.

The initial paper in this theme <A1-1999> was a direct result of undertaking investigations to inform and develop teaching and to enhance the curriculum of the BAcc degree at the University of Glasgow. This was similar to earlier research I conducted, including Stoner and Nisbet (1989 and 1990). <A1-1999> is based on data gathered in 1996 & 1997 and reports on the large changes in students’ reported IT skills both on entering the degree programme and over their first year. This study was conducted at a time when the use of IT in schools was changing rapidly, primarily in order to inform curriculum development by identifying potential issues in students’ skills and computer access. The reported change in some of the IT skills between the two cohorts was very significant. The more important finding and contribution from a practical and policy perspective was that there remained (despite the “common perception” at the time) a great deal of diversity amongst entrants’ IT skills. Indicating that, rather than being in a position to decrease IT training within accounting programmes, there was a need to deal with diversity and to be aware of relatively low levels in the IT skills most relevant to the analytic skills necessary to do well in accounting studies and in the accounting profession, particularly spreadsheet and database skills.

<A3-2009> is a longitudinal follow up to <A1-1999> considering data over the ten year period, 1996 to 2001 and 2006. Longitudinal studies are rare in the field and this paper¹³ provides a perspective on students’ changing skills ratings over a ten year period. One of the contributions of the paper is a robust defence of the use of self assessed skills in research of this nature, pulling together arguments used in various studies as well as illustrating the deficiencies in the arguments of recent papers that purport to provide evidence that show the use of such surveys to be unreliable (for example McCourt *et al*; 2003). The principal contribution and striking result of this survey is that, whilst many of the entrants’ reported skill levels appear to be continuing to increase over the period (as might be expected), skills in some areas were not. Again the skill areas of most concern to the practice of accounting, particularly spreadsheet and database skills, are

¹³ This paper was the runner-up best paper in 2009 in the journal Accounting Education: an international journal.

the areas in which reported skills, confidence, and usage were not increasing: offering a warning to those who assume that students no longer need to develop and learn skills in these areas.

Together these papers contribute to our knowledge about the skills of students and to the methodological debate concerning appropriate methods of surveying skill attributes. In terms of methodology, these papers use statistical methods based on quantitative survey data which attempts to elicit self-assessed judgements in a contextualised way. Also, the use of confidence data in addition to the perceived skills data allows some interpretation from a subjectivist perspective, and inherently reflects the participants' views rather than only those of the researcher.

The skills paper <A4-2010> examined students' skills in a broader way, and used a more overly subjectivist methodology. This paper is a research outcome of another curriculum development project (part funded by the University of Glasgow Learning and Teaching Development Fund¹⁴). Using independently collected anonymous¹⁵ focus group data the research investigates important issues and barriers encountered by first year students entering the accounting degree. The contribution stems from important findings, including an increased understanding of the student perspective on the learning and acquisition of generic skills, especially in relation to the first year university experience, and the existence of significant impediments and barriers hindering both learning and skills development. From this perspective the learning process is found to be complex due to the interrelationships between time management and confidence, the difficulty students have in engaging with the concept of modelling and on students' progress towards "learning to learn". The paper also reflects on the potentially important role of students building their generic skills in parallel with their discipline learning in their path towards 'intellectual and ethical development'¹⁶ (Perry, 1970).

¹⁴ Margaret Milner and I were equal joint applicants/principal investigators on this research, I lead on the writing of this paper.

¹⁵ The independent educational facilitator de-identified the data before it was disclosed to the authors.

¹⁶ The phrase 'intellectual and ethical development' is from the title of the text in which Perry derives his framework of student development "from a simplistic, categorical view of knowledge to a more complex, contextual view of the world and of themselves" (Perry, 1999: back cover).

Both of the later skills papers <A3-2009 & A4-2010> were influenced by experiences gained and research conducted during my time on secondment to the Learning Technology Dissemination Initiative (LTDI). These experiences also motivated <A2-2003>: a longitudinal reflection and evaluation which examined the practical and pedagogic implications of the implementation of technologies into the accounting curriculum. Though much of the data and analysis used in this chapter was relatively informal, the initial evaluation of the “experiment” was formally structured and researched using innovative methodologies that looked at the nature of students’ supplantive and supportive use of the LT provided (Stoner & Harvey, 1999¹⁷). The theoretical approach in this work was based on Stoner (1996d), which drew primarily on Laurillard (1993) and Gagné, Briggs and Wagner (1992): a paper that was the basis of the core chapter (Stoner 1996b) in the LTDI book “Implementing Learning Technology” (Stoner, 1996a)¹⁸, and which also formed the basis of the CTI-AFM plenary Stoner (1997a).¹⁹

Paper <A5-2012> was the result of a submission to a special issue of Issues in Accounting Education on Introductory Accounting Courses²⁰. Initially this research was motivated by the novel ways that students were introduced to accounting through the use of modelling and spreadsheet technology (a development of my long-standing interest, see for example Stoner, 1993). Due to the nature of the special issue the published paper concentrates more on the international context and the use of matrix accounting theory than on technology and skills: aspects that offer potential extensions to this work. This paper makes two significant contributions. First, it increases

¹⁷ Co-written and research with a colleague from LTDI, this paper was presented but not pursued to referee publication.

¹⁸ This book was the most substantial and one of the most successful LTDI publications which has been widely used in pedagogic development and cited in research publications (despite its predominantly practical purpose). [The number distributed in 1995/6 is not now known but 1,200 printed copies were distributed in the following year, as well as many electronic copies and several rights to reprint: this part of the LTDI website attracted 100-150 hits per week in 1996/7 (when the WWW was in its infancy) [Source: LTDI Annual Reports, 1995-96 and 1996-97, available at <http://www.icbl.hw.ac.uk/ltidi/ltidi-pub.htm#AnnualRpt> , last accessed 12/11/2011].

¹⁹ During this period at LTDI I was also actively involved in collating information about available Learning Technologies (Stoner, 1995 and Moge & Stoner; 1996), writing practical guides (Stoner, 1997b; Buckner & Stoner, 1996) and reviewing and evaluating LT resources in edited publications (Stoner, 1996c, 1997c and 1999b), and peer reviewed accounting education publications (Stoner, 1997d, 1997e & 1999c). Moge & Stoner (1996) was edited by others in later editions: the last (10th) edition is available at <http://www.icbl.hw.ac.uk/ltidi/info-direct/infodir.pdf> [accessed 18/6/2012]

²⁰ A call that resulted in nearly 80 submissions and the publication of 30 papers (a mixture of research papers, commentaries and teaching resources) in two volumes (data from Editor’s Report to the editorial team, August 2012).

international awareness of the nature of accounting and accounting education in Russia, one of the increasingly important BRIC nations²¹. Second, and most relevant to this theme, it brings to light how the mathematical modelling approach of matrix accounting, an approach to accounting and transaction processing that is used in practice in many contemporary organisational information systems (particularly those based on ERP systems²²), could be used and integrated into accounting education: thereby enhancing the skills and knowledge of students in this area.

The sixth paper <A6-2013> indirectly relates to elements of the above research, particularly <A4-2010>, via its consideration of approaches to learning and teaching. This paper is a commentary and reflective essay published for a special volume of the journal *Issues in Accounting Education* aimed at the international audience, particularly academics in parts of the world converting to IFRS²³. It concentrates on the effects of and reactions to the introduction of IFRS in UK higher education, highlighting the differences between universities dominated by a research lead focus from those more focused towards teaching and vocational priorities²⁴. <A6-2013> is informed by an interest in the different attitudes towards the introduction of critical analysis and “learning to learn” skills in the accounting curriculum, including the phasing of that introduction. This is reflected in the discussion of learning, faculty (staff) effects and the association between university approach, curriculum, and the introduction of these “higher level” cognitive skills. The contribution of this paper within this theme is to illustrate the applicability of, and need to consider, students’ skills in the design and delivery of the accounting curriculum and to do so taking account of the institutional and learning context.

²¹ The BRIC nations, Brazil, Russia, India, and China, (or BRICS, including South Africa) are discussed as the major developing economies in the world (<http://www.bbc.co.uk/news/business-18242370> : Accessed 24/08//2012).

²² ERP, or Enterprise Resource Planning, systems are the core of most modern corporate accounting information systems and they invariably store data in table formats which are, or can be, manipulated efficiently with matrix mathematics.

²³ International Financial Reporting Standards.

²⁴ Within this paper a simplistic, and possibly controversial, association is implied between the research lead and vocationally focused universities and the classification of “old” and “new” (pre and post 1992) universities. Whilst recognising this is an oversimplification, this distinction was made to frame the discussion of the authors’ experiences in a way that is understandable to an international audience.

Learning and the historic introduction and use of printed texts (Theme-B)

This theme includes research into the nature, genesis and influence of the pioneering publication by Fra' Luca Pacioli (c.1446/47 – 1517) of the first printed text on bookkeeping and accounting, the treatise *Particularis de Computis et Scripturis* (“*de Scripturis*”), contained within his *Summa de Arithmetica, Geometria, Proportioni et Proportionalita* printed in Venice in 1494 (“*Summa*”)²⁵. Collaborative work with Professor Sangster and others focuses on the text of *Summa* and the immediate implications and interpretations of Pacioli’s writing in the context of the time in which it was written. In this work Professor Sangster and I have been the main contributing authors, though the earlier publications (particularly <B8-2008>) were largely motivated by the interests of McCarthy. The sole authored work, though founded in specific details of the text of *de Scripturis*, has a broader historical perspective, looking at the genesis of a particular aspect of the bookkeeping set out for students by Pacioli.

Within <B7-2007> we provide a clear link between Pacioli’s 15th Century text and present day pedagogy by considering the way in which Pacioli presented and “taught” the art of bookkeeping, largely by comparing the structure and content of *de Scripturis* with a modern model of instructional writing (Rowntree, 1994)²⁶. Several devices from Rowntree were identified in Pacioli’s text, leading to observations that we could learn (or relearn) lessons from Pacioli’s writing that we could use in our teaching, particularly his extensive use of contextualisation and practical advice: the most significant contribution. This highlighting of contextualisation appears in the analysis and arguments of most of the other papers in this theme.

By considering the style of writing and presentation of *Summa* we contribute to the understanding of Pacioli and his contribution to accounting history in <B8-2008>. A puzzling question is identified: though Pacioli’s style was lauded in his time by some, within fifty years and to the present day his use of vernacular language²⁷ has been

²⁵ The importance of Pacioli and his *Summa* are not restricted to accounting, as the text is one of the most influential early compendiums of mathematics and Pacioli is known to have had important links with contemporaries in other fields of endeavour of the time, including Leonardo Da Vinci.

²⁶ A text largely founded on the writing of materials for self-study and distance learning resources.

²⁷ For example by the mathematician Federico Commandino (1509–75) who favoured the vernacular language of Florence, which was later to form the basis of standard Italian, rather than the mercantile language of the northern markets, which Pacioli used.

heavily criticised to such an extent as to question the readability of the text. In this novel paper we contextualise the text and its writing in relation to the humanist education and social system of Renaissance Italy and to the fresco decoration in the *Sala dell'Udienza* of the *Collegio del Cambio*²⁸ in Perugia: a major artistic work of the renaissance artist Pietro Perugino²⁹ which is thought to reflect the humanist (*umanista*) movement of the time, and which was created at or close to the time that Pacioli was in Perugia. This paper concludes that Pacioli's choice of language and style was a deliberate attempt to appeal to a wide range of society of the time, especially the merchant classes and teachers in the *abbaco* system, and that this was an important element in the success and influence of his text: by concluding this the paper also contributes to my other work in this area including the arguments in <B9-2008> and <B12-2011>.

The main argument, and conclusion, of <B9-2008> is that *Summa* and therefore *de Scripturis*³⁰ was “intended primarily as a reference text for merchants and as a school text for their sons, and that the large majority of sales of the book were to the mercantile classes” <p.131>. This focus on the intended market for *Summa*, a topic largely neglected in the literature, threw new light on Pacioli's text principally by considering the educational system of the time, the content and structure of *Summa* as whole, and other possible markets for the book. The significance of this paper extends beyond its underlying thesis because the perspective taken reinforces the approach used in other papers in this theme, and in particular the importance of *Summa* in relation to the *abbaco* schools. <B9-2008> and its conclusions are partially challenged by Yamey (2010), in large part repeating and defending his position in earlier papers (dating back to the 1970s and before). However, <B12-2011>, a significant paper in its own right, provides an extensive critique of, and rebuttal to, the comments of Yamey and extends (and corrects) the earlier analysis providing stronger support for the conclusion of <B9-2008>.

Unlike much of the prior research in the area (particularly that of Yamey) <B12-2011> emphasises the need to consider *de Scripturis* as an inherent part of *Summa* as a whole and in the context of the *abbaco* education system and the cultural environment of the time rather than analysing it as a separable text on bookkeeping. From this perspective the pedagogical structure and approach of *de Scripturis* provides an important element

²⁸ The audience hall of the Moneychangers Guild, Perugia.

²⁹ Also known by his name at birth, Pietro Vannucci; c.1446-1524.

³⁰ Pacioli's treatise on double entry bookkeeping.

of the support for the market conclusions and Yamey's non-recognition of the value of *de Scripturis* is shown to be flawed; elevating awareness that Pacioli's main focus of learning the craft and art of bookkeeping was to instil within his readers an understanding of the principles of bookkeeping, rather than the rote learning of rules that are envisaged by Yamey.

The related papers <B13-2012> and <B14-2013> examine the last page of Pacioli's *de Scripturis*. The first part of the page is identified in <B13-2012> to describe Pacioli's version of a merchant's *Ricordanze*: a book Pacioli advises merchants to keep in order to record future orientated business related matters that would not be reflected in the other formal books of account (which record past or completed transactions). Despite the volume of research on and translations of *de Scripturis* over many years this paper is unique in this revelation.

The second part of the page is analysed in <B14-2013>. The analysis of these entries considers their position within the text (after the *Ricordanze*), the standard forms of journals in both Venice and Tuscany (including Florence), and the nature and use of *Ricordanze* in Tuscan records. This paper thereby demonstrates that these entries are, rather than as often accepted sample ledger entries, examples of entries in Pacioli's version of a *Ricordanze*, and as the title of the paper implies, it resolves a conundrum that has existed for many years regarding the nature of these examples. Together these papers reinforce the need to consider the text more clearly as a product of its time, especially when considering its role as a tool of learning, and raise research questions concerned with why its use did not spread as widely as other aspects of *de Scripturis*, and whether or not it is a suggestion related to the recording of a merchant's fledgling banking operations.

The publications <B10-2010> and <B11-2011> are concerned with an accounting and bookkeeping practice that was common in mercantile trading businesses in the time and place that Pacioli wrote his *Summa*, 15th Century Venice. The practice was a form of perpetual inventory recording within the nominal ledger, termed the Early Perpetual Inventory Recording (EPIR). Accounting history literature had previously recorded Pacioli's method of bookkeeping for stocks of goods (EPIR) though writers, including Yamey (1994), had questioned the quality of Pacioli's *de Scripturis* because of this 'strange' (p119) treatment of inventory.

The description, genesis and development of this technique is detailed and discussed in <B11-2011>, which also traces the perseverance of this EPIR technique in the teaching (and by implication) practice of accounting in (at least) the UK and US until the 19th Century. This paper also draws comparisons to the strikingly different treatment that became the dominant method around the turn of the 19th into the 20th century (the Periodic Inventory Valuation, PIV, system) and the Modern Perpetual Inventory Recording (MPIV) system that has been developed since. The comparison is such that the method detailed in Pacioli's *de Scripturis* is criticised as of little value in some textbooks of today³¹, and ignored in most others. The direct contribution of this paper is to highlight the historical perseverance of the methods of bookkeeping described by Pacioli.

In addition <B11-2011> raises questions regarding why the EPIR systems fell out of favour and concludes with observations regarding some possibilities and implications of the change. These issues are partly developed in the later parts of <B10-2010>³² and are the subject of work in progress. Though in nascent form in <B10-2010> two issues arising from this change are developed and discussed: both in relation to the information content of ledger accounts under the various systems of goods inventory accounting. First the demise of EPIR is discussed in relation to the potential educational implications of the development, in particular the potential decreased motivation for learning arising from the lowered contextual value of the information readily available in the accounts. Second, <B10-2010> speculates on the potential relationship between the change to the less informative ledgers under the "new" PIV system and the rise of capitalism, in particular by looking at changes in the accounting of the Hudson's Bay Company in the early 19th Century.

The published work in this section has implications and importance from both an historical perspective, particularly in relation to Pacioli's *Summa* that has lead him to be hailed as the "father of accounting", and from perspectives on learning and the role of educational technologies, specifically the printed book as the new technology of the time.

³¹ Including Wood and Sangster (2005, 2008)

³² This is a conference paper published in Russian conference proceedings that included, as its introduction, much of the material covered in <B11-2011> (that was later extracted as a fully refereed, western, publication).

A feature of the contribution of the work in this theme is that it has explicitly attempted to deal with the broader educational and social context of the time in which Pacioli's text was introduced: in contrast to much of the other research on Pacioli's *Summa* (at least in the accounting history arena). In particular this work considers *Summa*, and the fact that it was printed, in the context of the *abbaco* education system and therefore, unlike other work in the area, the links with merchants. In part this emphasis on the 'then contemporary environment' is an extension and manifestation of the desire to maintain a broadly subjectivist methodological stance, in particular attempting to utilise a degree of empathy with readers and writers of the past and to look into possible intersubjective shared meanings.

This theme brings into the discussion the learning about learning that we can gain by investigating and considering the history of accounting education, in particular the historic introduction and use of printed texts in the teaching of bookkeeping and accounting. The work here is largely situated within the context of the work and life of Fra' Luca Pacioli in the 15th Century, whilst my more recent work is considering the ways in which the learning technologies introduced by Pacioli's printed text have influenced the teaching of bookkeeping and accounting over the following centuries.

Conclusions

Limitations and further avenues of research

Much of the research in Theme-A is based on data from single institutions: generalisability is therefore problematic. The work on IT skills is however comparable, to a limited degree at least, with similar work in other institutions, including work using adaptations of the instrument developed in the earlier paper <A1-1999>. The barriers and impediments paper <A4-2010> is less readily comparable to research conducted elsewhere, but its strength is in the depth of analysis: a level of richness that would not be practicable with more widely representative methodologies. Clearly there are many further avenues for research in these areas, both in terms of looking to analyse further changes in students' skills, in refining the methods used to assess students' skills and in determining the links between skills and learning about accounting (and other disciplines).

The majority of the historical work (Theme-B) relates to a period over five hundred years ago, consequently there are limitations in relation to the evidence available: resulting in some reliance on the historiography of the discipline and on the interpretations, and critique, of other writers on accounting history. In large part this is an unavoidable issue, however there are possibilities for further research on records of the period that may help illuminate or refine the analysis, though such records are limited. The more recent, sole authored, work is examining traces of Pacioli's influence in more recent times; this does have a more evidential base: the educational texts of the 16th to 20th centuries.

The contribution

Given the diversity of the work included in this submission there is no single research question and a diverse range of contributions. The work included contributes to our understanding of the introduction and utilisation of learning technologies in the teaching of accounting, both printed books in the 15th century and IT in the late 20th/early 21st centuries, and the skills required to facilitate learning within the discipline of accounting.

The two papers <A1-1999 & A3-2009> add to our understanding of the IT skills that students bring with them to university, and raises awareness of the need to look beyond the taken for granted assumptions about the abilities of new generations of students. The work on generic skills <A4-2010>, whilst showing the importance of skills development, also highlights the complexities in this area particularly in relation to issues concerned with confidence in making choices, both in the subject matter, via modelling choices, and in time management: not knowing what to do, what to study. By discussing these issues understandings are drawn in relation to the problems of transition to university and to students' intellectual development.

The paper on integration of learning technologies <A2-2003> contributes to an understanding of the integration of these technologies and illustrates why the material on skills has importance to student learning as, in its way, does the paper on the use of simulation modelling and matrix accounting within a Russian context <A5-2012>. The contribution within the theme of the UK IFRS teaching paper <A6-2013> relates to the apparent effect of different teaching and learning approaches on students' development of critical and 'learning to learn' skills, which reinforces the need to consider the issues

raised in the work on the development of skills in the first year of an accounting degree <**A4-2010**>.

The skills and technology work has also informed the research on Pacioli, helping to contextualise and understand the changes in accounting education during the Renaissance and the period that followed, as the printed text was the new learning technology of the time (the 15th and 16th centuries). The earliest paper in this series <**B7-2007**> illustrates this in its use of a modern model of producing materials for distance learning.

The work on Pacioli with Professor Sangster and others³³ contributes significantly to our knowledge and understanding of Pacioli as a pioneer in the field of accounting education, and the role of his writing within *Summa* in the education, development and spread of double entry bookkeeping and accounting, in particular by relating to literature in fields such as renaissance art, educational systems and social development. In addition to throwing new light on the history of the discipline, this work shows the strength of Pacioli as an educational writer in the field of accounting and his *Summa* as an important book for merchants of the time.

The sole authored work on Pacioli³⁴ concentrates on an element of the minutiae of the bookkeeping process, the accounting for goods inventory, and traces the longevity of this method of recording transactions. Though this is an area of detail, to merchants, who were the prime market for Pacioli's writing at the time, it is an important aspect of their operations, and the analysis shows the important potential this has in terms of informing central business decisions. The nascent work is feeding into research on the role of bookkeeping in the evolution of capitalism and the implications for accounting education.

In relation to this submission, the contribution of the papers with Professor Holland³⁵ are concerned primarily with the methodology and methodological approaches that have informed the majority of the work included here. However, both have had wider influences, not just on the methodologies and approaches used by Professor Holland and myself but also of others in the field. In addition the earlier paper has, especially in

³³ **B7-2007, B8-2008, B9-2008, B12-2011, B13-2012 & B14-2013**

³⁴ **B10-2010 & B11-2011**

³⁵ **C15-1996 & C16-2004**

combination with other work by Professor Holland, made a significant contribution to the literature on institutional finance and to the understanding of the way that the markets and market participants process and use information.

Finally

The two themes of this submission include works that have individually made unique and significant contributions to the fields of accounting education and accounting history, and the non- theme publications have made a contribution methodologically and to the finance literature. Taken together the works presented provide a significant and original contribution to the knowledge and understanding of the role of learning technologies in accounting education and by investigating new learning technologies in the different periods of time and place provide a platform for further research to help us to appreciate the importance of skills and technologies in accounting, and in accounting education.

Word count of the Explanatory Essay: c.5364 words.

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Section 2: The published works

Section 2 of this thesis is not included in the public version of the submission[#]

Full details of the public work that forms part of this thesis are provided in the lists on pages 3 to 8 of this thesis (and in the references on pages 25-26).

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